

Ibri II Solar Independent Power  
Project (IPP)  
Sultanate of Oman



Environmental and Social  
Impact Assessment -  
Volume 4 – Technical  
Appendices

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# APPENDIX A

## Environmental and Social Scoping Report

Ibri II Solar Independent Power  
Project (IPP)  
Sultanate of Oman

Environmental & Social  
Impact Assessment: Scoping  
Report



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## **APPENDIX A – KROOKI OF THE PROJECT LAND AREA**

## **APPENDIX B - CIRIA GOOD PRACTICE GUIDELINES: CONTAMINATED LAND**

## **PRELIMINARY RISK ASSESSMENT**

## LIST OF ABBREVIATIONS

| Abbreviation | Meaning  |
|--------------|--|
| CEMP         | Construction Environmental Management Plan           |
| COD          | Commercial Operation Date                            |
| ESIA         | Environmental and Social Impact Assessment           |
| Eps          | Equator Principles                                   |
| EPC          | Engineering, Procurement and Construction            |
| EPFIs        | The Equator Principle Financial Institutions         |
| GHG          | Greenhouse Gas(es)                                   |
| GIIP         | Good International Industry Practice                 |
| IFC          | International Finance Corporation                    |
| IFI          | International Financial Institution                  |
| ILO          | International Labour Organisation                    |
| IPP          | Independent Power Project                            |
| LTSO         | Licensed Transmission System Operator                |
| MECA         | Ministry of Environment and Climate Affairs          |
| NOMAC        | The First National Operation and Maintenance Company |
| OEMP         | Operational Environmental Management Plan            |
| OETC         | Oman Electricity Transmission Company                |
| OPWP         | Oman Power and Water Procurement                     |
| O&M          | Operation and Maintenance                            |
| MW           | Mega Watt  |
| PPA          | Power Purchase Agreement                             |
| PV           | Photovoltaic   |
| RAP          | Resettlement Action Plan                             |
| WHO          | World Health Organisation                            |
| 5 Capitals   | 5 Capitals Environmental and Management Consulting   |

# 1 INTRODUCTION

Over the past two decades, the government of the Sultanate of Oman has engaged a successful programme to expand and improve the delivery of electricity and water services in the Sultanate by restructuring and developing the private sector involvement in electricity and water sectors in Oman. Energy diversification is a part of the 'Oman 2040' Strategy and in line with the overall economic diversification plans in the country.

The Oman Power & Water Procurement Company (OPWP) has awarded the contract to construct a 500MW Solar Photovoltaic Power Plant in the Ad Dhahirah region of Ibri, Oman to a consortium of Saudi Arabia's ACWA Power and Kuwait's Gulf Investment Corporation and Alternative Energy Projects Company.

The project award includes the design, engineering, construction, commissioning, ownership, financing, operation and maintenance of the Solar PV Power Plant. The solar PV Power Plant known as; the Ibri II Solar Independent Power Plant (herein referred to as 'the Project') will be developed as an Independent Power Project using bi-facial PV module technology.

## 1.1 Key Project Information

**Table 1-1 Key Project Information**

|   |  |
|---|--|
| <b>PROJECT TITLE</b>  | Ibri II Solar Independent Power Plant (Ibri II Solar IPP), Sultanate of Oman   |
| <b>PROJECT PROPONENT</b>  | Oman Power & Water Procurement Company (OPWP)  |
| <b>PROJECT OWNER</b>  | ACWA Power & Gulf Investment Corporation and Alternative Energy Projects Company   |
| <b>EPC CONTRACTOR</b>   | Consortium of Powerchina and Powerchina Huadong  |
| <b>OPERATION &amp; MAINTENANCE COMPANY</b>  | The First National Operation and Maintenance Company (NOMAC)   |
| <b>ENVIRONMENTAL CONSULTANT FOR MECA AND LENDERS - COMPANY NAME &amp; ADDRESS</b> | Yahya Engineering (MECA Consultant)<br>P.O.Box 1537<br>Sultanate of Oman<br>Postal Code 131, Al Hamriya<br>Tel: +968 (0) 9 179 9170  |
|   | 5 Capitals Environmental and Management Consulting (Lender Consultant)<br>PO Box 119899<br>Dubai, UAE<br>Tel: +971 (0) 4 343 5955<br>Fax: +971 (0) 4 343 9366<br>www.5capitals.com |
| <b>POINT OF CONTACT</b>   | Hardik Ramaiya, Principal Consultant<br>hardik@yahyaengineering.net  |

## 1.2 Scope of Work

5 Capitals Environmental & Management Consultancy (5 Capitals) has been appointed by ACWA Power to manage the Environmental Impact Assessment (ESIA) for the Project in accordance with Omani environmental regulations and the lending standards of the Project's prospective lenders. In turn, 5 Capitals has engaged Yahya Engineering, a firm registered with the Ministry of Environment and Climate Change (MECA) to collaborate in preparing the ESIA studies.

As a pre-cursor to the ESIA, this "Environmental & Social Scoping Report" has been prepared to outline the anticipated environmental impacts and risks associated with the project and to identify the respective scope of work required for the ESIA. This Scoping Report will be submitted by Yahya Engineering to the Environmental Regulator in Oman, the 'Ministry of Environment and Climate Affairs (MECA) prior to commencing the ESIA.

This document herein is the ESIA Scoping Report for the Ibri II Solar Independent Power Project (IPP).

ACWA Power are seeking project finance from International Financial Institutions (IFIs) who are likely to be signatories of the Equator Principles (EP), 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, the required ESIA will need to be of a standard that can demonstrate alignment with the EP's, IFC Performance Standards and IFC EHS Guidelines. It is also likely that ACWA Power will seek project finance from other IFIs who are not signatories of the Equator Principles (EP). Where this is the case, the required ESIA will be of a standard that can demonstrate alignment with the requirements of such financial institutions.

This scoping report and subsequent ESIA will be submitted to the prospective project lenders. This includes consideration of potential 'social' impacts attributable to the Project, and the on-going management of these impacts & risks.

It should be noted that for the purpose of this document the term ESIA is considered to be inclusive of the Environmental Impact Assessment (ESIA) requirements of MECA as well as the Environmental & Social Impact Assessment requirements of the lenders. As such, topics such as community health & safety, labour and working conditions are discussed herein so as to satisfy lenders requirements.

### 1.3 Objectives of the ESIA Scoping Report

The main objectives of this ESIA Scoping in relation to the 'Project' are as follows:

- To provide an overview of the project, to enable context for the reader;
- To provide an overview of the regulation context requiring ESIA, other obligations and environmental & social standards applicable to the project;
- To identify preliminary environmental & social baseline conditions and receptors to ensure that proposed assessment techniques (including required baseline surveys) are designed to enable the establishment of representative environmental conditions for the Project and its areas of impacts/influence;
- To identify preliminary environmental & social potential impacts relating to the construction and operational phases of the project, at an early stage to ensure assessment techniques for the subsequent ESIA address these issues specifically; and
- Based on the preliminary impacts, to delineate the assessment requirements of the ESIA and ESIA structure.

This ESIA Scoping report has been informed by:

- Analysis of the Project details, design and proposed works as provided by ACWA Power;
- Review of relevant satellite mapping;
- Review of available and applicable secondary data sources;
- Visits to the project site in October 2018 and May 2019; and
- 5 Capitals' experience and review of ESIA's for similar PV projects and other projects in Oman, including the ESIA for the nearby Ibri IPP.

## 2 PROJECT INFORMATION

### 2.1 Project Background and Rationale

The 500 MWac Solar PV Project in Ibri, Oman is a continuation of the implementation by the Government of its privatisation policies designed to encourage private sector participation in the provision of utilities in Oman. This comes in line with Oman's vision of restructuring its electricity sector and diversifying its energy resources. This renewable energy project is the largest utility scale Solar PV project in the Sultanate of Oman that will contribute to meeting the energy needs of the people and enhancing the targeted economic diversification.

### 2.2 Project Location

The proposed project will be located in an undeveloped area of approximately 1,327 hectares in the Ad Dhahirah region of Ibri, Oman. The proposed site is located adjacent to the Highway 21 (Buraimi-Ibri highway) west of the town of Ibri, approximately 100km off the coast and approximately 100km away from the border with the UAE. The site's elevation is approximately 285m above sea level.

**Figure 2-1 Proposed Project Location Within the Sultanate of Oman**



The proposed Project site coordinates are presented in the table below.

**Table 2-1 Project Site Coordinates**

| ID | WGS 84 UTM ZONE 40Q |            |
|----|---------------------|------------|
|    | NORTHING            | EASTING    |
| 1  | 2587243.654         | 420382.738 |
| 2  | 2586490.345         | 420382.505 |
| 3  | 2584762.710         | 421892.148 |
| 4  | 2583732.813         | 420698.010 |
| 5  | 2582798.702         | 420698.010 |
| 6  | 2581829.953         | 421502.780 |
| 7  | 2581829.953         | 422127.567 |
| 8  | 2583099.947         | 423673.929 |
| 9  | 2583508.354         | 423338.513 |
| 10 | 2584242.317         | 424180.766 |
| 11 | 2583913.360         | 424468.030 |
| 12 | 2583880.468         | 424430.372 |
| 13 | 2583790.081         | 424509.303 |
| 14 | 2583869.013         | 424599.690 |
| 15 | 2584288.602         | 424233.280 |
| 16 | 2584293.367         | 424238.747 |
| 17 | 2587243.654         | 421667.393 |

The overall project layout is presented in the figure below.



Figure 2-2 Overall Project Layout





## 2.3 Land Use and Site Condition

### 2.3.1 Land Ownership

The proposed project site for development is owned by the Ministry of Housing. The Project Company will enter into a Usufruct Agreement with the Ministry of Housing.

The Ministry of Housing through a Land Lease Agreement with the Project Company will grant the Project Company a Usufruct Right over the land to enable the Project Company undertake its activities on the site for an initial duration of 25 years.

The Krooki, (also be referred to as the project affection plan) for the projects land area issued by the Ministry of Housing is presented in Appendix A. This document shows the current owner of the land to be used for the development of the proposed project.

### 2.3.2 Site Condition

The proposed project site is located approximately 100km from the border with UAE and about 28km north of the town of Ibri. The site condition is undeveloped and in its vast majority is greenfield. The topography of the Project site is predominantly flat with gravel plains while some areas have low sand sheets and evidence of runoff water flows/collection are found in other areas.

Runoff/wadi areas were identified in the north western and south western areas of the Project site during an initial site visit on 1<sup>st</sup> October 2018. The north western runoff/wadi was prominent during the May 2019 visit following heavy rainfall a couple of days before. This included evidence of scour from water flow and erosion of channel edges. The presence of these low lying runoff areas suggests that the site is prone to water flow and/or accumulation at times of rainfall or rainfall on the mountains in surrounding areas.

**Figure 2-3 Runoff/Wadi Area (north-western section of site) – 23<sup>rd</sup> May 2019**



Review of satellite imagery and initial site visit undertaken on 1<sup>st</sup> October 2018 reveals that there are no expansive residential settlements within the project footprint. The nearest residential receptor outside the project site are located in villages few kilometers away from the Project site. However, it was identified during the visit in May 2019 that a small number of expatriate labourers (possibly 2-3 people at a time) live in small structures in the areas of the Project site, whilst tending to camels; understood to belong to the local Sheikh.

**Figure 2-4 Accommodation Hut (On-site) – 23<sup>rd</sup> May 2019**





**Plate 2-1 Views Across the Project Site Looking West**



**Plate 2-2 Views Across the Project Site Looking South East – towards the Ibri IPP**



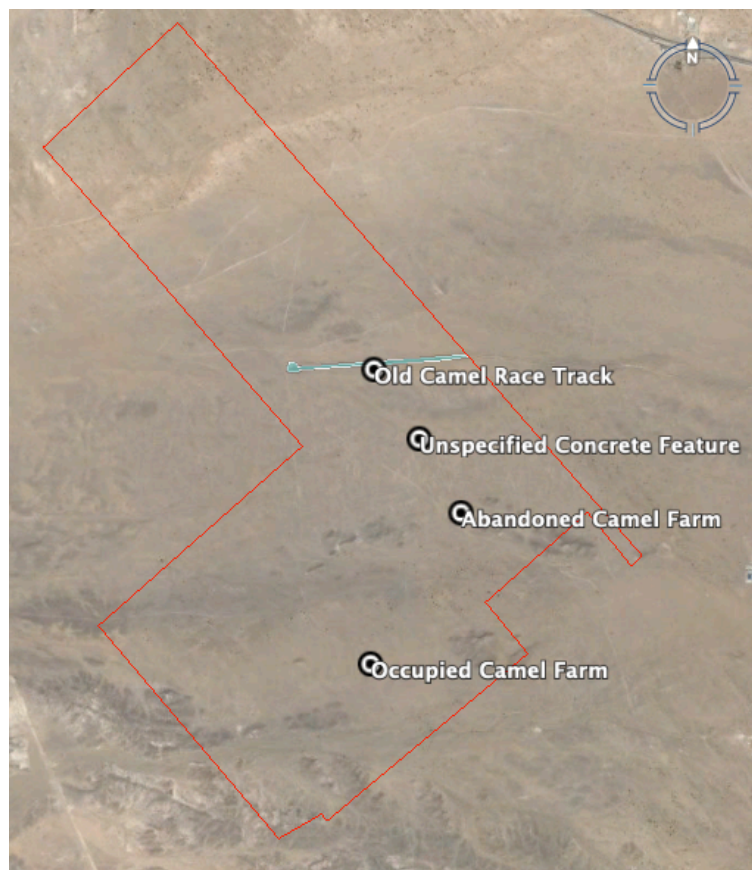
### 2.3.3 Land Use

Findings from site visit undertaken in October 2018 and review of satellite imagery identified few land uses within the Project site and these included:

- One (1) occupied camel farm;
- One (1) abandoned camel farm;
- Old (disused) camel race track;
- Grazing camels;
- An unidentified concrete feature;
- Several disused or seasonally used camel pens; and
- Evidence of vehicle tracks.

The location of these land uses within the Project site are presented in the figure below.

**Figure 2-5 Location of Land Uses within the Project Site**



ACWA Power has advised that OPWP and the Ministry of Housing would be responsible for relocating the camel farms and making other necessary arrangements for other land uses within the site prior to the commencement of construction works. Further to this, it will be necessary for ACWA Power to undertake any further measures required to align with lender



requirements for resettlement, including any compensatory or livelihood restoration measures (as applicable).

**Plate 2-3 Photographic Evidence of Land Uses within the Project Site**



**Occupied Camel Farm**



**Seasonally Used Camel Pen**



**Previous Camel Race Track**



**Disused Camel Pen**

**Plate 2-4 Photographic Evidence of Grazing Camel as Identified Towards the Northern Boundary of the Site (October 2018)**



**Plate 2-5 Vehicle Tracks with Animal Tracks (October 2018)**



Based on informal consultation with land users during a site visit in May 2019, it is understood that the camel farms/pens have been active on this land for at least 25 years. Historic satellite imagery from 2009 also shows these structures being present.

Besides the above identified land uses, no additional evidence of previous use of the project site was identified upon review of historical satellite imagery.

#### 2.3.4 Local Sensitivities

Based on local knowledge, previous studies, review of satellite imagery (from Google Earth) and site visits undertaken in October 2018 and May 2019, several receptors have been identified within 5km of the project site. The main sensitivities identified within a radius of 5km from the Project site include residential, agricultural, recreational and industrial premises and activities.

With regard to receptor identification, a 5km radius has been considered, as the expected range of potential impacts in relation to construction & operational phase impacts are not likely to exceed this zone.

Directly adjacent to the western boundary of the Project site is a Camel Race Track and approximately 400m north, 800m, 1km and 2.7km north east are agricultural lands. A petrol filling station and the Highway 21 (Buraimi-Ibri highway) are both located approximately 2.8km and 3km north east of the Project boundary respectively.

With regards to residential receptors, the Al Ma'mur village, Al Mazim village and Masha'rub village are located across the Highway 21 (Buraimi-Ibri highway) approximately 2.5km, 4km and 5km from the north east of the Project boundary respectively.

There are government licensed mechanised borewells on site to serve the camel herding resident population on site with a narrow pipeline connecting the camel farm/pen and the borewell. One of the other borewells on the boundary aligned with the Ibri Power Plant was abandoned.

Approximately 800m from the south east of the Project boundary is the Ibri Power Plant (a 1400MW natural gas power plant) currently undergoing construction.

**Table 2-2 Potential Local Receptor**

| RECEPTOR                             | RECEPTOR TYPE              | DISTANCE FROM PROJECT SITE  |
|--------------------------------------|----------------------------|---|
| Camel Race Track                     | Recreational               | Directly adjacent to the western boundary Project site.                 |
| Active Camel Farm 1                  | Residential/<br>Commercial | Approximately 200m from the south-eastern boundary of the Project site. |
| Active Camel Farm 2                  | Residential/<br>Commercial | Approximately 500m from the eastern boundary of the Project site.       |
| Borehole 1                           | Resource                   | Adjacent to the South-Eastern Project boundary (off-site)               |
| Borehole 2                           | Resource                   | Approximately 300m from the south-eastern boundary of the Project site. |
| Farmland 1                           | Agricultural               | Approximately 400m from the northern boundary of the Project site.      |
| Farmland 2                           |                            | Approximately 800m from the north east boundary of the Project site.    |
| Farmland 3                           |                            | Approximately 1km from the north east boundary of the Project site.     |
| Farmland 4                           |                            | Approximately 2.7km from the north east boundary of the Project site.   |
| Petrol Filling Station               | Commercial                 | Approximately 2.8km from the north east boundary of the Project site.   |
| Highway 21 (Buraimi-Ibri highway)    | Infrastructure             | Approximately 3km from the north east boundary of the Project site.     |
| Al Ma'mur Village                    | Residential                | Approximately 2.5km from the north east boundary of the Project site.   |
| Al Mazim Village                     |                            | Approximately 4km from the north east boundary of the Project site.     |
| Masha'rub village                    |                            | Approximately 5km from the north east boundary of the Project site.     |
| Ibri IPP                             | Industrial                 | Approximately 800m from the south east of the Project boundary.         |
| Ibri IPP – Worker Accommodation Area | Residential                | Approximately 600m from the south east of the Project boundary.         |



Figure 2-6 Potential Local Receptors (ref. Project site in red polygon)



Borehole 1



Borehole 2

## 2.4 Project Description

The Project will be developed by a consortium of Saudi Arabia's ACWA Power and Kuwait's Gulf Investment Corporation and Alternative Energy Project Company as an Independent Power Project (IPP) utilizing photovoltaic technology to generate electricity. The scope of the Project works will include the development, design, engineering, construction, commissioning, financing, operations and maintenance of the 500MW solar PV Power Plant.

Photovoltaic Power Plants use photovoltaic cells to generate electricity upon exposure to sunlight. This power generation technology converts solar radiation into direct current electricity using semiconductor materials in the form of a panel that exhibits photovoltaic effects. A typical PV Plant mainly comprises of a solar field which consists of a large group of semiconductor technology based silicon solar cells arranged in what is known as solar PV Panels or PV Modules. The solar panels convert sunrays (photons) to electrons and the electron flow generates Direct Current electricity (DC) which gets connected and channelled into an electric device 'inverter' to convert the Direct Current (DC) into Alternating Current (AC).

The proposed Project will utilize bifacial type Solar PV Panels that generate energy from both top and rear sides. The PV will comprise of PV cells within modules arranged in arrays upon single axis tracking system/ mounting structures. The PV modules will be designed and arranged to ensure the most efficient alignment for the capture of solar radiation. Mounting structures will be established within shallow foundations set into the underlying soils.

The PV for the Project will make use of 727849 modules, 3204 inverters and 2 X 220 transformers in order to generate DC capacity of 500MWp. The PV field of the proposed Project will occupy approximately 1154.25ha out of 1,327ha of the total project area.

The Plant will connect to the 220kV OETC Substation via two (2) 11kV 1000kVA cable links. This OETC substation will be constructed at the south eastern extent of the Project boundary.

**Table 2-3 Main Characteristics of the PV Plant**

| DESCRIPTION         | CAPACITY                                 |
|---------------------|--|
| <b>Modules</b>      | 395Wp (727846 modules/units)             |
| <b>Inverters</b>    | 3204 units 185kTL Huawei string inverter |
| <b>Transformers</b> | 2X220/270MVA, ONAN/ONAF, 33/220kV        |

In order to enhance the reflection of the sun onto the bifacial PV Panels to increase the efficiency of the captured sunlight, a thin layer of gypsum will be evenly spread across the solar field of the Project site. Water will be sprayed on the gypsum so as to bind to the rock/soil surface.

## 2.5 Project Auxiliary Facilities

### 2.5.1 Internal Access Road

In order to enable easy access within the Project site, the EPC Contractor will construct an internal within the Project site. This internal access road will be paved and will link to new road outside the site that will enable access to the Buraimi-Ibri Highway.

These Internal roads within the Project site will be developed such that it is adequate and suitable to connect to the road network in order to facilitate transportation of equipment to and within the site.

### 2.5.2 Water Supply

Water tanker trucks will transport water from outside the Project site to water storage tanks within the Project boundary to cover the water demand of the Project which will include portable water demand, raw water demand, firefighting water demand and service water distribution. At this stage the total annual volume of water required by the Project has not been finalised. However once finalised, this will be incorporated in the ESIA.

## 2.6 Project Associated Facilities

### 2.6.1 External Access Road

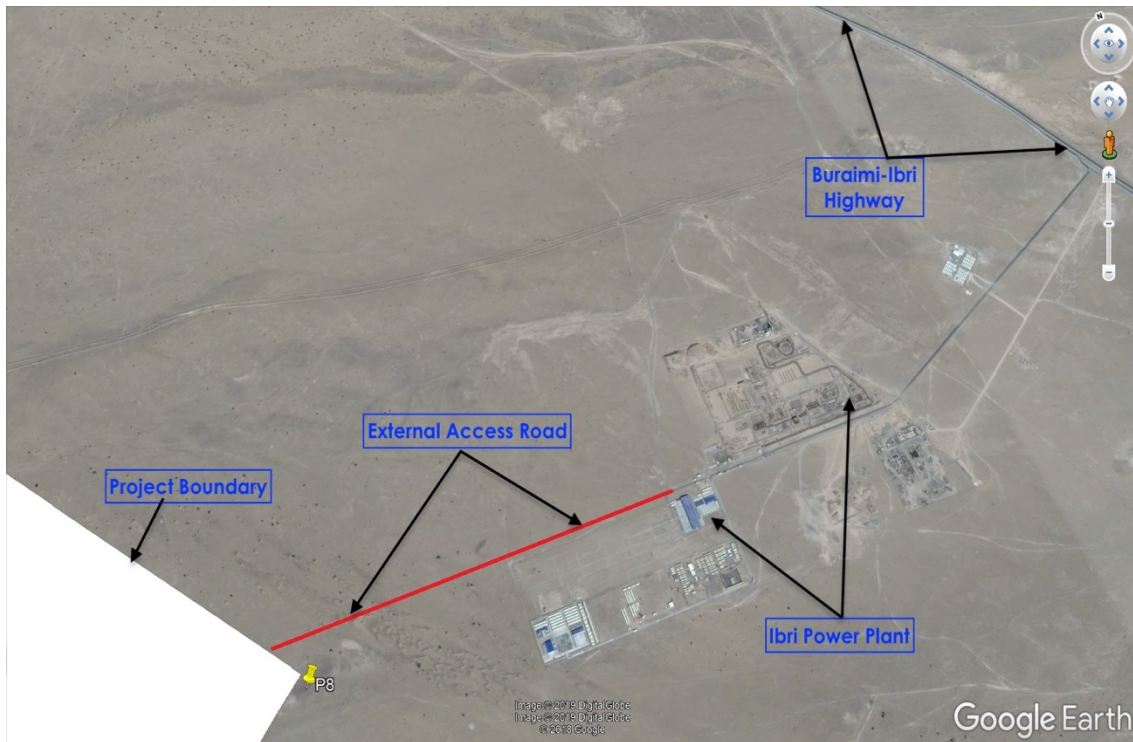
In order to enable easy access within and outside the Project site, the Project Company will construct the external access road outside the Project site. It is anticipated that the project will connect to the Buraimi-Ibri Highway via an external access road that will connect to the road that runs through the Ibri Independent Power Plant located at the south eastern boundary of the Project site.

This external access road will be paved and will link to new road within the site that will enable access to the Project site, administrative areas and the solar field.

The EPC Contractor is responsible for constructing the external access road.



Figure 2-7 Connection to Main Road Concept (Ref. Red Line)



## 2.6.2 Electrical Connections & Substation

The Project will require its own electrical connection facility on-site to enable connection between the PV Plant and the 220kV OETC substation located at the south eastern extent of the Project site. The PV Plant substation to be located at the east southern extent of the site approximately 430m from the OETC substation will be connected to the OETC Substation using 2 X 11kV 1000kVA cable links. (See Overall Project layout figure for location of the Plant substation and OETC substation).

Connection to the existing OHTL / grid from the OETC substation will be made via underground trench of 2 X 220kV power cables.

The Licensed Transmission System Operator (LTSO) will be responsible for developing the OETC substation.

## 2.7 Project Construction Requirements

### 2.7.1 Construction Works

Principal construction activities for this project are related to infrastructure and civil works and mechanical and electrical works.

Principal Project construction activities in relation to infrastructure and civil works include:

- Site clearing, levelling, elements of compaction in areas for structures, etc.
- Drilling of multiple foundations (expected to be up to 1m in depth) to install PV supports, held in place with a small amount of concrete;
- Installation of mechanical and electrical equipment for PV modules and equipment;
- Construction or compaction of internal roads on-site and other infrastructure including walkways & parking areas;
- Construction of storage facilities for equipment and materials and construction of laydown area
- Construction of general buildings, such as administrative building, sanitary rooms, workshops, electrical buildings, auxiliary buildings and structures, etc.
- Construction of security fencing according to ROP standards (Royal Oman Police standards);
- Concrete cable trenches;
- Construction of mechanical & electrical buildings including Plant substation; etc.

## 2.7.2 Construction Facilities

### Temporary Laydown Areas

Temporary laydown areas will be required in the construction phase for storage of materials by EPC Contractor and sub-contractors. The laydown areas also known as the temporary storage facilities areas or temporary laydown area is anticipated to be located at the east southern most extent of the Project site next to the proposed PV Plant Substation.

**Figure 2-8 Location of Temporary Laydown Area within the Project Site (Ref. grey polygon)**



## Worker accommodation

It is anticipated that a temporary contractor camp will be located within the Project site. This contractor camp will likely be used for workers employed by the Project's EPC Contractor.

It is understood that a large proportion of the sites labour force will comprise sub-contractors staff. Sub-contractors will be responsible for establishing/renting living accommodation (as appropriate) for their respective workers. However; as sub-contractors are yet to be formally engaged, the location of their temporary accommodation areas are not yet confirmed. It is likely that such accommodation areas will be situated offsite. Wherever located, the standards of facilities for all worker accommodation/camp will be specified by the Project Company and will need to be in accordance with the IFC/EBRD Worker Accommodation Guidelines. This will be stated as a requirement in the ESIA.

### 2.7.3 Workforce

The estimated number of construction workers on site during peak is expected to be between 1400 - 1500 workers. This will comprise a combination of Project Company, EPC Contractor and sub-contractor staff.

### 2.7.4 Vehicles, Equipment and Heavy Machinery Requirements

Contractors/Sub-contractors responsible for different construction activities within the site will make use of various kinds of vehicles, equipment and heavy machinery during the construction phase of the project. The expected details of equipment to be used on site during the site preparation and construction activities include:

- Machine for Piling
- Tractor for transport
- Excavators
- Cranes
- Forklifts
- Bulldozers
- Vibratory Rollers
- Graders
- Diesel Generators
- Buses
- Heavy Goods Vehicles
- Light Duty Vehicles
- Concrete mixers (for PV post foundations)

### 2.7.5 Construction Utilities

#### Water Supply

During construction phase of the Project, a licensed potable water supply company will supply potable water to the Project site. Where additional information is provided in regard to the water supply to the project site this will be included in the ESIA.

## 2.7.6 Construction Logistics

### Access Road

The access road to the site will be via a new connection from the Ibri IPP entrance from Highway 21, approximately 3km north east of the project boundary. This access road will be constructed to facilitate access to the operational site, but is expected to be used during the construction phase as an unpaved track initially prior to development and hardstanding.

## 2.8 Operational Phase Requirements

According to the Power Purchase Agreement, the project will be operational for 15-years. During this period, the project will be operated and maintained by NOMAC (The First National Operation and Maintenance Company). The provisions for end of life or decommissioning of the Project are unknown at this stage and it is possible that the Project may remain in place long after this date.

### 2.8.1 PV Plant General Operations and Maintenance

During the operational phase, routine cleaning of the PV panels/modules is planned to be conducted automatically (i.e. brushes installed on tracks along the rows of the modules) without the use of water in order to make the cleaning process more resource efficient (i.e. avoiding water use) and economically sound. However, on some occasions, it may be necessary to utilise water to ensure effective cleaning.

### 2.8.2 Operational Utilities

#### Water Supply

Water for use on site (such as periodic use in panel cleaning will be brought to the site by water tanker as required.

#### Wastewater Management

Due to the Project processes and the Project requiring only a small number of O&M staff, there will not be a dedicated wastewater treatment plant on-site. In addition, as the project is also located away from mains sewerage networks, it will be necessary for septic tanks to be installed to temporarily collect sanitary wastewater generated at administration buildings. Such wastewater would be collected and removed from the site on an as required basis during operations.

#### Electrical Supply

The Project will primarily utilise an amount of its own renewable electrical generation, but will otherwise draw electricity from the grid as required when not generating (e.g. at night).

## 2.9 Project Alternatives

In accordance with good practice methodologies for ESIA, the evaluation of various project design and activity alternatives should be considered, in order to ensure that the objectives of the proposed project have accounted for social, environmental, economic and technological options. The following project alternatives were considered at the feasibility stage:

- No Project Alternative and;
- Project Technology.
- Project Layout

*Note: Due to the establishment of the Project under the IPP model with a specified area of land designated by OPWP, it has not been possible for ACWA Power to assess alternatives with regard to site location.*

### 2.9.1 No Project Alternative

The power generating capacity of the Project will be 500MWac and this will add to the current power generating capacity within Oman and given the requirement for additional energy generation in the Sultanate of Oman, a 'No Project' option cannot be said to be a 'viable alternative'.

Looking at the anticipated impacts as a result of the development of this project although the construction phase may likely result in potential temporary negative impacts, the operational phase of the project will likely result in an overall positive impact, particularly due to the development of utilities and socio-economic benefits, and the increase in renewable energy being supplied to the Omani grid.

### 2.9.2 Project Technology

The Project will generate electricity using solar energy. As a renewable energy project, the Project will contribute to Oman's vision of diversifying its energy resources and will contribute to reducing the dependence of the Sultanate on foreign supplies of other conventional sources of energy (fossil fuel). The development of the Solar PV Project will also create employment and training opportunities for Omani nationals in the field of solar and renewable energy.

During the bidding stage, ACWA Power proposed the use of the following technologies for the development of the Project;

- Bi-facial type Solar PV Panels which generates energy from both top and rear sides



- Single axis tracker technology mounting system and
- String or central inverters.

Based upon the chosen design it is expected that the bi-facial type solar PV panels will maximise the efficiency of power generation from the Project.

### 2.9.3 Project Layout

The northern area of the Project site, subject to runoff flows as was observed during the site visit with evidence of fluvial activity. The ESIA team will consult with ACWA Power at the ESIA stage to identify alternatives that may/may be considered to mitigate or eliminate flood risks to the Project.

## 3 REGULATORY FRAMEWORK

### 3.1 Requirements for Environmental & Social Assessment

#### 3.1.1 Environmental Regulator in Oman

The environmental regulator in Oman is the Ministry of Environment and Climate Affairs (MECA).

Royal Decree No. 90/2007 established the Ministry for Environment and Climate Affairs (MECA), where environment-related works, allocations and assets were transferred from the responsibility of the Ministry of Regional Municipalities, Environment and Water Resources. Omani legislation relating to the requirement for environmental assessment followed the issuance of Royal Decree No 114/2001 entitled 'Law on Conservation of the Environment and Prevention of Pollution'.

A select summary of the responsibilities of MECA include:

- The environmental regulator is the designated competent agency to preside over and implement the laws in relation to the environment.
- The environmental regulator has the right to implement laws, fine violators and suspend or close facilities not complying to the applicable environmental laws.
- The environmental regulator has the authority to approve the environmental aspects related to projects and permit their construction and operational activities.
- The environmental regulator also has the authority to allow deviations from the standards, under agreed circumstances.

Prior to the issue of the request for proposal at the bidding stage, OPWP consulted with MECA regarding the development of the Solar Independent Power Plant at the proposed project site.

An initial "No Objection Letter" for the development of the proposed Project was received from MECA and in accordance with the "No Objection Letter" the successful bidder (i.e. the project sponsors) is required to undertake an ESIA in accordance with the Omani Environmental requirements and regulations. As such, the projects sponsors are ultimately responsible for obtaining an environmental permit from MECA and complying with any conditions to such environmental permit for the applicable Project.

### 3.1.2 Omani ESIA Requirements

The environmental guidelines developed and implemented by MECA classify projects into eight (8) groups according to the technical aspects of their construction and operation. The groups are further subdivided into a number of subgroups according to the industries commonly encountered in the Sultanate of Oman.

For each subgroup MECA has specified a list of general requirements that apply to all projects within the group and a list of technical requirements specific to each subgroup. These requirements should be met in order to obtain an Environmental Permit.

According to the classification system, it is anticipated that the proposed project falls under Group 1d "Industrial Projects – Power Generation Stations".

The relevant general requirements of this group that apply to this Project are:

- The applicant should submit a completed application form for the environmental permit and if necessary attach an Environmental Impact Assessment study (ESIA).
- The applicant is fully financially and legally responsible for any environmental damage resulting from the project and restoration of the environment.
- The development must be in conformity with the various Regulations/Ministerial Decisions, some of which require sub-permits/licences. The applicant is responsible for obtaining these documents.
- The applicant should ensure that noise levels do not exceed the levels determined in the Ministry's noise pollution control regulations.
- The applicant must not commence construction before obtaining the necessary approvals.
- The applicant must ensure full compliance with the health, security and safety requirements at the construction and operation stages of the project.
- The company shall place fuel storage tanks on impervious bases lined with reinforced concrete and surrounded by bunting walls.
- The company shall collect, store and dispose of hazardous waste in accordance with the Ministry's regulation.
- The company shall not use transformers and other electrical equipment containing polychlorinated Biphenyls (PCB) oils.
- Based on the nature of the project and its location the Ministry may include additional requirements.

The complete ESIA study document becomes a part of the application package for an Environmental Permit. After the review is completed the Ministry will either:

- Accept the conclusions of the ESIA and issue an Environmental Permit,

- Request further study, or
- Request re-application for an alternative proposal.

Once the permit is issued, the submitted ESIA document becomes a part of the permit and any changes to the ESIA require amendment to the Permit.

According to the Ministerial Decision No.48/2017 on Regulations for Organising Environmental Permitting, the Project can also be classified as a Category A Project – Electric Power Generations. Category A Projects require an Environmental Impact Assessment study prepared by an approved environmental consultancy prior to the start of project development.

### 3.1.3 Lender Requirements

ACWA Power are seeking project finance from international lenders who would provide a loan to enable the Project to be constructed. These lenders are expected to either have their own environmental & social investment policies and standards, or may be signatories of the Equator Principles, a voluntary set of guidelines for assessing and managing environmental and social risks in project financing.

#### **Asian Infrastructure Investment Bank (AIIB)**

One of the prospective lenders who may be involved in the financing of the Project is the Asian Infrastructure investment Bank (AIIB). AIIB have an established 'Environmental & Social Policy' and separate 'Environmental & Social Framework' documents that set out the applicable requirements the banks investment projects should fulfill in the potential receipt of finance.

The AIIB Environmental & Social Framework includes Environmental & Social Standards under the following headings:

- ESS 1: Environmental and Social Assessment and Management;
- ESS 2: Involuntary Resettlement; and
- ESS 3: Indigenous Peoples.

#### **Equator Principles Financial Institutions (EPFIs)**

The Equator Principles are a risk assessment framework used by financial institutions to determine, assess and manage the environmental and social risk in projects financing. The Equator Principles were updated in 2006 (EP II) to include projects with a capital cost of US\$10 million or more across all industry sectors and these are the prevailing applicable conditions for this project. The Equator Principles Financial Institutions (EPFIs) reviewed the Equator

Principles in 2011 and approved the latest version, EP III on April 26<sup>th</sup> 2013. These became effective from June 4<sup>th</sup> 2013 and should be fully implemented by December 31<sup>st</sup> 2013.

The EPs establish the minimum standards to be adopted by the EP Financial Institution (EPFI) as those from IFC Performance Standards/World Bank EHS Guidelines and/or the relevant host country laws, regulations and permits that pertain to environmental and social issues.

The Equator Principles consist of the following 10 Principles:

- Principle 1 - Review and Categorisation
- Principle 2 - Environmental and Social Assessment
- Principle 3 - Applicable Environmental and Social Standards
- Principle 4 - Environmental and Social Management System and Equator Principles Principle Action Plan
- Principle 5 - Stakeholder Engagement
- Principle 6 - Grievance Mechanism
- Principle 7 - Independent Review
- Principle 8 - Covenants
- Principle 9 - Independent Monitoring and Reporting
- Principle 10 - EPFIs Reporting

### **IFC Performance Standards on Environmental and Social Sustainability (2012)**

The IFC Performance Standards are designed to help avoid, mitigate, and manage risks and impacts throughout the life of a project as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities.

The 2006 version of the IFC Performance Standards was reviewed and made applicable to all new projects from 1<sup>st</sup> January 2012. The updated IFC PSs reflect IFC's stronger commitment to climate change, business and human rights, corporate governance and gender equality as well as strengthening the due diligence process for IFIs. Such updates include comparable labour terms for migrant and non-migrant workers, clarification of levels of stakeholder engagement, monitoring of supply chains and an enhanced focus on energy efficiency, etc.

The following lists the IFC Performance Standards (2012):

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts
- Performance Standard 2: Labor and Working Conditions
- Performance Standard 3: Resource Efficiency and Pollution Prevention



- Performance Standard 4: Community Health, Safety, and Security
- Performance Standard 5: Land Acquisition and Involuntary Resettlement
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Performance Standard 7: Indigenous Peoples
- Performance Standard 8: Cultural Heritage

*It is further noted that the IFC is a shareholder in ACWA Power, and therefore all ACWA Power projects must comply with the IFC Performance Standards and IFC EHS Guidelines.*

### **World Bank and IFC General EHS Guidelines**

The World Bank Group and IFC Environmental, Health and Safety Guidelines (EHS Guidelines) are technical reference documents with general and industry-specific examples of GIIP, as defined in IFC's PS 3: Resource Efficiency and Pollution Prevention. IFC uses the EHS Guidelines as a technical source of information during project appraisal activities.

The World Bank Group International Finance Corporation (IFC), Environmental, Health and Safety (EHS) General Guidelines of April 2007 superseded the World Bank Handbook issue of 1998. The updated EHS Guidelines serve as a technical reference source to support the implementation of the IFC Performance Standards, particularly in those aspects related to PS 3: Resource Efficiency & Pollution Prevention, as well as certain aspects of Occupational and Community Health and Safety. The General EHS Guidelines contain information on crosscutting environmental, health, and safety issues potentially applicable to all industry sectors. No industry specific guidelines have been developed for solar power projects.

The General EHS Guidelines contain the performance levels and measures that are normally acceptable to IFC, and that are generally considered to be achievable in new facilities at reasonable costs by existing technology

## **3.2 Applicable Environmental Legislation & Standards**

### **3.2.1 National Regulations**

The following regulations and standards will be applicable for the design and operation of the proposed Ibri II Solar IPP project.

#### **Royal Decrees**

- Royal Decree No. 6 of 1980 on Law of protection of Natural Heritage

- Royal Decree No. 46 of 1995 on Issuing the Law of Handling and Use of Chemicals.
- Royal Decree No. 29 of 2000 on Law of Water Resources Conservation
- Royal Decree No. 115 of 2001 on the Protection of sources of Potable Water from pollution
- Royal Decree No. 114 of 2001 on Law for the Conservation of Environment and Prevention of Pollution
- Royal Decrees No. 6 of 2003 on Law on Nature Reserves and Wildlife Conservation

### Ministerial Decisions

- Ministerial Decision No 17 of 1993 on Regulations for the Management of Solid Non-Hazardous Waste
- Ministerial Decision No 18 of 1993 on Regulations for the Management of Hazardous Waste
- Ministerial Decision 140 of 1993 on Regulations for Chemical Materials Registration and Related Permits
- Ministerial Decision 145 of 1993 on Regulations for Wastewater Re-Use and Discharge
- Ministerial Decision 79 of 1994 on Regulations for Noise Pollution Control in Public Environment
- Ministerial Decision 80 of 1994 on Regulations for Noise Pollution Control in Working Environment
- Ministerial Decision 248 of 1997 on Regulation for the Registration of Chemical Substances and the Relevant Permits.
- Ministerial Decision 421 of 1998 on Regulations for Septic Tanks, Soakaway Pits and Holding Tanks
- Ministerial Decision 187 of 2001 on Regulations for Organizing the Issuance of Environmental Approvals and the Final Environmental Permit
- Ministerial Decision 118 of 2004 on Regulations for Air Pollution

### 3.2.2 International Treaties and Conventions

As the Sultanate of Oman is a signatory to a number of international conventions, the Project is required to comply with the following applicable international treaties and conventions:

**Table 3-1 International & Regional Conventions/Protocols**

| CONVENTIONS, AGREEMENTS AND PROTOCOLS  | DATE SIGNED/RATIFIED |
|--|----------------------|
| Paris Agreement to the UN Framework Convention on Climate Change   | 22/04/2016           |
| Stockholm Convention on Persistent Organic Pollutants (POPs)   | 04/03/2002           |
| The Convention of Conservation of Wildlife and its Natural Habitat in the GCC Countries  | Signed               |
| Cartagena protocol on biosafety to the convention on biological diversity  | 11/04/2003           |
| Rotterdam Convention on the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade           | 31/01/2000           |
| Kyoto Protocol to the UN Framework Convention on Climate Change  | 19/01/2005           |
| United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa | 23/07/1996           |
| Convention on biological diversity   | 10/06/1996           |
| United Nations Framework Convention on Climate Change  | 11/06/1992           |
| Basel Convention on the control of transboundary movements of hazardous wastes and their disposal  | 08/02/1995           |
| Montreal Protocol on substances that deplete the ozone layer   | 30/06/1999           |
| Vienna Convention for the protection of the ozone layer  | 30/06/1999           |

In addition to the above, Oman contributes to many regional and international organisations that are concerned with the protection of environment and conservation of natural resources, such as the United Nations Environment Program, World Health Organisation, United Nations Food and Agriculture Organization, World Meteorological Organization, UNESCO, the Regional Organization for Protection of Marine Environment, the relevant organizations working under the Arab League and the Gulf Cooperation Council as well as the Gulf Area Oil Companies Mutual Aid Organization (GAOCMAO).

Oman is also a member of the International Labour Organisation (ILO). The ILO is committed to advancing opportunities for women and men to obtain decent and productive work in conditions of freedom, equity, security and human dignity. Its main aims are to promote rights at work, encourage good employment opportunities, enhance social protection and strengthen dialogue in handling work-related issues.

### 3.3 Environmental Standards

The applicable environmental standards (Omani regulations and lender guidelines) based upon expected Ibri II Solar PV Project risks and impacts are outlined below. Full reference to the applicable standards is provided in each relevant chapter herein.

**Table 3-2 Applicable Standards & Guidelines**

| ENVIRONMENTAL<br>PARAMETER | OMANI STANDARDS  | LENDER GUIDELINES   |
|----------------------------|--|---|
| Ambient Air Quality        | MECA currently uses the US EPA National Ambient Air Quality Standards (NAAQS)  | IFC EHS General Guidelines: Table 1.1.1<br>WHO Ambient Air Quality Guidelines |
| Noise                      | MD. 79/94 and the applicable limits of noise generated from industrial facilities  | IFC EHS General Guidelines: Table 1.7.1<br>Noise Level Guidelines             |
| Soil Quality               | Omani standards do not exist for soil or groundwater quality. As such, the use of the Dutch standards is common practice for the analysis of soils and groundwater, and these are viewed as international best practice. |   |

All the above-mentioned standards require project compliance. Where there is contradiction in limits between Omani standards and lender guidelines, the most stringent will apply.

In accordance with lender requirements, where specific national standards do not exist, an international good practice standard should be applied.

## 4 APPROACH TO ESIA

This section outlines the expected methodology that will be used to describe the sensitivity of environmental & social receptors, to predict the magnitude of environmental impacts and to assess the significance of the effect of the project activities on each relevant environmental parameter or component.

As the ESIA is inclusive of the requirements of MECA as well as the Environmental and Social Impact Assessment requirements of the lenders, social elements such as community health, safety and security, labour and working conditions, etc. have been included herein.

### 4.1 Delineation of Study Boundaries and Scope of Assessment

#### 4.1.1 Study Boundaries for Assessment

The proposed project will be located on land leased from the Ministry of housing through a Usufruct Agreement. The co-ordinates of the project boundary have been detailed in Section 2.2 Project Location.

The study area therefore comprises:

- The land in the defined Project footprint;
- Construction works, facilities/infrastructure and O&M activities within the defined Project footprint;
- The Project's area of influence and potential receptors (defined in specific sections herein);
- Associated Project Facilities:
  - Access road connection from existing Ibri II IPP access to the site;
  - Electrical connections from the site to the external Sub-Station;
  - The 220kV transmission grid substation; and
  - Connection from the Sub-Station to the Omani grid.
- Temporary Construction Facilities
  - Temporary construction access road
  - Temporary construction administration and laydown areas (inside the defined Project footprint)
  - Temporary worker accommodation areas (as applicable)

#### 4.1.2 Scope of Assessment

The ESIA will assess the potential impacts related to the proposed projects construction phase, commissioning and operations, in the areas outlined above.

Potential impacts relating to decommissioning are expected to be similar to those encountered during the construction phase (besides a larger proportion of electrical and hazardous wastes from PV panels). Given that the decommissioning phase is not expected for at least 15 years from Commercial Operation Date (in accordance with the term of the Power Purchase Agreement (PPA)), it is not considered practical to speculate on future environmental & social conditions including the sensitivity of current or future receptors at this time and likelihood of future facilities in place for waste.

It is considered that impacts relating to decommissioning are best approached and mitigated via a specific decommissioning plan prepared closer to the time of decommissioning. A plan prepared at this time would be able to account for changes in regulation, improvements in technology and methods of demobilization

### 4.2 Scoping

Scoping is a key stage in the ESIA process; it draws upon an understanding of the Project, available environmental baseline data and relevant regulations. With an understanding of these components, an aim of the scoping process is to identify potentially significant environmental impacts and evaluate whether or not full assessment will be required at the ESIA stage. This will ensure that only the impacts of potential significance will be assessed at the ESIA stage.

Following the consideration of whether to provide further detailed assessment or not provide detailed assessment for potential impacts, this scoping report sets out a suitable scope of works for the main ESIA, and the methods that will be used to achieve these.

The Scoping Report intends to provide an amount of factual information about the condition of the site and its surroundings prior to the commencement of the Project. An overview of the environmental baseline has been provided and is based on existing data sources and observations from site visits undertaken in October 2018 and May 2019. This has established what information is available and what further studies need to be undertaken at the ESIA stage.



## 4.3 ESIA Methodology

This section provides information about the data collection and consultation process followed to inform the ESIA and the methodology that has been used to describe the sensitivity of environmental receptors; predict the magnitude of environmental impacts and assess the significance of impacts upon applicable environmental parameters

### 4.3.1 Baseline Studies and Research

Forming an integral part of the ESIA, the baseline surveys provide a benchmark of the existing conditions by which the potential impacts of the proposed project can be assessed for the construction and operational phases.

Baseline surveys will comprise primary or secondary data (or a combination), which may include physical surveys on-site, information gathered during consultations, use of maps, satellite imagery, references from relevant studies and other available data sources.

The scope of the required studies is based upon the existing level of information available and a determination of what further information is required to provide a representative reference of the current environment. The determination of required further studies is set out in the relevant chapters of this scoping report, with justification.

The proposed baseline surveys have been outlined in this ESIA Scoping and may require refinements following any comments received from MECA during review of this scoping report.

The baseline surveys will be described in each relevant chapter of the ESIA, with applicable analysis results provided, and included to the ESIA appendices. The surveys are intended to provide representative data in regard to the areas that may potentially be impacted by the project. Justification of the scope of such studies has been provided in this ESIA Scoping report.

### 4.3.2 Project Stakeholder Analysis and Consultations

Consultation with stakeholders is an essential part of the environmental & social assessment process. The main objective of the consultation is to establish a dialogue with those stakeholders who may be affected by aspects of the Project or may have an interest in the outcome of the ESIA process. However, specific requirements for stakeholder engagement have not been established in Oman, and are not recognised as a necessity in the ESIA process.

In regard to the lender requirements, all of the AIIB ESS' and IFC Performance Standards include requirements for an amount of stakeholder engagement (either in the ESIA, or as part of the future ESMS) and therefore the project will require a level of engagement. In particular, IFC Performance Standard 1 on "Social and Environmental Assessment and Management

Systems” describes the stakeholder engagement requirements in more depth. It states the following:

*“Stakeholder engagement is the basis for building strong, constructive, and responsive relationships that are essential for the successful management of a project’s environmental and social impacts. Stakeholder engagement is an on-going process that may involve, in varying degrees, the following elements:*

- Stakeholder analysis and planning;
- Disclosure and dissemination of information;
- Consultation and participation;
- Grievance mechanism; and
- On-going reporting to Affected Communities.

*The nature, frequency, and level of effort of stakeholder engagement may vary considerably and will be commensurate with the project’s risks and adverse impacts, and the project’s phase of development.”*

As common and good practice, stakeholder engagement is considered a key aspect of all projects and should be undertaken at the ESIA stage in order to notify, gain views and enable a better understanding of the dynamics of the local environment.

With respect to Oman, a culturally relevant consultation process has been developed by 5 Capitals which will involve letter consultation with the key project stakeholders, at the ESIA stage.

With respect to the project, it is recognised that there are few project stakeholders due to the lack of any required land acquisition, rights of way and the development of the project away from key residential areas. Despite this, the following stakeholders have been initially outlined for consultation.

**Table 4-1 Overview of Proposed Stakeholders for Consultation**

| STAKEHOLDERS                                       | INTENTION FOR CONSULTATION  |
|--|---|
| Ministry of Environment and Climate Affairs (MECA) | Submission of Environmental Scoping Report to MECA and feedback in regard to the proposed ESIA scope.   |
| Ministry of Heritage & Culture (MOHC)              | To request information in regard to any known archaeological artefacts and cultural features within the project site.   |
| Ministry of Interior                               | To request coordination with the Wali of Ibri who will conduct meeting with other stakeholders in regards to the Project.   |
| Local Sheikh                                       | To understand the local context in the area regarding infrastructure and local land use, including camel rearing activities.  |
| Owner of the Camel Farms                           | To understand the historiography of local land use and gauging the potential impact of the project on the status quo  |
| Expatriate Camel Herders                           | To understand the impact of the potential impact of the project on their livelihood and map out their physical inventory to curate a custom resettlement compensation plan for this economically and social vulnerable community. |

In addition to the above, a series of consultations will be conducted by the local sub-consultant (Yahya Engineering) to obtain information in regards to the observed land uses and facilities identified on site based on October 2018 & May 2019 site visits. The bilateral consultation will include findings on the following:

- Previous camel race track – Is this facility now disused, is it under ownership by any particular person/group, are there formal or informal land use rights related to this?
- Camel farms/Pens – What are the land rights of the camel farm owners (formal or informal)? How long have they been using the land for? Are the people nomadic (i.e. move around throughout the year)? How important is this land to them? Are these people indigenous? Who owns the camels? What are alternative lands for them to use for structures and to graze upon?
- Water Well/Boreholes – Who owns these? What are they used for and who is it used by? Are permits available for the boreholes? Are there alternatives locally?
- Agricultural Land/Farmlands outside the Project site – Who owns these lands (individuals/groups)? Do they have formal/informal land use rights? What do they grow, how productive is the land? Is the farming for personal consumption, or is it a commercial operation and part of livelihoods? Are there other or alternatives land they also use/ can use as replacement?

The stakeholder consultations will include the following qualitative research tools popular in development planning:

- Structured Interviews
- Participant Observation
- Advisory Boards

- Limited Surveys for Physical Asset Mapping

The data gathered in the stakeholder engagement process shall inform the Resettlement Action Plan and the mitigation measures for the environmental and social management plan.

### 4.3.3 Impact Assessment Significance Criteria

In order to obtain a credible assessment of environmental & social impacts, the assignment of 'effect significance' to each identified impact needs to be a robust, consistent and transparent process. The methodology to assess 'effect significance' is outlined below and follows a Good International Industry Practice (GIIP) based on the assumption that the significance of an impact on resources or receptors is considered to result from an interaction between three factors:

- The nature and magnitude of the impact (i.e. a change in the environment, social and/or health baseline conditions);
- The number of resources or receptors affected (i.e. humans and the environment); and
- The environmental value or sensitivity of those resources or receptors to the change.

A three-step approach has been used to determine the significance of environmental effects, as follows:

- Step 1 – Evaluation of value/sensitivity of resource or receptor;
- Step 2 – Assessing the magnitude of the impact on the resource or receptor; a
- Step 3 – Determining the significance of effects.

#### Identification and Evaluation of Sensitive Receptors

Sensitive receptors are defined as:

Elements of the **environment** that are of value to the functioning of natural systems (i.e. areas or elements of ecological, landscape or heritage value, species, habitats and ecosystems, soil, air and water bodies or land-use patterns);

**Human** receptors, such as stakeholders (i.e. users of dwellings, places of recreation, places of employment, community facilities or household relocation) and human systems (e.g. employment market, population disease susceptibility and disease communicability, exposure to toxicity of chemicals).

The environmental & social value (or sensitivity) of the resource or receptor has been defined by using the criteria in the table below.

**Table 4-2 Environmental & Social Value of Receptor or Resource**

| VALUE<br>(SENSITIVITY) | DESCRIPTION OF VALUE  |
|------------------------|---|
| <b>Very High</b>       | High importance and rarity on an international scale and limited or no potential for substitution.<br>The receptor has already reached its carrying capacity, so any further impact is likely to lead to an excessive damage to the system that it supports.<br>Locations or communities that are highly vulnerable to the environmental impact under consideration or critical for society (e.g. indigenous peoples, hospitals, schools).  |
| <b>High</b>            | High importance and rarity on a national scale, and limited potential for substitution.<br>The receptor is close to reaching its carrying capacity, so a further impact may lead to a significant damage to the system that it supports.<br>Locations or communities that are particularly vulnerable to the environmental impact under consideration (e.g. residential areas, vulnerable/marginalized groups).   |
| <b>Medium</b>          | High or medium importance and rarity on a regional scale, limited potential for substitution.<br>The receptor is already significantly impacted, but it is not close to reaching its carrying capacity. Further impacts will get increase the stress of the underlying system, but evidence does not suggest that it is about to reach a critical point.<br>Locations or groups that are relatively vulnerable to the environmental impact under consideration (e.g. commercial areas). |
| <b>Low</b>             | Low or medium importance and rarity on a local scale.<br>The receptor is not significantly impacted and shows a large spare carrying capacity. Impacts are not likely to generate any noticeable stress in the underlying system.<br>Locations or groups that show a low vulnerability to the environmental impact under consideration (e.g. industrial areas).   |
| <b>Very Low</b>        | Very low importance and rarity on a local scale.<br>The receptor is not impacted and shows a very large spare carrying capacity. Impacts are very unlikely to generate any noticeable stress in the underlying system.<br>Locations or groups that show a very low vulnerability to the environmental impact under consideration (e.g. industrial areas).   |

The existence of receptors that are legally protected (e.g. designated areas, protected habitats or species) will be taken into consideration for the assessment of the sensitivity of the receptors.

### Identification and Evaluation of Potential Impacts

During the evaluation undertaken as part of the ESIA process, the following types of impacts have been considered:

- Direct Impacts - Potential impacts that may result from the construction and occupation of the Project acting directly on an environmental or social receptor (e.g. land take for construction of the camps);
- Indirect Impacts – Potential impacts which are not a direct result of a Project activity, often produced later in time or further removed in distance, but are normally a result of a complex pathway (e.g. dust deposition on vegetation which causes reduction in photosynthetic rates);

- Beneficial Impacts – Those impacts that have a positive, desirable or favourable effect on the sensitive resources or receptors (e.g. landscape providing artificial habitat for a variety of species, creating jobs during the construction and/or occupation phases of a project);
- Adverse Impacts – Those impacts that are detrimental and have a negative influence on sensitive resources or receptors;
- Secondary Impacts - Potential impacts that may result from the implementation of protection measures applied to mitigate potential direct impacts;
- Event Related Impacts - Potential unplanned or accidental impacts stemming from an unintentional event such as fire, explosion, oil spill, etc.; and

### **Defining Impact Magnitude**

The magnitude of the impact will be defined wherever possible in quantitative terms. The magnitude of an impact has a number of different components, for example:

- The extent of physical change;
- The level of change in an environmental condition;
- The permanence of impact and the reversibility of the impacted condition;
- Its spatial footprint;
- Its duration, its frequency; and
- Its likelihood of occurrence where the impact is not certain to occur.

The criteria used for identifying the magnitude of impacts is provided within the Table below.



**Table 4-3 Criteria for Magnitude of Impacts**

| MAGNITUDE OF IMPACT | DESCRIPTION OF MAGNITUDE   |
|---------------------|--|
| <b>Major</b>        | <p>Adverse: Loss of resource and/or quality and integrity; severe damage to key characteristics, features or elements. A major impact is usually large scale, permanent and irreversible.</p> <p>Beneficial: Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality.</p>   |
| <b>Moderate</b>     | <p>Adverse: Significant impact on the resource, but not adversely affecting the integrity; Partial loss of/damage to key characteristics, features or elements. Moderate impacts usually extend above the site boundary, and are usually permanent, irreversible or cumulative.</p> <p>Beneficial: Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.</p>  |
| <b>Minor</b>        | <p>Adverse: Some measurable change in attributes quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements. Minor impacts usually are only noticeable within the site and are temporary and reversible.</p> <p>Beneficial: Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.</p> |
| <b>Negligible</b>   | <p>Adverse: Very minor loss or detrimental alteration to one or more characteristics, features or elements.</p> <p>Beneficial: Very minor benefit to or positive addition of one or more characteristics, features or elements.</p>  |
| <b>No change</b>    | <p>No loss or alteration of characteristics, features or elements; no observable impact in either direction.</p>   |

### Determination of Significance of Impacts

Significance of impacts is determined by taking into consideration the sensitivity of an identified receptor or resource and the magnitude of the project impact. That is, the greater the environmental sensitivity of an identified receptor or resource, and the greater the magnitude of impact, the more significant the impact (project impact).

In addition to this, where a project has a major detrimental impact on a highly valued environmental resource/receptor, the consequences of that impact on the said resource would be significant adverse effect. In other words, it is the result of the impact acting on the receptor that produces an environmental effect.

Effects can be either beneficial or adverse. The table below shows the criterion used for determining the significance of environmental impacts. Definitions of each significance categories are provided in the table below.

**Table 4-4 Criteria for Determining Significance of Impacts**

|                         |           | MAGNITUDE OF IMPACT (DEGREE OF CHANGE) |                     |                     |                   |                   |
|-------------------------|-----------|--|---------------------|---------------------|-------------------|-------------------|
|                         |           | No change                              | Negligible          | Minor               | Moderate          | Major             |
| Sensitivity of Receptor | Very High | Neutral                                | Minor               | Moderate to Major   | Major             | Major             |
|                         | High      | Neutral                                | Minor               | Minor to moderate   | Moderate to Major | Major             |
|                         | Medium    | Neutral                                | Negligible to minor | Minor               | Moderate          | Moderate to Major |
|                         | Low       | Neutral                                | Negligible to minor | Negligible to minor | Minor             | Minor to moderate |
|                         | Very Low  | Neutral                                | Negligible          | Negligible to minor | Minor             | Minor             |

In some cases above, the significance is shown as being one of two alternatives. In these cases, a single description is decided upon with reasoned judgement for that level of significance chosen.

**Table 4-5 Definition of Significance of Effects**

| SIGNIFICANCE CATEGORY | CRITERIA  |
|-----------------------|---|
| <b>Very Large</b>     | Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category. |
| <b>Large</b>          | Important considerations at a local scale but, if adverse, are potential concerns to the project and may become key factors in the decision-making process.   |
| <b>Moderate</b>       | These effects, if adverse, while important at a local scale, are not likely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource.   |
| <b>Slight</b>         | Local issue unlikely to be of importance in the decision-making process. Effects do not exceed statutory limits. Nevertheless, they are of relevance in enhancing the subsequent design of the project and consideration of mitigation or compensation measures.  |
| <b>Neutral</b>        | No effect or effect that is beneath the level of perception, within normal bounds of variation or within the margin of forecasting error. No mitigation is required.  |

The approach to assigning significance of impact relies on reasoned argument, professional judgement and taking on board the advice and views of appropriate organisations. For some

disciplines it is determined by comparison, wherever possible with company, locally, nationally or internationally accepted standards. If no standards are available then it is necessary to develop project specific limits, based on guidance or best practice as necessary.

Such standards or limits are referred to as the **Significance Threshold**. If the size and type of impact is greater than the significance threshold, then this is termed a **Significant Impact**. Potential significant impacts need to be avoided and are therefore prioritised identifying mitigation measures to reduce the effect to an acceptable level. Significant effects will be those, which are 'Major' or 'Moderate to Major'.

**Note:** All predicted impacts with a beneficial impact have been colour coded green.

#### 4.3.4 Mitigation & Management Measures

The project includes a variety of measures to ensure that environmental standards and guidelines can be achieved by the project. The project's impact assessment process as outlined above will therefore take into consideration those measures included in the project's design. In addition to specific measures included in the project's design, the ESIA will outline further mitigation and/or management measures for the construction & commissioning phases and the operational phase, upon which the project can further minimise or avoid negative impacts, and ameliorate positive impacts.

Upon approval of the project, the stated mitigation and management measures in the approved ESIA will be required for implementation as a condition of the environmental permit, or as the lenders as part of the loan agreement.

#### 4.3.5 Residual Impacts

Following assessment of the mitigation and management measures, the project's residual impact significance will be considered to determine whether the proposed mitigation and management can be considered acceptable. The significance of such impacts is based upon the same criteria used to determine the impact significance before applying additional mitigation & management measures.

#### 4.3.6 ESIA Disclosure

As part of AIB's process to reach board agreement and in line with other lending banks international good practices for ESIA, an ESIA disclosure session will take place once the ESIA is in its final draft stage. The purpose of this meeting will be to invite Project Affected People and other relevant stakeholders to present an overview of the Project, and the Environmental & Social assessment process undertaken.

The ESIA disclosure session will be advertised 2 weeks prior to the intended meeting date and will include posted notices, as well as direct communications with stakeholders. During the disclosure session, attendees will be open to query the Project and ask questions to the panel, which as a minimum will include the Project developer, local registered environmental consultant submitting the ESIA to MECA, and the international Environmental & Social Consultant.

Feedback will be recorded and then updated in the ESIA (as applicable), prior to finalisation and further submission to MECA.

## 5 AIR QUALITY

### 5.1 Standards and Regulatory Requirements

#### 5.1.1 National Requirements

With regards to ambient air quality standards, MECA has developed and issued the ambient air quality standards for the Sultanate of Oman through the Ministerial Decree 41/2017.

The following table summarises these standards.

**Table 5-1 Omani Ambient Air Quality Standards**

| POLLUTANT                            | MAXIMUM LIMIT OF POLLUTANT CONCENTRATION LEVEL |                          | AVERAGING PERIOD FOR MEASURING POLLUTANT (H) |
|--------------------------------------|--|--------------------------|--|
|                                      | PPM  | $\mu\text{g}/\text{m}^3$ |  |
| Sulphur dioxide (SO <sub>2</sub> )   | 0.124  | 350                      | 1  |
|                                      | 0.0532   | 150                      | 24   |
| Hydrogen Sulphide (H <sub>2</sub> S) | 0.020  | 30                       | 1  |
| Nitrogen Dioxide (NO <sub>2</sub> )  | 0.123  | 250                      | 1  |
|                                      | 0.642  | 130                      | 24   |
| Ozone (O <sub>3</sub> )              | 0.0568   | 120                      | 8  |
| PM <sub>10</sub>                     | -  | 150                      | 24   |
| PM <sub>2.5</sub>                    | -  | 65                       |  |
| Carbon Monoxide (CO)                 | 24.3   | 30mg/m <sup>3</sup>      |  |
|                                      | 8.11   | 10mg/m <sup>3</sup>      |  |
| Non-Methane Hydrocarbon (NMHC)       | 0.24   | 160                      |  |
| Lead (Pb)                            | -  | 1.5                      |  |
| NH <sub>3</sub>                      | -  | 200                      |  |

#### 5.1.2 Lender Requirements

As a guide, the requirements of the Project lenders are expected to align with the IFC EHS Guidelines (which reference the WHO ambient air quality standards) have been as provided below.

**Table 5-2 WHO Ambient Air Quality Standards ( $\mu\text{g}/\text{m}^3$  unless otherwise specified)**

| PARAMETER        | 24 HOUR                | ANNUAL                |
|------------------|------------------------|-----------------------|
| PM <sub>10</sub> | 150 (Interim target 1) | 70 (Interim target 1) |
|                  | 100 (Interim target 2) | 50 (Interim target 2) |
|                  | 75 (Interim target 3)  | 30 (Interim target 3) |
|                  | 50 (guideline)         | 20 (guideline)        |
|                  | 75 (Interim target 1)  | 35 (Interim target 1) |

| PARAMETER         | 24 HOUR                                       | ANNUAL                    |
|-------------------|---|---------------------------|
| PM <sub>2.5</sub> | 50 (Interim target 2)                         | 25 (Interim target 2)     |
|                   | 37.5 (Interim target 3)                       | 15 (Interim target 3)     |
|                   | 25 (guideline)                                | 10 (guideline)            |
| NO <sub>2</sub>   | 200 (1 hour)                                  | 40                        |
| SO <sub>2</sub>   | 125 (Interim target 1)                        | 500 (10-minute guideline) |
|                   | 50 (Interim target 2)                         |                           |
|                   | 20 (guideline)                                |                           |
| O <sub>3</sub>    | 160 (interim target 1) (8-hour daily maximum) |                           |
|                   | 100 (8 hour daily maximum guideline)          |                           |

**Source:** World Bank General EHS Guidelines, 2007

## 5.2 Observations and Baseline Condition

### 5.2.1 General

The climate of Oman can be described as subtropical dry hot desert climate with low annual rainfall, very high temperatures in summer and high levels of humidity particularly in inland areas. Daily maximum temperatures in the summer months (June to September) reach up to 40°C and above. Although rainfall is infrequent, there can be sudden heavy downpours potentially leading to flash floods. Due to the environment and low rainfall, a hot dust laden wind known as “the Shamal” occur reasonably frequently, especially in the summer months where there is typically less soil moisture, higher wind speeds and increased humidity; all favouring dust creation and suspension. This Shamal wind could be very strong resulting in sandstorms or dust storms with the potential of significantly impacting ambient air quality.

### 5.2.2 Site Based

On a local scale, the surrounding area of the Project site is sparsely populated with few existing emission sources, with the exception of Highway 21 (Buraimi-Ibri highway) approximately 2km from the north eastern boundary of the Project and the under commissioning Ibri IPP CCGT,

Mobile source emissions from vehicles have the potential to contribute to ambient concentrations of Nitric Oxide, NO<sub>2</sub>, SO<sub>2</sub>, VOC’s, CO and Particulate Matter (i.e. PM<sub>2.5</sub> & PM<sub>10</sub>) in the local air shed. Given the low vehicle flow on the road and as it is located approximately 3km from the north east boundary of the Project site, inputs from the highway are likely to be indistinguishable from background concentrations at this distance due to mixing.

The Ibri IPP (a 1400MW natural gas power plant) located approximately 2km from the south east of the Project boundary is still undergoing commissioning and is not yet fully operational. The IPP will contribute point source emissions from stack structures either in simple or combined



cycle operations, which will primarily include concentrations of NO<sub>x</sub> (as NO and NO<sub>2</sub>) and CO due to the use of the natural gas as primary fuel. Under back up liquid fuel operations there may be respective reduced emissions of NO<sub>2</sub> and CO, but an increase in SO<sub>2</sub> and a small amount of Particulates. Where the wind emanates from the east, this will likely result in dispersion towards the Ibri II IPP, with a possible increase in pollutant concentrations in the project area.

### 5.3 Sensitive Receptors

Review of satellite of satellite imagery and findings from the site visit undertaken in October 2018 identified a number of receptors around the Project site. Such receptors have been outlined to be within a 5km radius and have been identified in Section 2.3.4 "Local Sensitivities"

In relation to ambient air quality impacts from the project, the expected range of impacts are likely to be within a zone of 1km. A 1km radius has been considered as the potential zone of impact because the project is a renewable Project (Solar PV Plant) and is not expected to result in any air emissions. Any impacts upon ambient air quality will be limited to the construction phase (i.e. dust generation, vehicle movements and equipment use) or vehicle movements during the operational phase.

During construction, local ambient air quality may potentially be affected by increased dust, particularly during the site preparation stage (site clearance, levelling and excavations), the movement of vehicles on unpaved road surfaces and by the exhaust fumes of construction vehicles, equipment and temporary power generators. These activities can cause impacts to nearby receptors (e.g. <200m for gaseous emissions and <500m for particulate emissions).

Findings from the site visit undertaken on October 2018 and review of satellite imagery has identified recreational, agricultural, residential and an industrial property undergoing construction within 1km of the proposed project site.

These included the camel race track directly adjacent to the western boundary of the site, farmlands 1, 2 & 3 located north & north east of the Project site, the proposed Ibri II Solar IPP EPC contractor camp to be located within the site, and the Ibri IPP currently undergoing construction approximately 1km north of the project site.

**Table 5-3 Air Quality Receptors**

| RECEPTOR                 | RECEPTOR TYPE           | SENSITIVITY | JUSTIFICATION  |
|--------------------------|-------------------------|-------------|--|
| Ibri IPP Contractor Camp | Residential             | High        | It is possible that the existing Ibri IPP camp will be re-used during the Ibri II IPP Project. As the contractor camp will be occupied during the construction phase of the project, residents of this camp are particularly vulnerable to changes in ambient air quality. |
| Camel Race Track         | Recreational            | Medium      | This camel race track is likely used occasionally and whenever in use, users of this race track will be relatively vulnerable to changes in ambient air quality as a result of development of the Project  |
| Active Camel Farm 1 & 2  | Residential/ Commercial | High        | The camel farm(s) includes a residential attachment and camel pens which are sensitive to changes in air quality.  |
| Farmland 1               | Agricultural            | Medium      | Users of this farmland are relatively vulnerable to changes in ambient air quality as a result of development of the Project   |
| Ibri IPP                 | Industrial              | Low         | This industrial receptor will not be significantly impacted by changes in ambient air quality as it is of low vulnerability due to ambient air quality impacts from its own construction activities.   |

**Figure 5-1 Air Quality Receptor Locations**



## 5.4 Potential Impacts

### 5.4.1 Construction Phase

Activities associated with the construction phase are likely to result in fugitive emissions of dust and gaseous pollutants associated with the use of plant, vehicles and machinery.

In particular, impacts are likely to be associated with:

- Increased particulate concentrations, as a result of dust generating activities on site;
  - Dust deposition, resulting in the soiling of surfaces;
  - Visible dust plumes, which are evidence of dust emissions;
- Increase in concentrations of airborne particles and nitrogen dioxide due to exhaust emissions from diesel powered vehicles and equipment used on site (non-road mobile machinery) and vehicles accessing the site;
- Stored VOCs and other volatile hazardous materials; and
- Odour from temporary wastewater facilities (e.g. temporary toilet blocks), or wastewater containment.

#### Dust Generation

In line with the UK's IAQM Guidance on the Assessment of Dust from Construction, the need for detailed assessment relating to dust impacts will normally be required where

- There is a 'human receptor' within 350m of the boundary of the site, or within 50m of a route used by construction vehicles on public roads (up to 500m from the site entrance).
- There is an 'ecological receptor' within 50m of the boundary of the site, or within 50m of a route used by construction vehicles on public roads (up to 500m from the site entrance).

With respect to the screening criteria above, dust generation as a result of construction activities can potentially impact residents at the Project contractor camp and the camel race track as they are located within 350m of the Project site boundary. The farmland 3 and the contractor camp are also located within 50m of the route to be used by construction vehicles.

#### Gaseous Emissions

The principle sources of gaseous emissions to air during construction will be the combustion of fossil fuels from the operation of vehicles, construction equipment (such as temporary diesel generators) and mobile plant. Any emissions from these sources are not expected to result in noticeable incremental impacts to the local air shed as it will mix in ambient air close to the point of origin resulting in emissions that are not distinguishable from the background concentrations.

## **Volatile Organic Compounds (VOCs)**

A small volume of fuels, paints, solvents and other volatile substances are likely to be required during the construction phase, which will be stored in secure areas within the construction laydown areas. Any potential impact will be due to inappropriate storage or use of substances in close proximity to the construction site boundaries. Such impact will be negligible at the Project contractor camp and will be limited to the immediate surrounding area.

## **Odour**

The construction phase of the project will include a number of temporary toilet facilities with in-built or separate septic tank storage. In the event of ineffective odour management, there is the potential for release of some odour to the immediate surrounding areas associated with any inappropriate containment and coverage associated with wastewater holding tanks. However, such impact are likely to be temporary, and are expected to be limited to the Project footprint and immediate surrounding areas.

### **5.4.2 Operational Phase**

As the proposed project is associated entirely with the generation of renewable energy, there are no permanent fuel combustion requirements or any other associated air emissions directly from the Project.

An emergency diesel generator will likely be incorporated to supply provide supply in case of a site connection issue or disconnection from the grid. However, the use of this (besides maintenance testing) will be very limited, if used at all.

The Project will necessitate limited vehicle usage along the access road and wider routes to the site. Such impacts will be limited as there will be only a small requirement for operational staff. These increases in vehicles during operations are unlikely to be discernible and any air quality impacts to receptors are also not likely to be detectable.

## **5.5 Proposed Assessment Requirements for ESIA**

In order to provide a representative assessment of the significance of potential impacts, the following methods have been proposed to enable further assessment in the ESIA.

**Table 5-4 Air Quality Impacts Assessment Methodology at the ESIA Stage**

| POTENTIAL IMPACT          | ESIA ASSESSMENT METHODOLOGY  |
|---------------------------|--|
| <b>Construction Phase</b> |  |
| Dust Generation           | Given that there is a 'human' receptor within 350m of the project boundary, there is a potential for dust generated during site preparation activities and movements along the site access road and on unpaved surfaces to impact these receptors. Hence, further assessment is therefore considered necessary at the ESIA stage   |
| Gaseous Emissions         | Emissions are not expected to result in noticeable incremental impacts to the local air shed as any emission from construction vehicles & machinery are expected to mix in ambient air close to the point of origin resulting in emissions that are not distinguishable from the background concentrations.<br>As such, a further detailed assessment of this potential impact is not required |
| VOC's                     | Potential impact from VOC's will be negligible & limited to the Project contractor camp and immediate surrounding areas as such a further detailed assessment of this potential impact is not required.  |
| Odour                     | Potential impacts from odour during construction are expected to be temporary, negligible & limited to the Project contractor camp and immediate surrounding areas and as such further detailed assessment is not required.  |
| <b>Operational Phase</b>  |  |
| Vehicle Gaseous Emissions | Given that the operation of the Project will only require the usage of few vehicles, emission from vehicle movements are not expected to result in emissions that are not distinguishable from the background concentrations. Hence, further detailed assessment is not proposed in the ESIA.  |

In order to provide a representative assessment of the significance of potential impacts, the methods listed in the table below have been proposed to enable further assessment on potential impacts in the ESIA.

**Table 5-5 Air Quality Impacts Assessment Methodology at the ESIA Stage**

| POTENTIAL IMPACT                       | ESIA ASSESSMENT METHODOLOGY  |
|--|--|
| <b>Construction Phase</b>              |  |
| Dust Generation and Gaseous Pollutants | <p><u>Baseline Study:</u></p> <p>A baseline assessment of particulates (PM<sub>10</sub> &amp; PM<sub>2.5</sub>) will be undertaken for at one (1) central location within the project site.</p> <p>As a precautionary approach and to better understand baseline air quality conditions that may affect site personnel, the ambient air quality survey will also monitor ambient concentrations of Carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), sulphur dioxide (SO<sub>2</sub>) and ozone (O<sub>3</sub>) over this same period.</p> <p>Short term ambient air continuous monitoring campaign will run for ten (10) days to ensure the provision of representative conditions that can be compared with hourly and 24-hourly standards, as well as indicating diurnal fluctuations in ambient air quality, or fluctuation with the local weather conditions.</p> <p>A meteorological station will also be established for the period of the monitoring adjacent to the air quality monitoring station to measure wind speed, direction, humidity and temperature.</p> |

| POTENTIAL<br>IMPACT | ESIA ASSESSMENT METHODOLOGY   |
|---------------------|---|
|                     | <p>Results of the air quality monitoring will be provided in <math>\mu\text{g}/\text{m}^3</math> and will be compared against applicable ambient air quality standards.</p> <p><u>Assessment of Impact Significance:</u><br/>In accordance with a best practice methodology (such as the UK's Institute of Air Quality Management (IAQM) for construction dust) an assessment of the potential impacts of construction dust will be made. Potential impacts will be combined with baseline concentrations to determine the significance of impacts.</p> |

Given that the operation of the project is unlikely to result in any net variation to local air quality condition (as there are no specific emission sources), modelling or detailed air quality assessment for the operational phase is not proposed.

Air quality impacts that could be attributable to the construction phase are expected to be common for construction projects in Oman, and are considered to be manageable through the implementation of a robust Construction phase Environmental Management Plan (CEMP). The ESIA will provide further details regarding required considerations and necessary mitigation to be included within the CEMP for all potential impacts including those identified as not requiring further detailed assessment in the ESIA.

The ESIA will include best practice mitigation and management measures to reduce the potential for any associated impacts to air quality. The intention will be for these best practice measures to be included into the Operational phase Environmental Management Plan (OEMP) and operational phase ESMS for effective management and implementation on-site. The same is relevant for potential impacts identified during the construction phase, whereby best practice mitigation and management measures will be included to the ESIA for incorporation to the CEMP and construction phase ESMS.



## 6 NOISE AND VIBRATION

### 6.1 Standards and Regulatory Requirements

#### 6.1.1 National Requirement

Omani regulations for noise are applicable for both the workplace and ambient noise levels. The ambient noise levels are provided in M.D. 79/94 and the applicable limits of noise generated from industrial facilities is provided in the following table.

**Table 6-1 Limits of Noise Generated by Industrial Sources**

| TYPE OF DISTRICT   | LEQ, T, dB(A)                   |                                       |  |
|--|---------------------------------|---------------------------------------|--|
|  | DAY TIME<br>7AM-6PM<br>WORKDAYS | EVENING TIME<br>6PM- 11PM<br>WORKDAYS | NIGHT TIME<br>11PM – 7AM<br>WORKDAYS AND<br>HOLIDAYS |
| Rural residential and recreational                         | 45                              | 40                                    | 35   |
| Sub-urban residential                                      | 50                              | 45                                    | 40   |
| Urban residential  | 55                              | 50                                    | 45   |
| Urban residential with some workshops or business city hub | 60                              | 55                                    | 50   |
| Industrial and commercial                                  | 70                              | 70                                    | 70   |

The regulations also provide maximum noise levels, measured at the sensitive receptor, for road sources, and these are shown in the following table.

**Table 6-2 Limits of Noise Generated by Road Traffic Sources**

| TYPE OF DISTRICT   | LEQ, T, dB(A)                   |                                       |  |
|--|---------------------------------|---------------------------------------|--|
|  | DAY TIME<br>7AM-6PM<br>WORKDAYS | EVENING TIME<br>6PM- 11PM<br>WORKDAYS | NIGHT TIME<br>11PM – 7AM<br>WORKDAYS AND<br>HOLIDAYS |
| Rural residential and recreational                         | 60                              | 55                                    | 50   |
| Sub-urban residential                                      | 65                              | 60                                    | 55   |
| Urban residential  | 65                              | 60                                    | 55   |
| Urban residential with some workshops or business city hub | 65                              | 60                                    | 55   |
| Industrial and commercial                                  | 70                              | 65                                    | 60   |

The above noise limits will be applicable to the movement of project related vehicles during the construction and operational phases of the project.

Ministerial Decree 80/1994, describes the measures taken to control noise pollution in the working environment. The requirements specify that:

- Employees should not be exposed to noise levels exceeding 85dB(A);
- If work place noises exceed 85dB(A), then the employer should provide the workers with suitable personal hearing protection devices;
- The attenuation devices should minimise the noise levels to 80dB(A) or lower; and
- Machines must be designed and constructed in such a way that risks resulting from elevated noise are reduced to the lowest level possible using state-of-the-art technology and available means particularly at noise source

### 6.1.2 Lender Requirements

Financial institutions are expected to also require adherence to WHO noise standards as detailed in IFC EHS Guidelines. The IFC General EHS Guidelines require that the project be in compliance with the WHO noise standards, though these relate to noise received at receptor locations rather than the project boundary.

**Table 6-3 World Health Organisation Ambient Noise Level Guidelines**

| RECEPTOR                                | ONE HOUR LAEQ (DBA) |                  |
|---|---------------------|------------------|
|   | DAYTIME (7AM-10PM)  | NIGHT (10PM-7AM) |
| Residential, Institutional, Educational | 55                  | 45               |
| Industrial, Commercial                  | 70                  | 70               |

**Source:** World Bank EHS General Guidelines, 2007 & Guidelines for Community Noise, WHO, 1999.

Noise impacts should not exceed the levels presented above, or result in a maximum increase in background levels of 3dB at the nearest sensitive receptor location off-site.

Furthermore, the following requirements have also been specified in the IFC EHS noise guidelines:

- No employee should be exposed to a noise level greater than 85dB (A) for duration of more than 8 hours per day without hearing protection. In addition, no unprotected ear should be exposed to a peak sound pressure level (instantaneous) of more than 140dB(C).
- The use of hearing protection should be enforced actively when the equivalent sound level over 8 hours reaches 85dB (A), the peak sound level reaches 140dB(C), or the average maximum sound level reaches 110dB (A). Hearing protective devices provided should be capable of reducing sound level at the ear to at least 85dB (A).

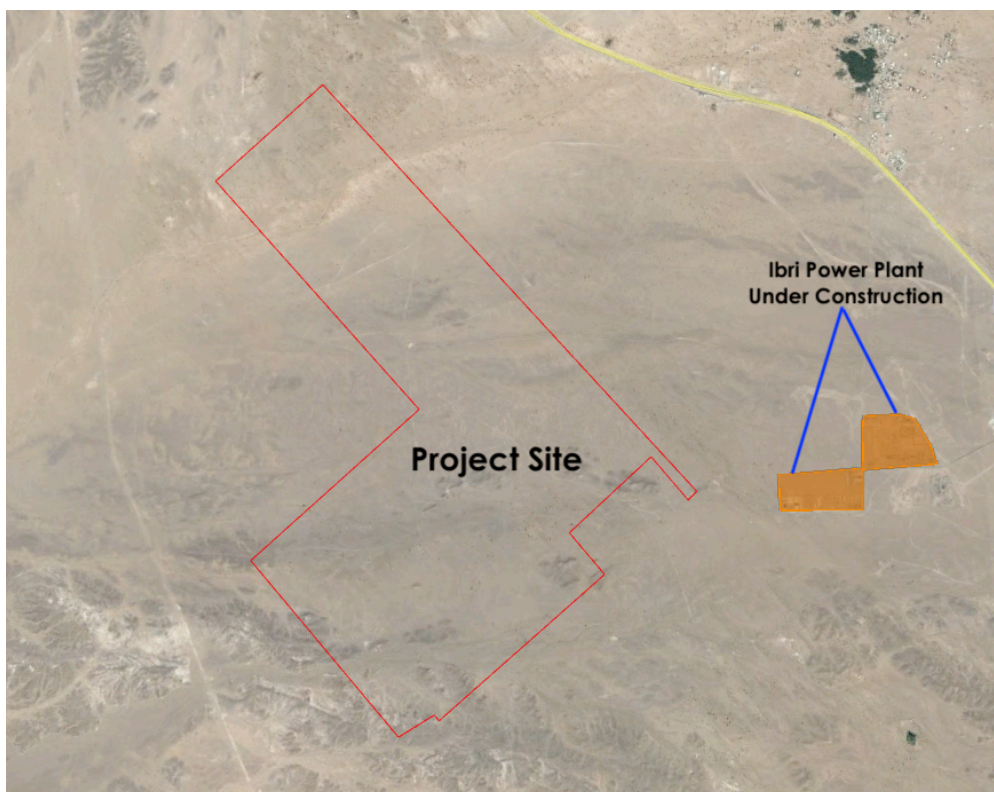
- For every 3dB(A) increase in sound levels, the allowed exposure period or duration should be reduced by 50%.
- Where feasible, use of acoustic insulating materials isolations of the noise source and other engineering controls should be investigated and implemented prior to the issuance of hearing protection devices as the final control mechanism.
- Medical hearing checks on workers exposed to high noise levels should be performed periodically.

## 6.2 Observations and Baseline Condition

### 6.2.1 Noise

The Project site is located away from permanent anthropogenic noise generating activities. The only notable anthropogenic noise sources observed from the Project site during the site visits in October 2018 and May 2019 were distant vehicle noises from Highway 21 located approximately 3km north east of the Project site and the distant construction/commissioning activities of the Ibri IPP located approximately 800m south east of the Project boundary. Noise sources from Highway 21 are only discernible in low magnitude along the north eastern extent of the Project boundary while noise from the Ibri Power Plant are only discernible at the south-eastern extent of the Project site.

**Figure 6-1 Local Noise Sources**



## 6.2.2 Vibration

In terms of a baseline, no noticeable vibrations, or potential sources of vibration were encountered at any time during the site visits undertaken.

## 6.3 Sensitive Receptors

In relation to noise and vibration impacts, the expected range of impacts are likely to be within a zone of 1km. This is due to noise propagation losses over distance. Findings from the site visits and review of satellite imagery have identified evidence of residential, agricultural and industrial properties within 1km of the proposed project site that may be susceptible to changes in noise levels.

These included the proposed Ibri II Solar IPP contractor camp to be located within the site, users of the camel race track directly adjacent to the western boundary of the site, Farmlands 1, 2 & 3 located approximately 400m north, 800m north east and 1km north of the project site, and Ibri Power Plant located approximately 800m south east of the project site.

**Table 6-4 Noise & Vibration Sensitive Receptors**

| RECEPTOR                 | RECEPTOR TYPE            | SENSITIVITY   | JUSTIFICATION   |
|--------------------------|--------------------------|---------------|---|
| Ibri IPP contractor camp | Residential              | <b>High</b>   | The existing worker accommodation area may be maintained for the Ibri II IPP construction works. As the proposed contractor camp will be occupied during the construction phase of the project, residents of this camp are particularly vulnerable to increase in ambient noise levels. |
| Active Camel Farm 1 & 2  | Residential / Commercial | <b>High</b>   | The camel farm(s) includes a residential attachment and camel pens which are sensitive to changes in noise.   |
| Camel Race Track         | Recreational             | <b>Medium</b> | This camel race track is used occasionally and as such whenever it is in use, users of this recreational facility is relatively vulnerable to changes in ambient noise levels as a result of development of the Project.  |
| Farmland 1, 2, 3 & 4     | Agricultural             | <b>Medium</b> | Users of this farmland are relatively vulnerable to changes in ambient noise levels as a result of development of the Project.  |
| Ibri Power Plant         | Industrial               | <b>Low</b>    | This industrial facility is currently undergoing construction and has been identified as a local noise source. Hence it is of low vulnerability to changes in ambient noise levels.   |

Figure 6-2 Noise & Vibration Sensitive Receptor Locations



## 6.4 Potential Impacts

### 6.4.1 Construction Phase

#### Construction Noise

Construction activities will likely result in temporary and short duration increases in the noise and vibration levels emanating from the project site, laydown areas and access road.

Noise will be generated and propagated to the surrounding areas via a range of processes. Pertinent construction activities at the project site in relation to noise are likely to include earthworks, movement of vehicles, compaction works and piling.

The combination of noise from the above sources can also introduce potential cumulative impacts when generated in tandem. All of these impacts may have a negative effect on the amenity of receptors within 1km of the Project site due to the flat topography, limited attenuating vegetated ground cover and lack of intervening structures to provide attenuation.



## Construction Vehicle Noise

Increases in traffic during construction may result in increases in the noise levels at off-site receptors within 1km to the Project boundary. In addition, increase in traffic on the existing highway approximately 3km north east of the Project site may result in a discernible impact on road users and any receptors in close proximity to the Highway as the current traffic flow on this highway is low.

## Vibration

Certain construction processes, particularly those involved with site preparation and civil works, e.g. breaking, piling, vibratory rollers etc. have the potential to create vibration within the vicinity of the works. Vibration is also anticipated to occur sporadically around the construction site due to the movement of materials and equipment.

However, it should be noted that vibrations tend to dissipate rapidly as they spread due to losses of energy radiating 360 degrees from the source. As such, vibratory impacts at the project contractor camp will likely be negligible while impacts at the camel race track, the farmland 1, 2 & 3 and Ibri IPP are not expected to be discernible due to attenuation of vibration over distance.

## 6.4.2 Operational Phase

### Operational Noise

Besides maintenance vehicles and potential low magnitude humming from the electrical transformers (which is not expected to be discernible at over 50m distance from source), there will be very few specific point noise sources from the project.

Given the minimal requirements for site activity during operation, impacts from vehicles are also not expected to be major source of noise. As such, operational noise is not expected to be discernible at identified receptor locations.

Under emergency situations, noise from the emergency diesel generator may be discernible on site, but will unlikely be discernible to off-site receptors.

### Vibration

As the PV Project will not contain rotating, vibrating, or other major moving parts, it is not anticipated that the project will result in any discernible operational vibration impacts.



## 6.5 Proposed Assessment Requirements for ESIA

In accordance with the outlined potential impacts, the table below details those impacts that may or may not require further detailed assessment at the ESIA stage.

**Table 6-5 Noise & Vibration Impacts for Further Assessment at the ESIA Stage**

| POTENTIAL IMPACT               | JUSTIFICATION   |
|--------------------------------|---|
| <b>Construction</b>            |   |
| Construction Site Noise        | It is anticipated that construction site noise may be discernible at the Project contractor camp, the camel race track, Farmland 1,2 & 3 and Ibri Power Plant if not properly managed. As a result further assessment is therefore considered necessary at the ESIA stage.  |
| Construction Access Road Noise | The increase in vehicle traffic due to the construction phase may be noticeable at locations adjacent to the access road. Therefore, further assessment is considered necessary at the ESIA stage.  |
| Vibration                      | Vibration impacts are expected to be negligible and not anticipated to impact receptors (Project contractor camp, the camel race track, Farmland 1, 2 & 3 and Ibri Power Plant). Hence, further detailed assessment is not considered necessary in the ESIA.  |
| <b>Operation</b>               |   |
| Operational Noise              | Given that operation of the Project will not include noisy components or include noise generating activities, there will be limited noise sources from the Project.<br>Given the minimal requirements for site activity during operation, noise impacts from vehicles required during the operation and maintenance are not expected to be discernible at receptor locations. Therefore, further detailed assessment is not required in the ESIA. |
| Vibration                      | Impacts related to vibration are not expected during operational activities. Therefore, further detailed assessment is not required in the ESIA.  |

In order to provide a representative assessment of the significance of potential impacts, the methods listed in the table below have been proposed for those potential impacts requiring further assessment in the ESIA.

**Table 6-6 Noise & Vibration Impacts Assessment Methodology at the ESIA Stage**

| POTENTIAL IMPACT                            | ESIA ASSESSMENT METHODOLOGY   |
|---|---|
| <b>Construction Phase</b>                   |   |
| Construction Site Noise & Access Road Noise | <u>Baseline Study:</u><br>In order to confirm baseline conditions prior to construction works, a noise monitoring survey will be undertaken as a key component of the ESIA in order to assess construction noise. The noise survey will be undertaken at accessible, representative locations of the project footprint (see figure below). It is proposed that four (4) locations will be monitored at the Project<br>One (1) of these monitoring locations will be situated in close proximity to the Project contractor camp, another monitoring location will be close to the proposed external access road. |

| POTENTIAL<br>IMPACT | ESIA ASSESSMENT METHODOLOGY   |
|---------------------|---|
|                     | <p>The noise survey will be undertaken with a noise meter compliant with Class 1 specification, as set out in BS EN 60804:2001.</p> <p>The survey will monitor ambient noise levels for 15-minute periods to provide measurements of Leq(A) readings for daytime, evening and night time periods. Where night time noise monitoring is not possible the daytime noise measurements will be taken to represent the worst-case ambient noise levels due to increased daytime activities.</p> <p>The ESIA baseline noise section will include:</p> <ul style="list-style-type: none"> <li>• GPS coordinates, photographic record and map of the monitoring locations.</li> <li>• Presentation of monitoring results.</li> <li>• Comparison of results to applicable Omani &amp; WHO standards.</li> </ul> <p><u>Assessment of Impact Significance:</u></p> <p>Assessment of impact significance will be made by considering the existing baseline condition in combination with the potential additional construction phase noise impacts from construction sources.</p> <p>The determination of impact magnitude will be made based upon a prediction of construction noise using BS5228-1:2009 'Code of Practice for Noise and Vibration Control on Construction and Open Sites'. A basic model for the calculation of noise propagation will be used to predict the expected additional impact of the works at the receptors.</p> <p>The potential impacts will be based upon the degree of change in decibels at the receptor location and compliance to regulatory noise standards.</p> |

Given that the operation of the project is unlikely to result in noise and vibration impacts that will be discernible at receptor location (as there are no specific noise sources), modelling or detailed noise level assessment for the operational phase is not proposed.

**Figure 6-3 Proposed Noise Monitoring Locations**



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**Note:** Location of actual noise monitoring stations may vary dependant on suitability of locations for noise monitoring.

The ESIA will include good practice mitigation and management measures to reduce the potential for any associated effects upon noise and vibration. The intention will be for these good practice measures to be included into the OEMP and operational phase ESMS for effective management and implementation on-site. The same is relevant for potential impacts identified during the construction phase, whereby best practice mitigation and management measures will be included to the ESIA for incorporation to the CEMP and construction phase ESMS.

## 7 TERRESTRIAL ECOLOGY

### 7.1 Standards and Regulatory Requirements

#### 7.1.1 National Requirement

RD 6/2003: Law on Nature Reserves and Wildlife Conservation established requirements for the protection of designated nature reserves within the Sultanate of Oman and identifies a list of species that are protected against killing, hunting or smuggling. Such species are provided in the table below.

**Table 7-1 List of Protected Wildlife Species in the Sultanate of Oman**

| PROTECTED WILDLIFE SPECIES IN OMAN  |                     |
|---|---------------------|
| Arabian Oryx  | Honey badger        |
| Arabian leopard   | Hare                |
| Arabian Tahr  | Red fox             |
| Reem or Sand Gazelle  | Green turtle        |
| Nubian ibex   | Loggerhead turtle   |
| Striped hyena   | Olive ridley turtle |
| Arabian Gazelle   | Hawksbill turtle    |
| Houbara bustard   | Wild cat            |
| Caracal   | Sand cat            |
| Arabian wolf  | Rueppell's sand fox |
| All falcon, owl, vulture, eagle, flamingo, pelican, gull and tern species |                     |

#### 7.1.2 Lenders Requirement

The assessment of impacts upon terrestrial ecology will be made with due consideration to the IFC Performance Standard 6 on Biodiversity Conservation and Sustainable Natural Resource Management which establishes requirements for protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources.

### 7.2 Observations and Baseline Condition

The proposed site for the development of the Ibri II Solar IPP is greenfield. There are two (2) principal habitat types within the project site which included: gravel plain habitat and low-lying sand sheet habitat. In general, there was no vegetation at the gravel plains areas of the site. However, various low-lying vegetation, shrubs and trees (of similar species) were identified during the initial site visit in the low-lying sand sheet areas as well as in and around the runoff areas present within the site.

During the initial site visit, with the exception of grazing camels potentially belonging to the camel farm within the site or in close proximity to the site, fauna species were not identified on site. However, evidence of the presence of fauna species (animal tracks & faeces) were noted during the site visit suggesting that this site may support animals such as; reptiles (e.g. lizards, snakes, etc.) and mammals (e.g. rodents, etc.). The presence or absence of fauna will need to be determined at the ESIA stage.

**Plate 7-1 Evidence of Flora Species at the Project Site.**





**Plate 7-2 Evidence of Fauna Species at the Project Site.**



**Animal Tracks**



**Animal Faeces**

There are no designated ecological area or Nature Reserve located in close proximity to the Project site as all the Nature Reserve within the Sultanate are located over 50km from the Project boundary. In addition, no birds were identified within the Project site during the initial site visit and according to the BirdLife International Bird Sensitivity Mapping Tool<sup>1</sup>, there are no recorded bird flyways within the Project locality as all bird flyways have been identified and recorded to be outside the Project vicinity (See Figure below).

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<sup>1</sup> **Source:** <https://maps.birdlife.org/MSBtool/> Accessed 15<sup>th</sup> April 2019



Figure 7-1 Important Bird Areas in Oman

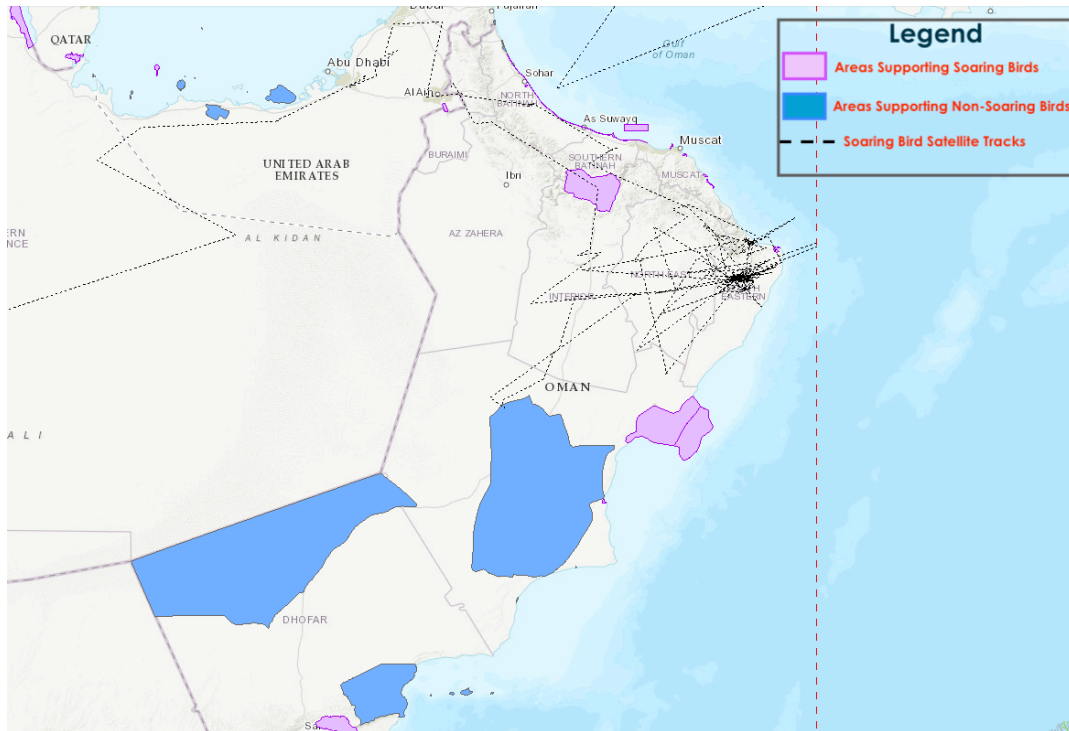
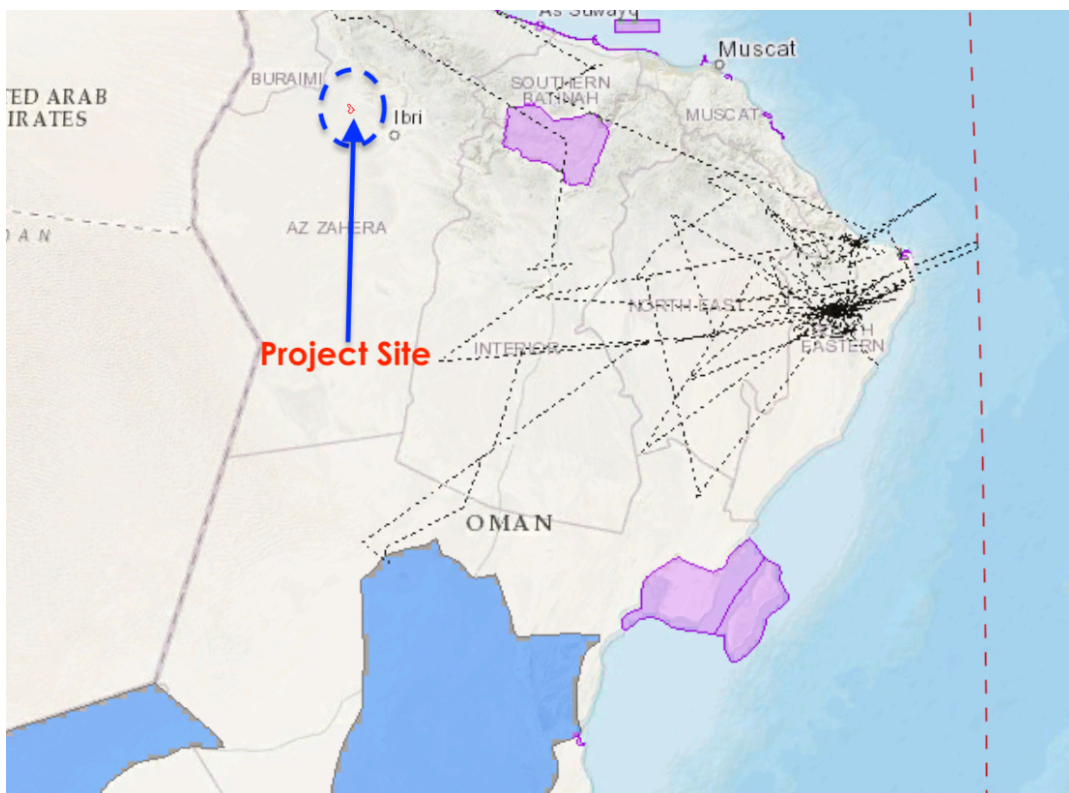


Figure 7-2 Project Location and Important Bird Areas in Oman



The nearest recorded bird flyway to the Project site is over 60km from the north eastern boundary of the Project site.

## 7.3 Sensitive Receptors

**Table 7-2 Potential Terrestrial Ecology Receptors**

| RECEPTOR | EXPECTED SENSITIVITY | JUSTIFICATION   |
|----------|----------------------|---|
| Fauna    | <b>Low</b>           | The preliminary site visit did not identify any specific habitats or species of concern relating to terrestrial ecology (such as protected or IUCN designated species). |
| Flora    | <b>Low</b>           | The habitats in the Project's footprint are very common for inland areas of Oman.   |

**Note:** the sensitivity of this receptor will be confirmed in the ESIA baseline depending on the outcome of the surveys.

## 7.4 Potential Impacts

### 7.4.1 Construction Phase

#### Habitat Loss & Disturbance to Fauna

Site preparation works will include clearance, removal of all vegetation within the site, grading for foundations, excavations for below ground infrastructures, and trenching and backfilling for cables therefore complete loss of the existing habitat and disturbance of fauna near or on the site is anticipated.

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.

### 7.4.2 Operational Phase

Due to the spread of gypsum over the Project area and hard standing construction over some area of the proposed site such as the internal access roads, impacts during the operational phase to any on site vegetation is not anticipated. 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; or to the fauna species inhabiting/using these areas.

Birds in proximity to the site are not expected to be impacted by the project directly, but may indirectly be attracted to the site under the influence of 'lake effect', a potential phenomenon whereby birds mistake the reflective surfaces of solar PV panels for the surface of water. Although lacking firm research, there is suggestion amongst the scientific community and avian protection bodies that 'lake effect' has the potential to injure birds or lead to their

mortality where birds attempt to land on the PV panels. As such, there may be potential for such impacts to occur to birds attracted by 'lake effect'.

If landscaping of the site border or administrative blocks will be undertaken, the use of native vegetation may increase biodiversity on the site by providing habitats foraging opportunities and refuge for fauna species. Inappropriate landscaping using non-native or non-naturalised species could however result in the introduction of invasive species to the area.

## 7.5 Proposed Assessment Requirements for ESIA

In accordance with the outlined potential impacts, the table below details those impacts that further assessment at the ESIA stage.

**Table 7-3 Terrestrial Ecology Impacts for Further Assessment at the ESIA Stage**

| POTENTIAL IMPACT  | JUSTIFICATION   |
|---|---|
| <b>Construction</b>   |   |
| Habitat Loss  | Impacts are expected to be minor as the site habitats are common for inland areas of Oman. However, a baseline assessment of flora species in the project footprint will be undertaken at the ESIA stage.   |
| Disturbance to Fauna  | Initial site visit did not identify faunal species of importance within the site or immediate areas. However, although impacts (if any to fauna) are generally not expected to be of significance, the ESIA will include a baseline assessment/ review of potential faunal species within the Project site. |
| <b>Operation</b>  |   |
| As additional impacts to flora species are not expected during operation of the PV Plant, further impact assessment is not proposed in the ESIA.<br>With regards to fauna species, although the potential for impacts related to 'lake effect' are largely unknown, it is considered appropriate further assessment is required at the ESIA stage due to the local presence of bird migration pathways. |   |

In order to provide a representative assessment of the significance of potential impacts, the following methods in the table below have been proposed to enable further assessment of potential impacts in the ESIA.

**Table 7-4 Terrestrial Ecology Impacts Assessment Methodology at the ESIA Stage**

| POTENTIAL IMPACT                    | ESIA ASSESSMENT METHODOLOGY  |
|-------------------------------------|--|
| <b>Construction Phase</b>           |  |
| Habitat Loss & Disturbance of Fauna | <u>Baseline Study:</u><br>Based on the expected limited potential for ecological impacts, the terrestrial ecology survey will be undertaken by a regionally experienced ecologist.<br>Up to three (3) 100m transects will be walked in the different habitats across the site i.e. the gravel plains, sand sheet and the runoff channel. The ecologist will record all sightings of flora and fauna species, as well as any signs of fauna tracks and burrows. |

| POTENTIAL<br>IMPACT | ESIA ASSESSMENT METHODOLOGY  |
|---------------------|--|
|                     | <p>Although the site does not contain bird flyways, the terrestrial ecology baseline (transects surveys) will include consideration of avifauna by conducting bird surveys during the transect survey and will feature specific observations for any migrating bird species. Incidental sightings of resident birds will also be made during the survey.</p> <p>All fauna species will be referenced against IUCN status for vulnerability and recorded in the ESIA. Where birds (avifauna species) are identified, records will be taken in regard to species type, abundance, flight direction and any other notable factors</p> <p><u>Assessment of Impact Significance:</u><br/>The outcomes of the baseline survey will be compared with the expected site clearance during construction to determine potential impacts upon ecology.</p> |

**Figure 7-3 Proposed Ecological Survey Locations**



**Note:** It should be noted that the above survey locations are indicative and may slightly change or even increase in number during the ecological survey with the intention of conducting the transect surveys at the gravel plains, sand sheet and the low lying runoff channel.

The ESIA will also include good practice mitigation measures for terrestrial ecology so that impacts of 'Slight' significance can be reduced. The intention is to include these mitigation measures into the respective CEMP and OEMP documents for effective management and implementation on-site.



## 8 SOILS, GEOLOGY, HYDROLOGY AND GROUNDWATER

### 8.1 Standards and Regulatory Requirements

#### 8.1.1 National Requirement

Several legal instruments in the Sultanate of Oman are in place to control the handling and management of potentially dangerous substances; which may affect the quality of soil, groundwater or any surface water. These included:

- RD No. 46/1995: Issuing the Law of Handling and Use of Chemicals;
- MD 140/93: Regulations for Chemical Materials Registration and Related Permits;
- MD No. 248/1997: Regulation for the Registration of Chemical Substances and the Relevant Permits.

In addition, RD No. 114/2001: Law for the Conservation of Environment and Prevention of Pollution establishes strict prohibition against the release of environmental pollutants.

However, there are no established soil or groundwater quality standards in Oman.

#### 8.1.2 Lender Requirements

The IFC Performance Standards requires adherence to IFC Performance Standard 3 on 'Resource Efficiency and Pollution Prevention' and this requires the client and/or the Project to:

- Avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities; and
- Prevent the release of pollutants to water and land due to routine, non-routine, and accidental circumstances, or when not feasible, minimize and/or control the intensity and mass flow of their release.

As there are no defined soil standards for Oman, the use of the 'Dutch Soil Guideline' or Dutch standards will be considered as a good practice standard for the analysis of soils as they are considered a good international practice.

The Dutch Standards identify maximum allowable concentrations for contaminants in soil. The soil intervention values indicate when the functional properties of the soil for humans, plants and animals is seriously impaired or threatened. They are representative of the level of contamination above which a serious case of soil contamination is deemed to exist.

The Dutch Standards for the most significant pollutants are presented in the table below. Where a parameter is not covered by the Dutch Standards, other appropriate international standards shall be used.

**Note:** Compliance to Dutch standards for soil quality is not required in Oman, but has been included only as a good practice standard; as it is required by the lenders (where national standards are not in operation).

**Table 8-1 Dutch Soil Standards**

| PARAMETERS                        | SOIL (MG/KG DRY MATTER) |                               |
|-----------------------------------|-------------------------|-------------------------------|
|                                   | TARGET VALUE*           | INTERVENTION VALUE            |
| <b>Heavy Metals</b>               |                         |                               |
| Arsenic                           | 29                      | 76                            |
| Barium                            | 160                     | -                             |
| Cadmium                           | 0.8                     | 13                            |
| Chromium                          | 100                     | -                             |
| Chromium III                      | -                       | 180                           |
| Chromium IV                       | -                       | 78                            |
| Cobalt                            | -                       | 190                           |
| Copper                            | 36                      | 190                           |
| Lead                              | 85                      | 530                           |
| Mercury                           | 0.3                     | 36 (inorganic)<br>4 (organic) |
| Molybdenum                        | 3                       | 190                           |
| Nickel                            | 35                      | 100                           |
| Zinc                              | 140                     | 720                           |
| <b>Aromatic Compounds</b>         |                         |                               |
| Benzene                           | 0.01                    | 1.1                           |
| Ethyl benzene                     | 0.03                    | 110                           |
| Toluene                           | 0.01                    | 32                            |
| Xylene (sum)                      | 0.1                     | 17                            |
| Styrene (vinylbenzene)            | 0.3                     | 86                            |
| Phenol                            | 0.05                    | 14                            |
| Cresols (sum)                     | 0.05                    | 13                            |
| <b>Chlorinated Hydrocarbons</b>   |                         |                               |
| <b>Volatile Hydrocarbons</b>      |                         |                               |
| monochloroethene (vinyl chloride) | 0.01                    | 0.1                           |
| Dichloromethane                   | 0.4                     | 3.9                           |
| 1,1-dichloroethane                | 0.02                    | 15                            |
| 1,2-dichloroethane                | 0.02                    | 6.4                           |
| 1,1-dichloroethene                | 0.1                     | 0.3                           |



| PARAMETERS                    | SOIL (MG/KG DRY MATTER) |                    |
|-------------------------------|-------------------------|--------------------|
|                               | TARGET VALUE*           | INTERVENTION VALUE |
| 1,2-dichloroethene (sum)      | -                       | 1                  |
| Dichloropropanes (sum)        | -                       | 2                  |
| Trichloromethane (chloroform) | 0.02                    | 5.6                |
| 1,1,1-trichloroethane         | 0.07                    | 15                 |
| 1,1,2-trichloroethane         | 0.4                     | 10                 |
| Trichloroethene (Tri)         | 0.1                     | 2.5                |
| Tetrachloromethane (Tetra)    | 0.4                     | 0.7                |
| Tetrachloroethene (Per)       | 0.002                   | 8.8                |
| <b>Chlorobenzenes</b>         |                         |                    |
| Monochlorobenzene             | -                       | 15                 |
| Dichlorobenzenes (sum)        | -                       | 19                 |
| Trichlorobenzenes (sum)       | -                       | 11                 |
| Tetrachlorobenzenes (sum)     | -                       | 2.2                |
| Pentachlorobenzene            | -                       | 6.7                |
| Hexachlorobenzene             | -                       | 2.0                |
| <b>Chlorophenols</b>          |                         |                    |
| Monochlorophenols (sum)       | -                       | 5.4                |
| Dichlorophenols (sum)         | -                       | 22                 |
| Trichlorophenols (sum)        | -                       | 22                 |
| Tetrachlorphenols (sum)       | -                       | 21                 |
| Pentachlorophenol             | -                       | 12                 |

## 8.2 Observations and Baseline Condition

### 8.2.1 Geology

Geologically, Oman is at a tectonic intersection: the spectacular mountains and coastlines of northern Oman result from the collision and interaction of four crustal plates.

According to the Water Resources in Oman issued by the Ministry of Regional Municipalities and Water Resources (source: <https://www.mrmwr.gov.om/en/web/mrmwr/downloads>), the main geological sequences in the Sultanate include;

- The Pre-Permian Basement Rocks which comprises of granites, gneisses, partly metamorphosed siliclastic and carbonate sediments and metavolcanics;
- The Hajar Super Group which are made of carbonate sediments, limestone, dolomites and marls of mid Permian to late cretaceous age;
- The Sumaini Group which is made of locally thrust sedimentary sequences of Permo-Triassic limestone, dolomites, sandstones and marls;

- The Samail Ophiolite which covers extensive areas of northern Oman and is the world's largest intact and best exposed obduction ophiolite, a slice of oceanic lithosphere approximately 75 to 95 million years old and;
- The Limestones, which are widespread throughout Oman with common development of karst terrain especially during wet periods.

**Figure 8-1 Simplified Surface Geology of Oman**



**Source:** Fookes P.G. and Lee E.M., (2009) – Desert Environment of Inland Oman

## 8.2.2 Hydrology

The average annual amount of rainfall run-off or surface water – wadi flow in Oman is estimated to be about 1,050Mm<sup>3</sup>. During flood flows in wadis, significant quantities of water infiltrate the coarse wadi gravels and replenish the shallow alluvial aquifers. Some of the balance is intercepted by newly-constructed dams; the rest, estimated nationally to be about 119Mm<sup>3</sup>/year is lost to the sea.

## 8.2.3 Hydrogeology and Groundwater

### General

Groundwater resources in Oman maybe considered as renewable or non-renewable. Renewable resources describe aquifers that receive replenishment – or recharge - from rainfall or infiltration of surface water flows. These are mostly found in areas of moderate to high rainfall and/or where surface water flows are common (the southern and northern regions of Oman).

Non-renewable resources however receive little or no modern-day recharge and owe most of its existence to historic times when the climate was much wetter than it is now. These are typically found within the interior basin where thick tertiary carbonate formations occur that have several hundred meters of thickness and store vast quantities of water.

According to the Water Resources in Oman issued by the Ministry of Regional Municipalities and Water Resources, major groundwater flows in Oman are from the Al Hajar Al Gharbi and from the Dhofar mountains both towards the sea and towards the Interior. In both mountain areas, alluvial deposits in wadi beds typically form excellent aquifers and contain renewable resources of good quality groundwater on account of regular recharge from rainfall, surface water flow and locally the inflow of groundwater from adjacent hard rock aquifers. The seaward flows recharge the extensive alluvial aquifers of the coastal plains. Flows to the interior provide similar local replenishment to shallow aquifers and converge at topographic lows, such as at Umm As Samim, from whence groundwater discharge occurs through direct evaporation.

Nationally, total recharge to Omani groundwater reservoirs is estimated to average almost 1,300Mm<sup>3</sup>/year. Approximately 70% of this results indirectly from infiltration of surface water flows and the balance from direct rainfall recharge. With settlement and development, the demand for water has led to ever-increasing interception of groundwater flows due to abstraction from dug wells and aflaj. Such interception and use has modified the natural balance; in some areas the rate of abstraction now exceeds the rate of replenishment. Such areas where water abstraction exceed replenishment include Al Batinah, Salalah and the inland areas of Ad Dhahirah (The Project Location), Ad Dakhliyah and Ash Sharqiyah.

## 8.2.4 Project Site Conditions

### Topography

The site condition is undeveloped and in its vast majority is greenfield. The topography of the Project site is predominantly flat with gravel plains while some areas have low sand sheets and evidence of runoff water flows/collection are found in other areas. The gravel plains were noted to lack vegetation and the gravels at the gravel plains vary in sizes; from fine gravels in some areas to medium/large size gravel in other areas. The areas with low sand sheets were noted to have vegetation.

**Plate 8-1 Overview of Project Site**



**Gravel Plain areas with fine to medium sized gravels**



**Sand sheets with evidence of vegetation**

**Soil**

During the initial site visit in October 2018, it was observed that there are generally two predominant soil types in the project area. These are soils overlain with gravels and soft sand or sand sheets. The gravel content of the soils are finer in size on flatter areas and larger on slightly elevated areas. The soft sands or sand sheet were noted to have vegetation such as



trees and shrubs. With the exception of several vehicle tracks noted across the site, the site is a greenfield site.

**Plate 8-2 Soils Overlain with Large Gravels at Slightly Elevated Areas with Finer Gravels on Flatter Areas at the Background**



Existing Influences on Soil Quality

The limited use of vehicles within localised areas of the site provides the potential for the presence of vehicle residues (e.g. oils & greases, hydrocarbons and heavy metals) on the surface soils/topsoils potentially causing soil pollution.

Review of historic satellite imagery of the Project site from 2009 to 2018 indicates that besides the presence of vehicle tracks, which was evident from 2009 to present day and the site, has never been developed.

**Surface Water**

Although there are no permanent surface water features identified within or adjacent to the Project site, low lying runoff areas were identified to flow across the north western and south western areas of the Project site during site visits. Although these are barely discernible (in summer) and have free draining soils, the presence of these runoff areas suggests that the site is prone to perennial water flow and/or accumulation during periods of heavy rainfall. This was

further observed during the site visit in May 2019 approximately 3 days following heavy rainfall, and by the presence of more defined fluvial erosion and scour.

**Figure 8-2 Runoff/Wadi Area (north-western section of site) – 23<sup>rd</sup> May 2019**



### Groundwater

The geotechnical investigation report provided with the project RFP reports that during the geotechnical investigation at the Project site between 15<sup>th</sup> & 22<sup>nd</sup> May 2018, groundwater was not encountered at any time during drilling for boreholes between a depth of 8m to 10m or during installation of piezometers.

During the initial site visit undertaken in October 2018, two groundwater boreholes were identified outside the southern extent of the Project footprint. During the site visit in May 2019, it was understood from informal consultation with land users that the water could be pumped and be used for agricultural activities at camel farms/pens. It is possible that these groundwater boreholes are also used for municipal and domestic purposes. However, this will be further investigated during consultations at the ESIA stage.

### 8.2.5 Initial Pollution Conceptual Model and Preliminary Risk Assessment for Land Contamination

Based on the above, the following conceptual model (see table below) has been developed to determine the level of risk of contamination that may exist at the project site. This has been



conducted by undertaking a “Source – Pathway – Receptor” analysis of the project footprint and surrounding land uses.

The Contaminated Land Risk Assessment methodology used for this assessment was based on CIRIA C552 (2001) Contaminated Land Risk Assessment – A Guide to Good Practice, in order to quantify potential risk via risk estimation and risk evaluation. This process determines an overall risk category which can be used to identify likely actions for the site, as have been incorporated to the methodology of this ESIA. This methodology uses qualitative descriptors and therefore is a qualitative approach (ref. Appendix B for the CIRIA good practice guidelines).

**Table 8-2 Source – Pathway – Receptor Model**

| POTENTIAL SOURCE  | POTENTIAL RECEPTOR | POTENTIAL TRANSPORT PATHWAYS   |
|---|--------------------|--|
| Minor spills and leaks from vehicle activity within the site (e.g. oils & greases, hydrocarbons and heavy metals) | Soil               | Direct contamination to surface and sub soils, limited to isolated areas of soil on-site.  |
|   | Surface Water      | Contamination of surface water during rainfall with the possibility of pollution to spread to other areas of the site as a result of water flow/run-off. |

**Table 8-3 Source – Pathway – Receptor Analysis**

| POTENTIAL SOURCE   | POTENTIAL RECEPTOR | POTENTIAL TRANSPORT PATHWAYS  | LIKELIHOOD OF SOURCE – RECEPTOR LINKAGE | POTENTIAL CONSEQUENCE OF SOURCE TO RECEPTOR LINKAGE | RISK CLASSIFICATION |
|--|--------------------|---|---|---|---------------------|
| Minor spills and leaks from vehicle activity within the site (e.g. oils & greases, hydrocarbons and heavy metals). | Soil               | Direct contamination to surface and sub soils.  | Likely                                  | Minor   | Low Risk            |
|  | Surface Water      | Contamination of surface water during rainfall with the possibility of pollution to spread to other areas of the site as a result of water flow | Likely                                  | Minor   | Low Risk            |

Following the outcome of 'Low Risk' for potential soil and surface water contamination from the above conceptual model, further soil investigation is not required to be undertaken in accordance with the CIRIA guideline.

## 8.3 Sensitive Receptors

**Table 8-4 Potential Receptors**

| RECEPTOR               | SENSITIVITY   | JUSTIFICATION  |
|------------------------|---------------|--|
| Soil Quality           | <b>Low</b>    | The initial conceptual model and preliminary risk assessment has identified risk to be low. Although it is likely the vehicle tracks located on the site may have directly contaminated the surface and top-soils of these tracks with vehicle residues, impacts are only likely to be mild at the worst case.<br>In addition, the quality of soil within the Project site is typical of the soil characteristics/structure found in Ibri. Hence, it is of low or medium importance and rarity on a local scale. |
| Groundwater Quality    | <b>High</b>   | Given that water abstraction in the Ad Dhahirah region of the Sultanate have been identified to exceed replenishment, the groundwater in this area is a vital resource with high importance on a national scale and limited potential for substitution   |
| Low lying Runoff Areas | <b>Medium</b> | The low lying runoff areas in the project area have developed naturally over time to provide suitable capacity for runoff flow path and drainage to underlying shallow alluvial aquifers during rainfall and storms. Given that groundwater is a vital resource in Ad Dhahirah, this receptor is of high or medium importance on a regional scale with limited potential for substitution and relatively vulnerable to potential impacts during construction.  |

## 8.4 Potential Impacts

### 8.4.1 Construction Phase

#### Historic Pollutants and Cross Contamination of Soil

Given the limited observations of possible existing pollution sources on site (i.e. areas of the project site that have been used as vehicle tracks) a low potential risk exists with regards to contamination of surface and top-soils of these tracks with any vehicle residues. Some localised soils may harbour existing measurable concentrations of pollutants. Such risks although 'low' may have the potential to become apparent during excavations and land grading on site. The same impact may occur where contamination impacts caused by construction works are also cross-contaminated in the same respect.

#### Spill and Leaks Associated with Construction

Soil and groundwater will be susceptible to contamination from various sources during the construction process. Storage and usage of fuels, chemicals and sanitary provision during the

construction phase will introduce risks associated with spills and leaks to ground. These are commonly associated with the transport, handling and storage of such materials.

The risk of accidental spillage and leakage of various chemical products, are often attributable to storage areas of the construction site as well as during the transportation of such materials on and off the site. Improper methods of storing, transferring, and handling of these products can result in spillage to the ground and result in soil contamination.

If contamination reaches groundwater, the spread of pollution can increase quite rapidly and can prove difficult to control.

### **Inadequate Waste Management**

Construction of the proposed project will involve activities that generate solid hazardous waste and non-hazardous waste, as well as potential liquid wastes. Wastes generated during these activities poses a threat to the site soils. Of particular concern is the management of hazardous waste generated during the construction phase and its handling. If the temporary storage and handling of such waste on the construction site is inadequate prior to being removed for disposal, the risk of soil and groundwater contamination increases.

### **Contamination of Low-Lying Runoff Areas**

During construction, the presence of fuels and chemical storage areas could introduce the risk of pollution to the runoff areas within the Project site in the event of a significant rain event, where a pathway for runoff is directed to these areas and a pathway for drainage to shallow aquifers is directed to groundwater. Instances of pollution could potentially result from the wash off of surface pollutants, particularly during the first flush of rainfall.

### **Flood Risk**

Two areas of the site (north-eastern and south-western areas appear to include runoff/wadi areas, which have been subject to fluvial processes. There is potential for flooding in this area during construction, which may affect construction works, but may also interact with potential pollution sources (in these areas), resulting in a potential pathway to soils and local ecology.

## **8.4.2 Operational Phase**

Specific project impacts to soil, geology and groundwater are not expected during the operational phase as the site will be static and will not have direct interactions with these environmental parameters i.e. soil & groundwater. Potential risks of concern during the operational phase are expected to be limited to the management and storage of hazardous materials/wastes/wastewater, chemicals and fuels and sanitary provision.

### **Spill and Leaks Associated with Operation**

Although there will be little or no interaction with hazardous materials or chemicals, storage and usage of any hazardous wastes & wastewater (e.g. diesel storage for emergency generator, low volume chemicals, transformer oils, waste and wastewater storage) during the operational phase, there remains a potential risk associated with spills and leaks to ground.

Certain sources of contamination that can introduce risks to soil and groundwater are cleaning fluids and solvents, oils from transformers and fuels stored for use by site vehicles. Although these materials may be used in small quantities, precaution must be paid to ensure proper storage, handling, transportation and adequate spill prevention. It is expected that the storage of any of these materials, chemicals and fuels will be within designated areas, which have specific management and mitigation measures in place to prevent exposure of these pollutants to unprotected soils.

### **Contamination of Low-Lying Runoff Areas**

Increased areas of hardstanding within the Project site are likely to result in an increase in runoff rates associated with first flush. However, it is noted that discharges to the runoff areas are not foreseen during operation, as the entire site will be covered with gypsum to enhance the reflection of sunlight onto the PV panels in order to increase the efficiency of the Project.

The use of gypsum also known as hydrated calcium sulphate is expected to reduce runoff of suspended solids or transport of pollutant to different areas of the site during first flush or periods of heavy rainfall and due to the stability of the gypsum layer, it will not result in "gypsum run off" during periods of rainfall.

In addition, because gypsum is commonly occurring salt in the natural environment in association with sedentary rocks, the use of this natural substance will not be incompatible with the natural geology and soils at the Project site which contains limestone such as calcernite & calcisiltite as it would retain the alkaline properties of the soil. As such, operational impacts to the runoff areas, or other surface water features during operation are not anticipated.

### **Flood Risk**

Two areas of the site (north-eastern and south-western areas appear to include runoff/wadi areas, which have been subject to fluvial processes. There is potential for flooding in this area during operations, which may interact and affect operational structures with potential secondary impacts upon the receiving environment.

## 8.5 Proposed Assessment Requirements for ESIA

In accordance with the described potential impacts, the table below details those impacts that may require detailed assessment at the ESIA stage.

**Table 8-5 Soil, Geology, Hydrology & Groundwater Impacts for Further Assessment at the ESIA**

| POTENTIAL IMPACT                             | JUSTIFICATION   |
|--|---|
| <b>Construction</b>                          |   |
| Cross Contamination of Soils                 | Areas of the site have vehicle tracks and may harbour residual vehicle contaminants in the top-soils. There is a potential for construction activities associated with excavating, grading and site clearance to spread existing contamination to other soils. Hence, further assessment is considered necessary at the ESIA stage. |
| Spill and Leaks Associated with Construction | Hazardous materials, fuels and chemicals will be on-site during the construction phase and there is a risk of direct contamination if not handled or stored correctly. Such risks will be managed through the implementation of a CEMP.   |
| Inadequate Waste Management                  | There is a potential for soil and groundwater contamination where waste generated as a result of construction activities are inadequately managed on site prior to being removed for disposal. Such risks will be managed through the implementation of a CEMP.   |
| Contamination of Runoff areas                | There is a potential for inadequate management of hazardous materials during construction to result in pollution of the water runoff areas within the Project site particularly during periods of rainfall. Such risks will be managed through the implementation of a CEMP.  |
| Flood Risk                                   | The ESIA scope does not include a specific Flood Risk Assessment, however, if this has been undertaken (by the Project Company) as part of the project, reference to this will be included in the ESIA.   |
| <b>Operation</b>                             |   |
| Spill and Leaks Associated with Operation    | Small quantities of hazardous materials, fuels and chemicals will be on-site during the operations phase and there is a risk of direct contamination if not handled or stored correctly. Hence, further assessment is considered necessary at the ESIA stage.   |
| Contamination of low lying runoff areas      | The use of gypsum over the Project area to enhance the reflection of sunlight will minimise the potential for run-off of suspended solids or pollutants to the low lying runoff areas during periods of rainfall.   |

In order to provide a representative assessment of the significance of potential impacts, the following methods presented in the table below have been proposed to enable further assessment of potential impacts in the ESIA.

**Table 8-6 Soil, Geology, Hydrology & Groundwater Impacts Assessment Methodology at the ESIA Stage**

| POTENTIAL IMPACT   | ESIA ASSESSMENT METHODOLOGY  |
|--|--|
| <b>Construction and Operational Phases</b>   |  |
| <p><b>Cross Contamination and Spill &amp; Leaks Associated with Construction/ Operation</b></p> <p><b>Flood Risk</b></p> | <p><u>Baseline Study:</u><br/>Although the initial conceptual model has identified a low risk of potential soil contamination on site, it is proposed to take a precautionary approach and assess the quality of site soils at the baseline phase. In order to provide a representative assessment of the significance of potential impacts at the ESIA stage, soil sampling and analysis for common pollutants (including heavy metals and petroleum-based hydrocarbons) will be undertaken as component of the ESIA. This is also proposed to identify prevailing soil quality conditions for soil types in the project area.</p> <p>Assessment of soil quality will be undertaken at representative locations within the project footprint. This will include three (3) soil sampling locations within the Project site. A topsoil sample will be collected from each sampling location up to a depth of 10cm (after scraping away the immediate surface layer). The purpose of sampling in the topsoil is based on the likely influence of above ground features (i.e. vehicle use). One sample will be taken from the vehicle track.</p> <p>Soil samples will be sent for analysis at an accredited laboratory in Oman and the samples will be analysed for concentrations of Oils &amp; Greases, TPH and a suite of heavy metals. The primary purpose of this analysis is to detect impacts from vehicular sources, which have been apparent on-site. The results obtained will be compared against applicable standards listed in the Standards and Regulatory Section above.</p> <p><u>Assessment of Impact Significance:</u><br/>The assessment of impact significance will be determined on the baseline condition of the soils and groundwater in combination with the expected likelihood and magnitude of impacts of cross-contamination to soils.</p> <p>It is expected that ACWA Power has undertaken a 'Flood Risk' assessment as part of engineering studies. Where this is available it will be referenced in the ESIA, including any specific risk mitigation considerations to avoid/reduce impacts of potential flooding.</p> |

The ESIA will include good practice proposed mitigation and management measures in order to protect soil and groundwater quality from potential impacts during construction and operations.



## 9 WASTE AND WASTEWATER MANAGEMENT

### 9.1 Standards and Regulatory Requirements

International financial institutions providing project finance will likely require adherence with the IFC General EHS Guidelines. With regard to waste, these guidelines require that projects:

- Establish waste management priorities at the outset of activities.
- Identify EHS risks and impacts with regards to waste generation and its consequences.
- Establish a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal of wastes.
- Avoid or minimize the generation waste materials, as far as practicable.
- Identify where waste generation cannot be avoided but can be minimized or where opportunities exist for, recovering and reusing waste.

Where waste cannot be recovered or reused, identify means of treating, destroying, and disposing of it in an environmentally sound manner.

There are Omani regulations such as MD 17, MD 18 and MD145 which regulate waste and waste water in the country

### 9.2 Potential Impacts

Soils, subsoils and rock are anticipated to be the primary waste requirement associated with the construction phase of the project site given the open nature of the site and the excavation requirements for foundations, cabling and internal road construction.

#### 9.2.1 Construction Phase

##### **Waste**

The construction phase can often be the most environmentally damaging phase of a project, particularly in regard to the volumes of waste that are generated, if not properly managed. Such impacts relate to the management of such wastes, particularly hazardous streams.

##### **Wastewater**

The Project will require on-site sanitation facilities for the construction workers (expected to be toilets with collection septic tanks). These facilities will require regular emptying and removal from the project site to a sanitary water treatment plant by an authorized handler.

Waste streams likely to be associated with the project construction phase are listed in the table below.

**Table 9-1 Anticipated Waste Streams Associated with the Construction of the Project.**

| SUBJECT       | CONSTRUCTION                              |
|---------------|---|
| Inert         | Subsoil and Rock                          |
|               | Glass                                     |
| Non-Hazardous | Concrete                                  |
|               | Asphalt                                   |
|               | Scrap metal                               |
|               | Plastic                                   |
|               | Packaging                                 |
|               | Broken panels                             |
|               | Municipal waste from construction workers |
| Hazardous     | Resins and paints                         |
|               | Waste oils                                |
|               | Waste solvents and thinners               |
|               | Waste fuel and chemicals.                 |
|               | Used spill kits and clean up materials.   |
| Wastewater    | Sanitary wastewater                       |
|               | Concrete wastewater                       |

### 9.2.2 Operational Phase

Disposal of material from operations can contribute to wastes directed to landfill resulting in subsequent risk of damage to local hydrological systems and emissions associated with necessary transport. However, given the nature of the project, quantities of waste likely to arise during operation are expected to be minimal.

Such minimal waste will be related to food waste from staff, office waste and limited maintenance waste such as broken parts, packaging of new materials etc. Limited hazardous wastes too.

Waste streams likely to be associated with the operational phase of the project are listed in the table below (it should be noted that all waste streams associated with the operational phase are anticipated to be of minimal quantity).

**Table 9-2 Anticipated Waste Streams Associated with the Operations of the Project.**

| SUBJECT       | OPERATION                               |
|---------------|---|
| Non-Hazardous | Landscaping waste                       |
|               | Replacement parts and packaging         |
|               | General waste from site staff.          |
| Hazardous     | Resins and paints                       |
|               | Waste oils                              |
|               | Waste solvents and thinners             |
|               | Waste fuel and chemicals.               |
|               | Used spill kits and clean up materials. |
| Wastewater    | Sanitary wastewater                     |

## 9.3 Proposed Consideration for Project ESIA

### 9.3.1 Waste

#### Construction

Should any evidence of contaminated materials be identified from the site soil investigation (as outlined in the soils, geology and groundwater chapter), the ESIA will consider appropriate disposal routes and potential acceptance criteria for any contaminated materials. This may include a requirement for additional analysis to provide a robust hazard classification.

#### Operations

The ESIA will identify the legal disposal mechanisms available for both non-hazardous and hazardous wastes during operations, which will include maintenance wastes (such as broken PV panels), that may require special handling. This will include identification of appropriate carriers and sites for such management, recycling and/or treatment and disposal.

#### Mitigation & Management

The mitigation section of the ESIA will consider the requirements established by Good International Industry Practice (GIIP) for general waste, hazardous waste and construction/demolition waste.

The Construction & Operational Environmental Management Plans (CEMP & OEMP) for the project should include a requirement for a Waste Management Plan to outline the projects waste strategy in accordance with the waste hierarchy.

### 9.3.2 Wastewater

#### Construction & Operations

The ESIA will inventory all wastewater streams and indicate the pathway and receptor of each stream. Any mitigation and control requirements for treatment will be fully outlined in the ESIA.

## 10 ARCHAEOLOGY & CULTURAL HERITAGE

### 10.1 Standards and Regulatory Requirements

#### 10.1.1 National Requirement

The safeguard of cultural heritage and archaeology in the sultanate of Oman is established through the 1980 Law on the protection of National Cultural Heritage as implemented through the Ministry of Heritage and Culture.

#### 10.1.2 Lender Requirements

International financial institutions will require adherence to IFC Performance Standard 8, which requires the identification and protection of features of cultural heritage value.

### 10.2 Observations and Baseline Condition

An examination of existing literature on archeologically and historically relevant sites in Oman reveals a selection of international significant sites.

#### 10.2.1 International Cultural Heritage Sites in Oman

According to the UNESCO World Heritage List and the Oman Ministry of Heritage and Culture, there are five cultural sites in Oman designated on the World Heritage List (year of designation in brackets):

- Bahla Fort (1987)
- Archaeological Sites of Bat, Al-Khutm and Al Ayn (1988)
- Land of Frankincense (2000)
- Aflaj Irrigation Systems of Oman (2006) and;
- Ancient City of Qalhat (2018).

#### 10.2.2 Project Site Observations

Based upon the site visit undertaken in October 2018 there were no signs of archaeological sites in the immediate vicinity or surroundings of the Project site.

With regards to cultural heritage, the camels herders on the Project site serve as an intangible cultural value Oman is historically known for its attachment to camels, which were a dependable source of not only transport but also food and milk In addition, a water tower styled in local Oman design was identified along the highway and this could be an item of cultural value.

Figure 10-1 Water Tower Styled in Local Omani Design



### 10.3 Sensitive Receptors

As the proposed project site is generally not known to be of importance archaeologically or culturally, the only expected receptors relate to potential underground buried artefacts.

Table 10-1 Archaeology & Cultural Heritage – Sensitive Receptors

| RECEPTOR                    | SENSITIVITY | JUSTIFICATION  |
|-----------------------------|-------------|--|
| Unknown Buried Archaeology  | Low         | The proposed project site or local area is generally not known to be of importance archaeologically or culturally. As such, the only expected receptors relate to potential underground buried artefacts. Such unknown buried artefacts may be of importance on a local scale. |
| Camel Farms within the site | High        | Camel farming and herding is recognised as an important aspect of the Omani's heritage and is hence of conservation value. As such, this receptor is of high importance and rarity on a national scale with limited potential for substitution.                                |

### 10.4 Potential Impacts

#### 10.4.1 Construction Phase

Excavation and earthwork activities can result in damage and destruction of undiscovered archaeological artefacts.

Following consultation with the Ministry of Heritage and Culture, the presence or absence of any known archaeological or cultural features will be included to the ESIA.

## 10.4.2 Operational Phase

The operational phase will not result in further impacts to archaeology, as the site will be static and excavations will not be required.

## 10.5 Proposed Assessment Requirements for ESIA

In accordance with the described potential impacts, the following table details those impacts that may require detailed assessment at the ESIA stage.

**Table 10-2 Cultural Heritage & Archaeology Impacts for further Assessment at the ESIA**

| POTENTIAL IMPACT   | JUSTIFICATION   |
|--|---|
| <b>Construction</b>  |   |
| Damage to Unknown Buried Archaeology   | Impacts are generally not expected due to the lack of cultural or known archaeological features at the project site. However, as with all earth works, there is risk of encountering previously undiscovered artefacts. Hence, further detailed assessment is therefore considered necessary at the ESIA stage. |
| Camel Farms within the site  | As the camel farms within the Project site will be relocated by OPWP & Ministry of Housing prior to the commencement of construction activities, impacts to these items of intangible cultural value during the project development are not anticipated   |
| Following consultation with the Ministry of Heritage and Culture, the presence or absence of any other known archaeological or cultural features will be included to the ESIA. |   |

As the potential impacts in relation to Archaeology & Cultural Heritage require further assessment (as per the process above), the ESIA will include brief examination of the available literature on archaeological and historical sites in Oman. The ESIA will include best practice mitigation measures for the construction phase. The intention is to include these mitigation measures into the respective CEMP for effective management and implementation on-site. A chance find procedure would also be incorporated within the project CEMP such that in the unlikely event any items of archaeological significance are uncovered, these can be appropriately identified and preserved.



# 11 LANDSCAPE AND VISUAL IMPACTS

## 11.1 Standards and Regulatory Requirements

Specific legislation in regard to landscape and visual impacts does not exist in Oman. However, the consideration of baseline and associated impacts described herein has been undertaken with reference to the guidelines set out by the UK Landscape Institute 'Guidelines for Landscape and Visual Impact Assessment, 3rd Edition' (2013).

## 11.2 Observations and Baseline Condition

### 11.2.1 Landscape

The proposed project will be constructed on a predominantly undeveloped, open landscape. Landscape typology is characterised by a belt of flat plains of gravel plains and sand sheets. The site presents sparse vegetation of shrubs and trees visible along sand sheet habitats.

The only significant anthropogenic contributions to the landscape are from the camel race track directly adjacent to the western boundary of the Project site and the Ibri Power Plant currently undergoing construction at the south east of the Project boundary and overhead power line to the west. The Ibri IPP results in a break from the natural/modified landscape and results in vertical intrusions as a result of the powerblock buildings and stacks structures. The same effect is apparent from the overhead transmission lines to the north of the Project site.

### 11.2.2 Visual Amenity

Besides views to the existing camel race track and the Ibri IPP undergoing construction, views above the site are predominantly unobstructed and provide good example of desert typology found within the Oman. The visual envelopes of these receptors are located at a similar elevation. Also, there is intervening vegetation from the highway and other properties next to the road.

## 11.3 Sensitive Receptors

With regards to visual receptors, findings from the site visits undertaken in October 2018 and satellite imagery of the site identified few receptors within 1km of the project boundary. This included; users of the camel race track directly adjacent to the western boundary of the Project site, users of the farmlands approximately 400m north, 800m north east and 1km north east of the project site and workers at the Ibri Power Plant approximately 800m south east of the Project Boundary. Besides the above-mentioned receptors, satellite imagery of the Project site did not identify any other visual receptor in close proximity to the project boundary.

**Table 11-1 Landscape and Visual Impacts – Sensitive Receptors**

| RECEPTOR   | RECEPTOR TYPE                             | SENSITIVITY   | JUSTIFICATION  |
|--|---|---------------|--|
| Landscape Character of the Project site                    | Open area- Across the entire Project site | <b>Low</b>    | The landscape across the entire Project site is that of the typical desert landscape present across the Oman. It is therefore of low or medium importance and rarity on a local scale. |
| Al, Ma'mur village, Al Mazim village and Masha'rub village | Residential                               | <b>High</b>   | Residents of these villages do not have a direct visibility of the Project site and as such will only be relatively vulnerable to changes in landscape character.                      |
| Camel Race Track   | Recreational                              | <b>High</b>   | Users of this recreational receptor have a direct visibility of the Project site and will be particularly vulnerable to changes in landscape character.                                |
| Farmland 1,2 & 3   | Agricultural                              | <b>Medium</b> | Users of these farmlands will be particularly vulnerable to changes in landscape character as a result of installation of PV Panels across the Project site.                           |
| Ibri Power Plant   | Industrial                                | <b>Low</b>    | The Power Plant is of low vulnerability to changes in landscape character as it is an anthropogenic contributions to the landscape.  |

## 11.4 Potential Impacts

### 11.4.1 Construction Phase

The construction of a new development, particularly those over a large land area have the potential to result in changes to the landscape character of a locality through land use and topographical changes, as well as causing a disturbance to the current visual envelope.

One of the first stages of construction activities will result in the fencing, levelling, grading and preparation of the site, ahead of construction beginning. The proliferation of other activities throughout the construction period and across the site will eventually result in major land use changes. Also, the subsequent construction of small new buildings and installation of PV Panels will transform the landscape.

The movement of heavy construction vehicles and earthworks on sandy surfaces are also likely to result in dust generation and a resulting temporary haze. Impacts to landscape character and the visual envelope of surrounding receptors will also occur at night where the addition of lighting during construction will illuminate this area.

### 11.4.2 Operational Phase

The development of the Project will include the installation of grid like PV arrays, which will likely to distort the existing undeveloped landscape character. A key change will result from the loss of the view of the characteristic brown sands and gravel, as these will be replaced with a view

of dark coloured flat PV Panels occupying an expansive area with whiter gypsum surfaces between the panels,.

Due to the low-lying design of the PV Plant, views across the wider landscape are unlikely to be significantly impacted. Given the distance of permanent receptors from the project site, this visual change from an open, unused landscape to low level infrastructure associated with the project is unlikely to have any significant visual impact.

It is envisaged that only minimal lighting will be required at night-time for security purposes. Impacts due to lighting may result in minimal changes to the night-time landscape character and views of the site.

## 11.5 Proposed Assessment Requirements for ESIA

Given the absence of any likely significant effects associated with landscape and visual impacts, a detailed assessment is not proposed as part of the ESIA. However, the ESIA will apply a measure of value/sensitivity to the receptors identify herein and determine the likely associated magnitude of impacts in order to quantify significance of effects. The ESIA will also identify opportunity for mitigation to reduce the magnitude of any identified impacts.

## 12 SOCIO-ECONOMICS

### 12.1 Standards and Regulatory Requirements

International financial institutions are likely to require adherence to:

- IFC performance Standard 1: This standard establishes requirements for the assessment of social risk and impacts associated with the project.

### 12.2 Observations and Baseline Condition

#### 12.2.1 Population and Demographics

According to the CIA World Fact Book, the population of the Sultanate of Oman was estimated to be approximately 4,613,241 individuals as of July 2017 of which about 45% i.e. 2,075,958 individuals are thought to be non-nationals. The vast majority of the population is located in and around the Al Hagar Mountains in the north of the country. Another population cluster is found around the city of Salalah on the far south. Most of the country remains sparsely populated.

Official growth rate estimates in 2018 put the current rate of annual growth at 2%. The table below gives a summary of Oman population information.

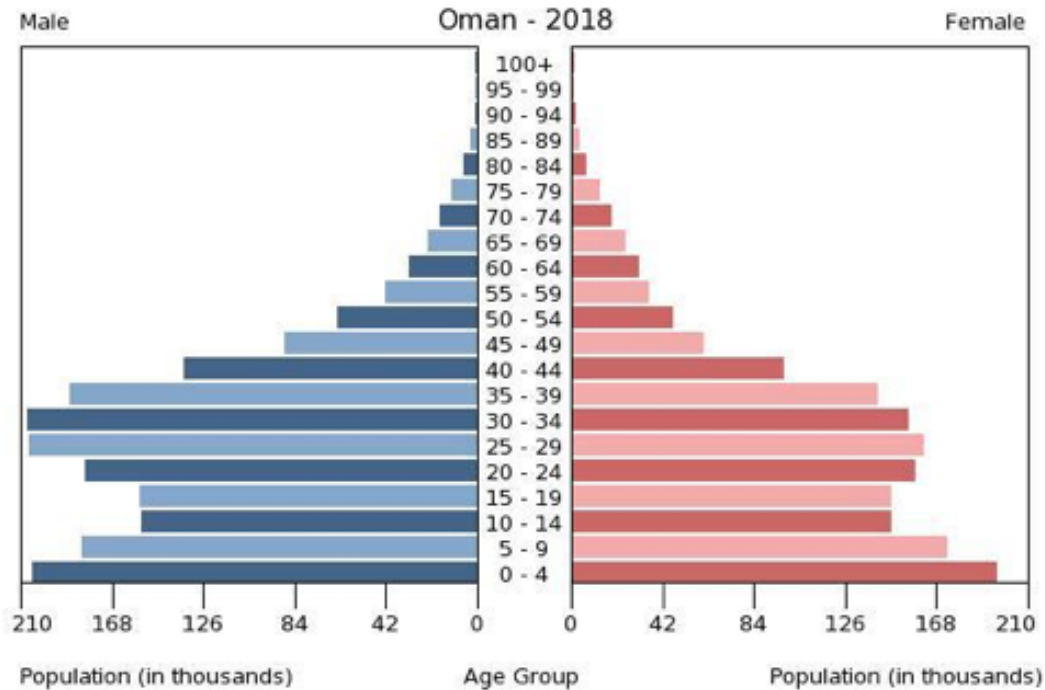
**Table 12-1 Oman Population Data Summary**

| CRITERIA                 | DATA (2017 ESTIMATE UNLESS SPECIFIED)  |
|--------------------------|--|
| Population               | 4,613,241 (2017 est.)  |
| Age Structure            | 0-14 years: 30.1%<br>15-24 years: 18.26%<br>25-54 years: 44.15%<br>55-64 years: 3.94%<br>65 years and over: 3.55% (2018 est.)  |
| Sex Ratio (Male/ Female) | At birth – 1.05<br>0-14 years: 1.05<br>15-24 years: 1.1<br>25-54 years: 1.38<br>55-64 years: 1.14<br>65+ years: 0.99<br>Total population 1.19 male/ female (2017 est.) |
| Life expectancy at birth | Total Population: 75.9 years<br>Male: 73.9 years<br>Female 78 years (2018 estimate)  |
| Birth Rate               | 23.7 births/1,000 population (2018 estimate)   |

Source: <https://www.cia.gov/library/publications/resources/the-world-factbook/geos/mu.html>

Accessed 16<sup>th</sup> April 2019

Figure 12-1 Oman 2018 Population Pyramid



Source: <https://www.cia.gov/library/publications/resources/the-world-factbook/geos/mu.html>

Accessed 16<sup>th</sup> April 2019

Ibri is a town in the Ad Dhahirah region of Oman. According to the Oman National Centre for Statistics and information, the total population of Ad Dhahirah was estimated in 2017 to be 213,771 individuals (both Omani Nationals and expatriates). Of these, 128,444 were males and 85,327 females, representing approximately 60.1% and 39.9 % respectively of the total Ad Dhahirah population.

In comparison with the estimated 2017 Oman population of 4,613,241 individuals (both Omani Nationals and expatriates), Ad Dhahirah region represents approximately 4.7% of the national population.

**Table 12-2 Ad Dhahirah Region Population Data**

| INDICATOR NAME   | 2017 POPULATION |
|------------------|-----------------|
| Total Population | 213,771         |
| Female           | 85,327          |
| Male             | 128,444         |
| Omani Male       | 75,734          |
| Omani Female     | 75,574          |
| Non-Omani Male   | 52,710          |
| Non-Omani Female | 9,753           |

**Source:** Oman National Centre for Statistics and information  
<https://data.gov.om/OMPOP2016/population?indicator=1000140&region=1000020-muscat&nationality=1000010-omani>. Accessed 16th April 2019

According to the Oman National Centre for Statistics and information, the total population in Ibri is approximately 165,354 individuals comprising of approximately 60.8% male (100,562) and 39.2% females (64,792).

**Table 12-3 Ibri Town Population Data**

| INDICATOR NAME   | 2017 POPULATION |
|------------------|-----------------|
| Total Population | 165,354         |
| Female           | 64,792          |
| Male             | 100,562         |
| Omani Male       | 56,893          |
| Omani Female     | 56,506          |
| Non-Omani Male   | 43,669          |
| Non-Omani Female | 8,286           |

**Source:** Oman National Centre for Statistics and information  
<https://data.gov.om/OMPOP2016/population?indicator=1000140&region=1000020-muscat&nationality=1000010-omani>. Accessed 16th April 2019

### 12.2.2 Economy & Employment

Oman is heavily dependent on oil and gas resources which can generate between 68% and 85% of government revenue depending on fluctuations in commodity prices. Besides crude oil production & refining and natural & liquefied natural gas production, other industries that provide source of revenue include construction, cement, copper, steel, chemicals and optic fiber. In recent times, Oman is pursuing a development plan that focuses on diversification, industrialisation and privatisation with the aim of reducing the Sultanate's dependency on the oil sector which has been a significant contributor to the GDP of the country in the past. The main areas of diversification included tourism, shipping, mining, manufacturing and aquaculture (CIA, World Fact Book, 2019).



As at 2017, Oman exports included petroleum, fish, metals and textiles worth \$103.3 billion to countries such as China (43.7%), UAE (11%), South Korea (7.9%) and Saudi Arabia (4.2%) and imports \$24.12 billion worth of machinery, transport equipment, manufactures goods, food, livestock and lubricants from UAE (35.5%), US (27.8%) and Brazil (4%).

Official figures from 2017 place the Gross Domestic Product of Oman at approximately 190.1 billion dollars. National GDP growth rate for 2017 was estimated to be -0.9%.

Official records in 2016 estimate the total labour force to be 2.25 million with approximately 60% of the labour force being Non Omani National. About 4.7% are into agriculture, 49.6% into industry and 45% in services. The unemployment rate in the country has not been estimated.

**Table 12-4 Summary of Oman Economic Data**

| CRITERIA  | DATA (2017 ESTIMATES UNLESS OTHERWISE STATED)                     |
|---|---|
| <b>GDP (Official Exchange)</b>                  | US\$70.78 billion   |
| <b>GDP (Purchasing Power Parity)</b>            | US\$190.1 billion   |
| <b>GDP per Capita (Purchasing Power Parity)</b> | US\$46,000  |
| <b>GDP Real Growth Rate</b>                     | -0.9%   |
| <b>Industrial Production Growth Rate</b>        | -3%   |
| <b>Labour Force</b>                             | 2.255 million (2016 Est.)<br>(About 60% are Non-Omani National)   |
| <b>Labour Force - by occupation</b>             | Agriculture: 4.7%<br>Industry: 49.6%<br>Services: 45% (2016 Est.) |
| <b>Unemployment Rate</b>                        | Unknown   |
| <b>Exports</b>                                  | US\$ 103.3 billion  |
| <b>Imports</b>                                  | US\$ 24.12 billion  |

Source: <https://www.cia.gov/library/publications/resources/the-world-factbook/geos/mu.html>

Accessed 16th April 2019.

### 12.2.3 Social Development & Infrastructure

Using the United Nations Human Development Index as a guide, Oman is ranked 48, with an index score of 0.821 (2017) and falls under the Very High Human Development Category. Although Oman's HDI of 0.821 is below the average of 0.894 for countries in the very high human development group, it is above the average of 0.669 for Arab States. Between 2000 and 2017, Oman's HDI value increased from 0.704 to 0.821, an increase of 16.6%. Graphical analysis of the change in HDI in the Sultanate over the past 17 years also indicates that the growth of the HDI in Oman has outstripped the HDI of other Arab states such as Jordan and

Libya both of which experienced different degrees of progress toward increasing their HDIs just like Oman.

It is evident, however, that the HDI does not necessarily paint a full picture of the state of social development in Oman as it is skewed significantly by the higher level of GDP in the Sultanate relative to many other Arab states. The Sultanate ranks less well in areas such as literacy and life expectancy, where it is ranked lower in the individual criteria rankings than it is overall.

### 12.2.4 Indigenous People

There are no identified settlements or any evidence of land use within the project area likely to be attributable to indigenous peoples.

### 12.2.5 Commercial and Industrial

Other than the existing camel race track, camel farms and Ibri Power plant currently undergoing construction, there are no other facilities of commercial or industrial importance within 1km of the Project site.

### 12.2.6 Traffic and Transportation

Transport to the Project site is understood to be via the Highway 21 (Buraimi-Ibri Highway) approximately 3km to the north eastern boundary of the Project site. This road includes a four lane dual carriage way. It is anticipated that the Project will construct an external access road from the Project site to the Highway to enable easy access to the site.

## 12.3 Sensitive Receptors

**Table 12-5 Potential Socio-Economic Receptors**

| RECEPTOR                    | SENSITIVITY | JUSTIFICATION  |
|-----------------------------|-------------|--|
| Welfare of Local Population | <b>High</b> | Any change to infrastructure, population or regional inputs is also likely to have effects for the welfare of the local population.  |
| Local / Regional Economy    | <b>Low</b>  | The proposed project is likely to influence regional businesses. Not only local contractors and those directly involved in the construction, but also for local commercial operations such as accommodation, food retailers etc. |
| Users of Highway 21         | <b>Low</b>  | As observed during the initial site visit, the traffic flows on this road is low at present as such, it has a large spare carrying capacity.   |

## 12.4 Potential Impacts

### 12.4.1 Construction Phase

#### Employment and Economics

The primary economic impact during construction is likely to result from employment creation during this phase. 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, whereby money earned on the project expended locally will re-circulate within the local economy. Whilst we have no evidence quantifying the multiplier effect within the Oman, studies undertaken in Europe and the US suggests the impact of expenditure on a local economy prior to leakage to be in the order of 4:1.

The solar plant is a proactive measure towards a low carbon transition for Oman's economy harnessing the abundant solar radiation in the country. This project is lender financed with massive potential of similar projects in the country. It will improve the resilience of Adh Dhahirah's energy mix.

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 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.).

#### Indigenous People

There are no ethnic minorities, indigenous peoples or internally displaced people in the project area, or nearby. Therefore, the potential negative social impacts of the project are likely to be relatively limited due to the relative isolation of the project.

#### Traffic

The construction period will result in an increase of vehicles entering the Project site. Construction vehicles will include a variety of vehicle classifications, e.g. HGV's, LDV's, trucks, pick-up trucks, excavators and other heavy/light equipment. It is envisaged that all the construction vehicles will connect to the site external access road via the Buraimi-Ibri Highway (Highway 21).

Traffic flows on this highway is low at present as observed during the initial site visit in October 2018 as such, construction phase traffic may therefore result in significant variation from current condition.

#### 12.4.2 Operational Phase

The completion of the proposed project will result in the secure provision and increased capacity of electrical energy in Oman. Other than the improved electrical infrastructure, the most significant local benefits will result from the potential employment opportunities related to the operation of the facility.

Transportation impacts during operations are not expected to be significant, as the operation of the solar plant will not require continuous delivery of materials, or other equipment in order to operate. There will be occasional deliveries and waste removals from the site, which will not result in a significant amount of traffic on the Highway 21.

### 12.5 Proposed Assessment Requirements for ESIA

Consultation with identified stakeholders as identified in Section 4.3.2 of this report will be undertaken. This will include consultation with the Wali of Ibri and other potentially interested and potentially affected. The aim of these bi-lateral consultation is to understand the social and economic dynamics of the area in light of the Project intervention; such as impacts to employment, health, education, utility (water resources) and energy access etc.

The social consultation methodology informing the assessment of impacts of the project on the relevant stakeholders will involve:

- Structured interviews with Ministries;
- Unstructured interviews with the camel herders to understand their situation and the understand the dynamics of the project area;
- Unstructured Interviews with the Local Sheikh and the owner of the camels; and
- Advisory Board with the HE The Wali of Ibri.

## 13 COMMUNITY HEALTH, SAFETY AND SECURITY

### 13.1 Standards and Regulatory Requirements

The project lenders will require compliance with IFC Performance Standard 4: Community Health, Safety and Security. This standard establishes requirements for the safeguard of the local community from potential risks associated with the project including impacts associated with introduction of communicable disease, site access and operation, material use etc. The objectives of IFC PS4 are to:

- *To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances.*
- *To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.*

### 13.2 Observations and Baseline Condition

Project related activities might result in the increase of risks associated with those who live near the Project site or may visit areas in and around active Project sites.

This chapter has been specifically included to outline and assess the impacts relating to the safety and security of the public who access the surrounding area and may be subject to project related impacts.

The majority of secondary impacts relating to public health in terms of air quality, noise, waste etc., have been addressed in specific chapters elsewhere in this report. This chapter therefore concentrates more specifically on the potential emergency impacts that could relate to the project and the security of the project to avoid instances of trespass, or other misdemeanours.

### 13.3 Potential Impacts

#### 13.3.1 Construction Phase

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 equipment, excavations, transportation amongst others, including fire and pollution releases.

## **Public/Community Safety**

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. With particular regards to this Project, there are not expected to be specific works that could result in widespread pollution incidents, due to the limited use of hazardous material or chemical storage on-site. However, where there is a potential for isolated incidents relating to oil spills, dust dispersions, etc. to occur, such risks will be managed in the construction phase through the implementation of a robust CEMP and an Emergency Preparedness and Response Plan.

## **Worker Influx and Disease**

The construction phase of the Project will require additional workforce as well as site-based security at the gates and on patrol around the site. Hence there will be an increase in the population number of the local area. Although the EPC Contractor's accommodation camp will be located on site, the subcontractor worker accommodation location is yet to be confirmed, however it is expected that the majority of sub-contractor staff will be based in the local area of Ibri, and therefore may come into contact with local populations.

## **Security**

The construction phase of the Project will require site-based security at the gates and on patrol around the site in order to prevent the public from trespassing to the construction site. This is so as to minimize the potential for construction site incidents to occur.

Following suitable security risk assessment by the EPC Contractor the security arrangements should be guided by UN Code of Conducts for law enforcement officials.

In addition to this, security personnel will receive internal training in regard to grievances, reporting such grievances and dialogue with any members of the local community.

### **13.3.2 Operational Phase**

## **Public/Community Safety**

The project will carry various risks that could result in impacts to public safety where such impacts are transferred or received outside of the project site. Such impacts may relate to fire, VOC fumes, explosions, spills of back up fuels, exposure and security concerns of trespassers.

The extent of such impacts may range outside of the projects boundaries and require the involvement of outside agencies to help manage and abate such impacts (e.g. Civil Defence, Police and Army).



Risks to public safety will be appropriately addressed and prepared for in the operational phase 'Emergency Preparedness and Response Plan' and training.

### **Security Staff**

The project will also include site based security at the project main entrance and on patrol around the site during operations. As is consistent with the construction phase, the O&M Contractor will undertake a security risk assessment to determine the appropriate level of security required at the facility. Security arrangements should be guided by UN Code of conducts for law enforcement officials. In addition to this, security personnel will receive internal training in regard to grievances, reporting such grievances and dialogue with any members of the local community.

## **13.4 Proposed Assessment Requirement for ESIA**

The ESIA will highlight the principle community, health, safety and security issues associated with the project and identify proposed mitigation measures and associated plans that will need to be prepared and implemented to ensure that potential for these impacts are appropriately managed. The ESIA will also discuss the projects security provision and relevant aspects relating to IFC Performance Standards such as influx of workers and spread of disease.

## 14 LABOUR & WORKING CONDITIONS

### 14.1 Standards and Regulatory Requirements

#### 14.1.1 National Requirement

Oman's 2003 Labor Law (Decree No 35/2003) governs employee/employer relations in the private and public sector, and enumerates the protections afforded all legally resident workers, except for domestic workers. The law provides clear guidelines on working hours, and specifies the penalties for noncompliance with its provisions.

#### 14.1.2 Lender Requirements

The following applicable IFC Performance Standards aim to identify and ensure that social and economic impacts of a project are addressed in the relevant areas, in particular:

- Performance Standard 2: Labor and Working Conditions;

In accordance with IFC Performance Standard 2 (Labor and Working Conditions) there is a requirement to align with the following conventions:

- ILO Convention 29 on Forced Labor;
- ILO Convention 105 on the Abolition of Forced Labor;
- ILO Convention 138 on Minimum Age (of Employment);
- ILO Convention 182 on the Worst Forms of Child Labor;
- ILO Convention 100 on Equal Remuneration;
- ILO Convention 111 on Discrimination (Employment and Occupation);
- UN Convention on the Rights of the Child, Article 32.1; and
- UN Convention on the Protection of the Rights of all Migrant Workers and Members of their Families.

### 14.2 Observations and Baseline Condition

Any construction project will introduce health and safety risks associated with the use of plant, machinery and construction processes. Risks can be severe depending on the type of activities required, materials used and site condition.

For projects in isolated locations or where the local population/skill sets require influx of people from other regions/countries consideration will need to be given associated with accommodation, welfare, sanitary provision, health care, hygiene, food potable water etc.

## 14.3 Potential Impacts

### 14.3.1 Construction Phase

#### **Occupational Health and Safety**

Common activities undertaken during construction such as the movement of heavy machinery, excavation, handling of chemicals, etc. can all introduce significant risk to the health and safety for the associated work force. In particular, risks are more likely to be apparent for those who are not familiar with the type of works undertaken and/or the associated hazards.

The type of hazards attributable to a construction site will vary significantly depending on the construction methods employed and the degree of control implemented by the EPC and affiliated sub-contractor. It is therefore of the utmost importance that the EPC and affiliated sub-contractors demonstrate consideration of health and safety risks as part of their chosen construction methods and that these risks are appropriately mitigated.

#### **Working Conditions**

Labour exploitation on construction sites unfortunately has become a reality in some parts of the world. Inequalities in income, education and opportunities has led to opportunistic immoral practices with labourers and site staff suffering as a consequence.

To ensure the wellbeing of the staff associated with the project, the EPC and associated subcontractors will need to plan for necessary provisions relative to the requirement of the required workforce. This includes appropriate labour accommodation plans and mechanism for inspections and corrective actions.

#### **Labour Accommodation**

It is necessary for the Project to provide suitable, safe and secure labour accommodation to all workers (EPC Contractor staff and Sub-Contractor staff). Various risks are present where sub-standard accommodation may be provided for the workforce and could relate bedroom accommodation, personal space, sanitary facilities, food and kitchen safety, security, access to utilities and services; amongst others.

### 14.3.2 Operational Phase

#### **Occupational Health and Safety**

The risks associated with the operational phase of the project are anticipated to be significantly less than during the construction phase due to reduced site activity and requirements for heavy plant and machinery.

There will be occupational health and safety risks attributable to the operational phase associated with maintenance and inspection requirements. Maintenance and inspection will also require the use of site vehicles and activities that pose risks to human health and safety.

The severity and likelihood of risks during the operational phase will be dependent on the frequency and requirements for planned and unplanned maintenance. The operation and maintenance team will need to ensure that a robust plan is in place to appropriately manage these risks.

#### **14.4 Proposed Assessment Requirements for ESIA**

The ESIA will highlight National and Lender requirements attributable to the project associated with worker conditions (including worker accommodation) and occupational health & safety and identify proposed mitigation measures & associated plans that will need to be prepared and implemented to ensure that potential for these impacts are appropriately managed.

Such plans, reporting and any necessary training will be included to the ESIA to best align with ACWA Power's existing corporate policies and systems, as well as any mandatory reporting requirements of the Power Purchase Agreement.

## 15 RESETTLEMENT REQUIREMENTS

### 15.1 Standards and Regulatory Requirements

#### 15.1.1 National Requirement

Oman has no statutory requirements for compensation related to resettlement, and livelihood impacts. However, the Ministry of Housing and the Supreme Council of Planning manages land use affairs in the country regarding land acquisition.

#### 15.1.2 Lender Requirements

##### **AIIB**

AIIB's Environmental & Social Framework includes ESS 2 on Involuntary Resettlement. ESS 2 requires for effective resettlement planning in the event that a Project will displace land users, structures and other customary land use rights holders. The resettlement planning process necessitates a full inventory and census of any displaced people and assets, to aim for a net gain to those displaced.

##### **IFC Performance Standards**

The following IFC Performance Standards aim to identify and ensure that impacts related to involuntary resettlement and land acquisition are addressed in the relevant areas, in particular:

- Performance Standard 5: Land Acquisition and Involuntary Resettlement.

IFC Performance Standard 5 establishes good practices for the assessment and management of land acquisition and resettlement, as undertaken directly by Project developers and when it is Government led.

- IFC Performance Standard 5 Guidance Notes (2012) Annex. A articulates the various sub elements of a Resettlement Action Plan which will be developed as a part of the ESIA process for lender requirements.

### 15.2 Observations and Baseline Condition

As depicted in the 'Land Use' section of this scoping report, the presence of camel farms were identified during site visits, which were manned by camel herders from South Asia, who have lived on the project site for numerous years (based on informal consultation with these people). Given the tenure on site, and as per ESS 2 & IFC PS5 the camel herders are expected to have informal land rights and may be eligible for resettlement and livelihood restoration compensation. It is understood that the land is owned by the state, and utilised by the local Sheikh for camel rearing for racing purposes.

During the site visit in May 2019, it was observed that one of the camel herders (from Bangladesh), was living in a permanent structure with limited utilities (i.e. no toilet, mains water or electricity), with access to electricity (via a solar panel and battery to light up a solitary bulb in the evenings). The wire framed shortish man in his fifties claimed to have been living in the project site for 27 years and had tended to camels. There was a government authorised mechanised bore well, which was connected to his farm by an underground water pipe.

Another camel herder from Pakistan claimed to have been living on the project site for 13 years, but has been in Ibri for 30 years. He shares the accommodation with the Bangladeshi camel herder. They cook food on a makeshift stove in an area designated for camel fodder.

Besides the accommodation areas, there are also several used and disused camel pens located within the Project footprint.

**Figure 15-1 Photographs of Selected Physical Assets on the Project Site**



### 15.3 Potential Impacts

As the Project's land is owned by The State, the Project will not involve land acquisition. However, as there are structures and land users on-site, there will rather be impacts relating to resettlement at the pre-construction phase.

This will necessitate the physical relocation, or demobilisation and reconstruction of such assets, as well as the movement of people who reside in these structures. Land for resettlement and future use has not yet been confirmed to ACWA Power, although it is understood that the Ministry of Housing will be responsible for undertaking the Government led process. Given that there are no statutory requirements for resettlement in Oman, it is possible that the Government led process may not align fully with the requirements of the lenders. This may result in impacts to the land users and their livelihoods, including sub-standard replacement of assets and access to utilities.



During the resettlement process, it is expected that the identified expatriate camel herders may be vulnerable to such changes, which could potentially affect their employment status, their livelihoods and security.

## 15.4 Proposed Assessment & Management Requirements

### 15.4.1 Pre-Construction Phase RAP

It will necessary to identify the process being undertaken by the Ministry of Housing to assess and implement the resettlement process. This will be achieved via consultation with relevant consultees. Based on the understanding of the proposed approach, a comparison will be made against the lender requirements for resettlement to identify any deficiencies that may need to be satisfied by the Project.

The resettlement and livelihood restoration actions are required by the lenders to be implemented in the pre-construction phase and informed by a robust Resettlement Action Plan (RAP). A RAP will be prepared which will include the key elements:

- Mapping of physical assets of the identified landholdings/land uses;
- Inventory of physical assets at the identified landholdings/land uses;
- Census and information gathering in regard to residents at the landholding/land uses;
- Development of a compensation matrix;
- Development of an alternative livelihood strategy for the residents of the camel farms;
- Action Plan to indicate timings of actions to be undertaken and responsibilities;
- Mechanism for Grievance Redress;
- Monitoring and Evaluation indicators.

Data gathering will be undertaken via site surveys and the undertaking of unstructured & structured interviews with the Project Affected People (PAP), as well as the Sheikh of the area, the camel owners, HE The Wali of Ibri, the Ministry of Housing, OPWP among others.

### 15.4.2 Construction and Operational Phases

The resettlement activities are limited to the pre-construction phase, however monitoring and evaluation of the indicators of implementation of the RAP are required to ensure the measures have been effectively undertaken. Monitoring and Evaluation indicators will be stated in the RAP and evaluated during the construction and operations phases of the project.

## 16 CLIMATE AFFAIRS

### 16.1 Standards and Regulatory Requirements

#### 16.1.1 National Requirement

MD 20/2016 and Rules for Writing Climate Affairs Chapters for EIA Projects (2013) mandates quantification of GHG emissions at the project level and consequent reporting of the same during the construction and operations phases in the ESIA Climate Affairs chapter which should include project specific climate change mitigation measures.

#### 16.1.2 Lender Requirements

Equator Principles Annex A mandates the undertaking of a Greenhouse Gas (GHG) Alternatives Analysis and annual GHG reporting on projects that generate more than 100,000 tons per annum of Scope I & Scope II CO<sub>2</sub> equivalent emissions.

### 16.2 Potential Impacts

#### 16.2.1 Construction Phase

Common activities undertaken during construction such as the operation of vehicles, heavy machinery, and operation of diesel driven generators will result in air emissions. This will result in the emission of GHGs. The volume of GHG emissions will be proportional to the volume of the fuel combusted.

#### 16.2.2 Operational Phase

As a solar power plant, the Project will result in zero operational emissions in its primary power generation function.

When not generating solar energy (e.g. at night) the Project will likely draw an amount of electricity from the Omani grid to operate key systems and ensure security lighting etc. Such electricity use will relate to indirect Scope II emissions.

The Project will also include an emergency diesel generator that will be operated to provide emergency electricity in the event of a blackout. Given that such events happen infrequently in Oman it is expected that this will result in minimal Scope I GHG emissions during the operational phase of the Project.

It is therefore not expected that the Project will reach the threshold of 100,000 tonnes of CO<sub>2</sub> equivalent per annum, as established by the Equator Principles.

### 16.3 Proposed Assessment Requirements for ESIA

However, during the construction phase, diesel generator fuel consumption and vehicular traffic will impose a reportable GHG footprint which shall be captured based on project planning data. This GHG emissions footprint shall be captured in the climate affairs chapter.

The ESIA will highlight National and Lender requirements attributable to the project associated with Climate Affairs. To satisfy MECA requirements, the expected GHG emissions will be calculated for the construction and operation phases of the project respectively. This will be achieved using a USEPA developed GHG emissions calculation tool, using AP-42 emissions factors.

A requirement of MECA is to develop a 'Climate Change Mitigation Plan' to identify and assess climate change risks related to the project, and develop methods in which such impacts can be mitigated.

## 17 REFERENCES

1. Guidance on the Assessment of Dust from Demolition and Construction (2014). Institute of Air Quality Management.
2. Birdlife International Bird Sensitivity Mapping Tool  
[https://maps.birdlife.org/MSBtool/?locale=en\\_US](https://maps.birdlife.org/MSBtool/?locale=en_US)
3. Ministry of Regional Municipalities and Water Resources  
<https://www.mrmwr.gov.om/en/web/mrmwr/downloads>
4. Fookes, Peter g., Lee, Edward M., (2009). Desert Environment of Inland Oman Volume 25, Issue 6 pp 226 – 231.
5. Dutch Target and Intervention Values (2000). Circular on Target Values and Intervention Values for Soil Remediation.
6. Soil Remediation Circular (2009). Groundwater Target Values And Soil And Groundwater Intervention Values. Annex 1.
7. The United Nations Educational, Scientific and Cultural Organization (UNESCO)  
<https://whc.unesco.org/en/statesparties/om>
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9. IFC PS 5 Guidance Notes

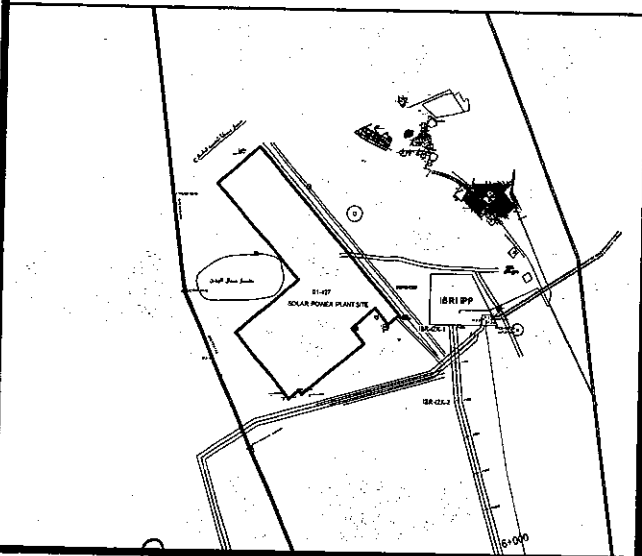
---

## APPENDIX A – KROOKI OF THE PROJECT LAND AREA

5-13-079-01-427 الرقم المسلسل

IBRI الولاية  
AL MAZEM المدينة / القرية  
رقم الخريطة:

SCALE 1:200000 الموقع العام



الإسقاط

| LINE  | NORTHING   | EASTING   | DIST (m) |
|-------|------------|-----------|----------|
| 1 2   | 2587282.55 | 419687.60 | 1468.93  |
| 2 3   | 2588249.11 | 420793.73 | 5810.16  |
| 3 4   | 2583869.07 | 424611.20 | 395.77   |
| 4 5   | 2583617.50 | 424305.68 | 551.12   |
| 5 6   | 2584042.95 | 423955.36 | 814.31   |
| 6 7   | 2583508.29 | 423341.15 | 527.25   |
| 7 8   | 2583100.84 | 423675.78 | 2137.94  |
| 8 9   | 2581741.25 | 422025.83 | 111.12   |
| 9 10  | 2581827.01 | 421955.17 | 348.10   |
| 10 11 | 2581605.64 | 421686.52 | 2260.53  |
| 11 12 | 2583344.46 | 420242.03 | 25.71    |
| 12 13 | 2583359.97 | 420262.53 | 2148.18  |
| 13 14 | 2584762.97 | 421889.27 | 0.30     |
| 14 1  | 2584763.20 | 421889.07 | 3345.69  |

AREA = 13280352 SQ. M.

رسم مساحي لقطعة أرض

بيانات القطعة

القطعة: 01-427 المربع

المساحة: 13280352 SQ. M.

رقم المنزل: السكة المجمع

[ شروط البناء ]

الإستعمال: محطة توليد الكهرباء بالطاقة الشمسية

الإرتفاع:

عدد الطوابق:

نسبة البناء:

الإرتدادات:

الأمم: الخلف الجانبان

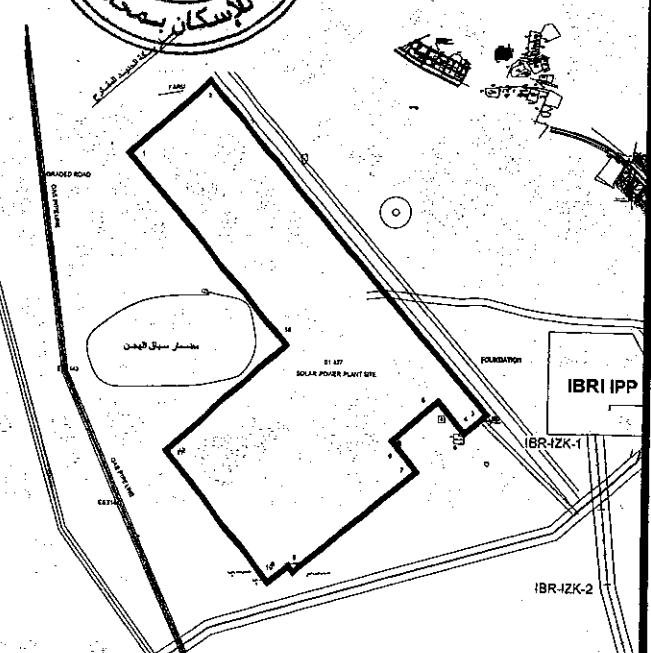
موقف السيارات:

شروط أخرى:

المخطط



SCALE 1:400000



الملاحظات

الرسم ناتج من دمج القطع بالأرقام  
320-321-322-323

دائرة المساحة

ختم الدائرة

التاريخ 19/02/2019 التوقيع Faisal Albadi المساح

التاريخ 04/03/2019 التوقيع SAMI الرسام

التاريخ التوقيع Obaid ALelawi التدقيق

التاريخ SAIF HUMAID ALSKATI المدير



## APPENDIX B - CIRIA GOOD PRACTICE GUIDELINES: CONTAMINATED LAND PRELIMINARY RISK ASSESSMENT

The Contaminated Land Risk Assessment methodology used for this assessment is based on CIRIA C552 (2001) Contaminated Land Risk Assessment – A Guide to Good Practice, in order to quantify potential risk via risk estimation and risk evaluation, which can be adopted at the Phase I stage. This will then determine an overall risk category which can be used to identify likely actions for the cable route. This methodology uses qualitative descriptors and therefore is a qualitative approach.

The methodology requires the classification of:

- the magnitude of the **consequence** (severity) of a risk occurring, and
- the magnitude of the **probability** (likelihood) of a risk occurring.

The potential consequences of contamination risks occurring at this site are classified in accordance with the Table below, which is adapted from the CIRIA guidance.

### Classification of Consequence

| CLASSIFICATION | DEFINITION OF CONSEQUENCE  |
|----------------|--|
| <b>Severe</b>  | Short-term (acute) risks to human health.<br>Short-term risk of pollution of sensitive water resource or ecosystem.<br>Catastrophic damage to crops/buildings/property/infrastructure, including off-site soils.   |
| <b>Medium</b>  | Medium/long-term (chronic) risks to human health.<br>Medium/long-term risk of pollution of sensitive water resource or ecosystem.<br>Significant damage to crops/buildings/property/infrastructure (on or off-site).<br>Contamination of off-site soils. |
| <b>Mild</b>    | Easily preventable, permanent health effects on humans.<br>Pollution of non-sensitive water resources.<br>Localised damage to crops/buildings/property/infrastructure (on or off-site).  |
| <b>Minor</b>   | Easily preventable, non-permanent health effects on humans, or no effects.<br>Minor, low-level and localised contamination of on-site soils.<br>Easily repairable damage to crops/buildings/property/infrastructure.                                     |

The probability of contamination risks occurring at this site will be classified in accordance with Table below, which is also adapted from the CIRIA guidance. Note that for each category, it is assumed that a pollution linkage exists. Where a pollution linkage does not exist, the likelihood is zero, as is the risk.

## Classification of Probability

| CLASSIFICATION         | DEFINITION OF PROBABILITY   |
|------------------------|---|
| <b>High Likelihood</b> | Circumstances are such that an event appears very likely in the short-term or almost inevitable in the long-term; or there is already evidence that such an event has occurred. |
| <b>Likely</b>          | Circumstances are such that such an event is not inevitable, but is possible in the short-term and is likely over the long-term.  |
| <b>Low Likelihood</b>  | Circumstances are such that it is by no means certain that an event would occur even over a longer period, and it is less likely in the short-term.                             |
| <b>Unlikely</b>        | Circumstances are such that it is improbable that an event would occur even in the very long-term.  |

For each possible pollution linkage (source-pathway-receptor) identified, the potential risk can be evaluated, as presented in the Table below. Based upon this, CIRIA C552 presents definitions of the risk categories, together with the investigatory and remedial actions that are likely to be necessary in each case. These risk categories apply to each pollutant linkage, not simply to each hazard or receptor.

## Overall Contamination Risk Matrix

|             |                 | CONSEQUENCE    |               |               |               |
|-------------|-----------------|----------------|---------------|---------------|---------------|
|             |                 | SEVERE         | MEDIUM        | MILD          | MINOR         |
| Probability | High likelihood | Very high risk | High risk     | Moderate risk | Low risk      |
|             | Likely          | High risk      | Moderate risk | Moderate risk | Low risk      |
|             | Low likelihood  | Moderate risk  | Moderate risk | Low risk      | Very low risk |
|             | Unlikely        | Low risk       | Low risk      | Very low risk | Very low risk |

## Definition of Risk Categories and Likely Actions Required

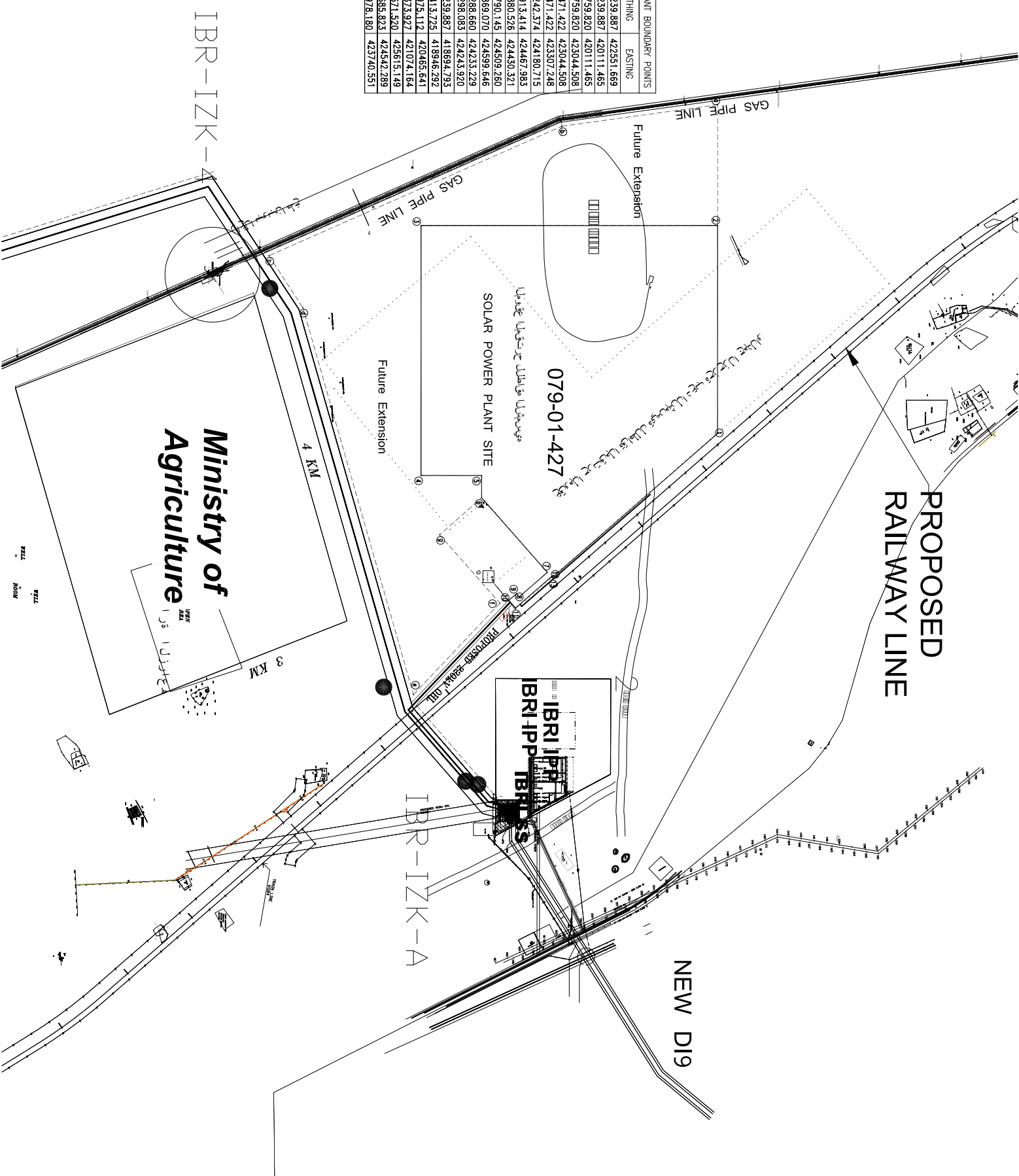
| RISK CATEGORY    | DEFINITION AND LIKELY ACTIONS REQUIRED   |
|------------------|--|
| <b>Very high</b> | Severe harm to a defined receptor is very likely, or has already occurred.<br>The risk is likely to result in a substantial liability.<br>Urgent investigation (if not already undertaken) is likely to be required.<br>Urgent remediation is likely to be required. |
| <b>High</b>      | Harm to a defined receptor is likely.<br>The risk, if realised, may result in a substantial liability.<br>Urgent investigation (if not already undertaken) is likely to be required.<br>Remediation is likely to be required in the long term, possibly sooner.      |
| <b>Moderate</b>  | Harm to a defined receptor is possible, but severe harm is unlikely.<br>Investigation is likely to be required to clarify the level of potential liability and risk.<br>Some remediation may be required in the longer term.   |

| RISK CATEGORY   | DEFINITION AND LIKELY ACTIONS REQUIRED  |
|-----------------|---|
| <b>Low</b>      | <p>Harm to a defined receptor is possible, but is likely to be mild at worst.<br/>Liabilities could theoretically arise, but are unlikely.<br/>Further investigation is not required at this stage.<br/>Remediation is unlikely to be required.</p> |
| <b>Very low</b> | <p>Harm to a defined receptor is unlikely, and would be minor at worst.<br/>No liabilities are likely to arise.<br/>Further investigation is not required at this stage.<br/>Remediation is very unlikely to be required.</p>                       |

## APPENDIX B

### **Krooki of site**

| POINTS NUMBER | NORTHING    | EASTING    |
|---------------|-------------|------------|
| 1             | 2586239.887 | 422551.669 |
| 2             | 2586239.887 | 420111.465 |
| 3             | 2582759.820 | 420111.465 |
| 4             | 2582759.820 | 423044.508 |
| 5             | 2583471.422 | 423044.508 |
| 6             | 2583471.422 | 423507.248 |
| 7             | 2584242.374 | 424180.715 |
| 8             | 2583893.414 | 424467.983 |
| 9             | 2583890.526 | 424430.321 |
| 10            | 2583790.145 | 424509.260 |
| 11            | 2583669.070 | 424599.546 |
| 12            | 2584288.660 | 424233.229 |
| 13            | 2584298.083 | 424243.920 |
| 14            | 2586239.887 | 418694.793 |
| 15            | 2584413.725 | 418946.292 |
| 16            | 2580975.112 | 420465.641 |
| 17            | 2581323.927 | 421074.164 |
| 18            | 2582671.520 | 425615.149 |
| 19            | 2583685.823 | 424542.289 |
| 20            | 2582928.180 | 423740.551 |



IBR-IZK-A

PROPOSED RAILWAY LINE

NEW D19

Ministry of Agriculture

IBRI IPP  
IBRI IPP  
IBRI IPP  
IBRI IPP

IBR-IZK-A

WALL ROAD

3 KM

4 KM

079-01-427

SOLAR POWER PLANT SITE

Future Extension

Future Extension

GAS PIPE LINE

GAS PIPE LINE

GAS PIPE LINE

GAS PIPE LINE

GAS PIPE LINE

GAS PIPE LINE

GAS PIPE LINE

GAS PIPE LINE

GAS PIPE LINE

## APPENDIX C

### Ambient Air Quality Calibration Certificates



### CALIBRATION CERTIFICATE

|  |  |
|--|--|
| <b>Test Division</b> : General Information<br><b>Customer</b> : LONESTAR ALPHA LAB<br><b>Location</b> : Muscat, Oman<br><b>Serial Number</b> : 01438<br><br><b>Calibration Date:</b> 03 JULY 2018<br><b>Next Calibration:</b> 02 JULY 2019 | <b>Instruments Version</b> : ETLOne<br><b>Baud Rate</b> : 960 [Digicom GSM]<br><b>Average Time</b> : 1 hour Average<br><b>Data base time</b> : 1 hour Average<br><b>Language</b> : English |
|--|--|

| GAS & METEO SENSORS | CODE     |
|---------------------|----------|
| CO                  | SENSIT   |
| O3                  | SENSIT   |
| NO2                 | SENSIT   |
| VOC                 | SENS3000 |
| CH4                 | SENSIT   |
| H2S                 | SENSIT   |
| NOISE               | DB3000   |
| SO2                 | SENSIT   |
| PM10, PM2.5, PM1    | OSIRIS   |
| METEO               | Met-3000 |

| Channels | Sensor - Range                | S/N | Status           |
|----------|-------------------------------|-----|------------------|
| 01       | CO (0.1-85.9 ppm)             | 001 | Calibration O.K. |
| 02       | O3 (10-250.6 ppb)             | 002 | Calibration O.K. |
| 03       | NO2 (10-271.5 ppb)            | 003 | Calibration O.K. |
| 04       | VOC (0.6-25 ppm)              | 004 | Calibration O.K. |
| 05       | CH4 (1-1500 ppm)              | 005 | Calibration O.K. |
| 06       | H2S (2-3000 ppb)              | 006 | Calibration O.K. |
| 07       | NOISE (45-105 db)             | 007 | Calibration O.K. |
| 08       | SO2 (5-10000 ppb)             | 008 | Calibration O.K. |
| 09       | PM 10 (0-6000 ug/m3)          | 009 | Calibration O.K. |
| 10       | WIND SPEED (0-50 m/s)         | 010 | Calibration O.K. |
| 11       | WIND DIRECTION (0-360 degree) | 011 | Calibration O.K. |
| 12       | TEMP (-40 - +60 C)            | 012 | Calibration O.K. |
| 13       | RH (0-100 %)                  | 013 | Calibration O.K. |
| 14       | RAIN (0-50 mm)                | 014 | Calibration O.K. |

|  |   |
|--|---|
| Starting heating time after preventive Maintenance period Before Installation on the ETL One Instrumentation | Starting Tests & Calibration Time Comparison between Reference Instrumentation after heating period |
|--|---|

| S.NO.                        | Tests Date   |
|------------------------------|--------------|
| 1. Internal board Tests      | 03 JULY 2018 |
| 2. Meteorological Sensor brd | 03 JULY 2018 |

Capitale Sociale Euro 1.000.000 I.v.  
 Registro Impres PD 02149470284  
 P. IVA e Cod.Fisc 02149470284  
 R.E.A. 211706





### Test Report Instrumentation

|    | Sensor - Range                | Reference Instrument | Actual Reading | Status |
|----|-------------------------------|----------------------|----------------|--------|
| 01 | CO (0.1-85.9 ppm)             | 10 ppm               | 9.99 ppm       | ok     |
| 02 | O3 (10-250.6 ppb)             | 15.2 ppb             | 15.1 ppb       | ok     |
| 03 | NO2 (10-271.5 ppb)            | 10.3 ppb             | 10.4 ppb       | ok     |
| 04 | VOC (0.6-25 ppm)              | 2.2 ppm              | 2.1 ppm        | ok     |
| 05 | CH4 (1-1500 ppm)              | 1.8 ppm              | 1.7 ppm        | ok     |
| 06 | H2S (2-3000 ppb)              | 8.8 ppb              | 8.7 ppb        | ok     |
| 07 | NOISE (45-105 db)             | 75 db                | 74.5 db.       | ok     |
| 08 | SO2 (5-10000 ppb)             | 12.5 ppb             | 12.4 ppb       | ok     |
| 09 | PM 10 (0-6000 ug/m3)          | 25.5 ug/m3           | 24.3 ug/m3     | ok     |
| 10 | WIND SPEED (0-50 m/s)         | 0.3 m/s              | 0.3 m/s        | ok     |
| 11 | WIND DIRECTION (0-360 degree) | 180.25 degree        | 180.45 degree  | ok     |
| 12 | TEMP (-40 - +60 C)            | 40 C deg             | 40.2 C Deg     | ok     |
| 13 | RH (0-100 %)                  | 55.5 %               | 55.4 %         | ok     |
| 14 | RAIN (0-50 mm)                | 0.0 mm               | 0.0 mm         | ok     |

| Date         | Part List                                   | Test Result            |
|--------------|---|------------------------|
| 02 july 2018 | Power supply                                | O.K.                   |
| 02 july 2018 | Power Deviation board                       | O.K.                   |
| 02 july 2018 | Microprocessor board                        | O.K.                   |
| 02 july 2018 | A/D Converter board                         | O.K.                   |
| 02 july 2018 | Sensor Controller board                     | O.K.                   |
| 02 july 2018 | Gas Sensors                                 | O.K.                   |
| 02 july 2018 | Metrology Sensors                           | O.K.                   |
| 02 july 2018 | Display                                     | O.K.                   |
| 02 july 2018 | GSM   | O.K.                   |
| 02 july 2018 | Sensor Chamber                              | O.K.                   |
| 02 july 2018 | Sensor Fan Assembly                         | O.K.                   |
|              | <b>Reference Instrument</b>                 | 01463                  |
|              | Flow reference                              | Bios Cal Digital Meter |
|              | Standard Zero Calibration Filter            | UNITECH                |
|              | Sensitivity Tests ETL3000                   | Passed                 |
|              | Dust Monitor Flow and Leak Tests            | Passed                 |
|              | Electronics Zero / Full scale Voltage level | Passed                 |



Signature \_\_\_\_\_

Calibration Date : 03 JULY 2018  
**Calibration Due Date: 02 JULY 2019**

Capitale Sociale Euro 1.000.000 l.v.  
 Registro Imprese PD 02149470284  
 P. IVA e Cod. Fisc. 02149470284  
 R.E.A. 211706



## APPENDIX D

### Noise Calibration Certificates



## WORLD ONE INSTRUMENTS

Calibration Centre

NABL ACCREDITED CALIBRATION LAB AS PER ISO/IEC 17025:2005

Reg. Office : # 19, 8th Main, 5th Cross, Saraswathipuram, Nandini Layout, Bangalore-560 096.

Email: worldoneinstruments@gmail.com / info@worldoneinstruments.com Ph 9900099913/9900032111/9900040111



### CALIBRATION CERTIFICATE

|  |                           |                                  |                    |                           |
|--|---------------------------|----------------------------------|--------------------|---------------------------|
| Certificate No.:                           |                           | ULR-CC200519000001489F           |                    | Page 1 of 1               |
| SRF No.:                                   | 19180                     | Date Of Issue:                   | 26 February 2019   | Parameter                 |
|  |                           | Calibrated on:                   | 25 February 2019   |                           |
|  |                           | Calibration Due on:              | 24 February 2020   |                           |
| Name & Address of the Customer:            |                           | Status of the item on receipt    |                    | Satisfactory              |
| ADP Consultant FZE<br>Hyderabad -          |                           | Date Of Receipt:                 | 25 February 2019   |                           |
|  |                           | Calibration Location:            | In House           |                           |
|  |                           | Usage Location                   | ----               |                           |
| Description & Identification of Item :     |                           |                                  |                    |                           |
| Nomenclature :                             | Noise Meter               |                                  |                    |                           |
| Make :                                     | Lutron                    |                                  |                    |                           |
| Model :                                    | SL4033SD                  |                                  |                    |                           |
| Serial No.:                                | Q652562                   |                                  |                    |                           |
| Resolution:                                | 0.1 dB                    |                                  |                    |                           |
| ID No.:                                    | ---                       |                                  |                    |                           |
| Range / Capacity:                          | (32 to 120) dB            |                                  |                    |                           |
| Reference Equipment used for Calibration : |                           |                                  |                    |                           |
| Nomenclature                               | Serial No.                | Certificate No.                  | Validity           |                           |
| Sound Level Calibrator                     | I.164120                  | 2018/03/190                      | 19 March 2020      |                           |
| Measurement Results                        |                           |                                  |                    |                           |
| SOUND ACCURACY:                            |                           |                                  |                    |                           |
| STD Setting                                | DUC Reading               | Error Claimed (+/-)              | Deviation Observed | Measurement Uncertainty ± |
| 94 dB                                      | 94.1 dB                   | ----                             | 0.1 dB             | 1.0 dB                    |
| 114 dB                                     | 114.3 dB                  | ----                             | 0.3 dB             | 1.2 dB                    |
| Calibration Procedure:                     | WOI-ME-SOP-SLM            |                                  |                    |                           |
| Calibration Method:                        | By Direct Method          |                                  |                    |                           |
| Environmental Condition of Measurement:    | Temperature: (25 ± 3) ° C | Relative Humidity: (45 to 75)%RH |                    |                           |

**Remarks:**

- . The calibration results reported corresponds to the particular item mentioned above
- . This Certificate refers to the values obtained at the time of calibration and under the above stated conditions.
- . All Calibrations are done in SI units and are traceable to National/International standards as required in ISO/IEC/17025
- . Certificate shall not be reproduced except in full without the written approval of Laboratory.
- . The usage of NABL symbol is as per NABL Guidelines NABL-133.
- . The reported uncertainty of measurement is stated as the standard uncertainty in measurement multiplied by the coverage factor =2, which for a normal distribution corresponds to a coverage probability 95.45%.
- . Risk is Limited to corresponding Service invoice only.

Calibrated By  
  
Nethra A

Checked By



## Certificate of Calibration

Certificate No: 1906067

|                    |   |                       |  |
|--------------------|---|-----------------------|--|
| Description:       | Sound Level Calibrator  | Customer ID:          | None   |
| Manufacture:       | Extech  | Range:                | 94 dB / 114 dB   |
| Model Number:      | 407766  | Date Received:        | 20-Apr-19  |
| Serial Number:     | H.383474  | Item Condition:       | New  |
| Asset No:          | 36067   | Option Installed:     | None   |
| Calibration:       | Full  | Calibration Date:     | 20-Apr-2019  |
| Calibrated to:     | Manufacturer Specification  | Calibration Interval: | 365 days   |
|                    |   | Due Date:             | 19-Apr-2020  |
|                    |   | Temperature:          | 23 °C ± 3 °C   |
| Data Type:         | As found As left  | Relative Humidity:    | 50 %RH ± 2.0 %RH   |
| Comments:          | Instrument Readings are within specifications, no adjustment performed. |                       |  |
| Customer Name:     | ADP Consultant FZE<br>P.O. Box: 40036<br>Ajman<br>United Arab Emirates  | End User:             | ADP Consultant FZE<br>P.O. Box: 40036<br>Ajman<br>United Arab Emirates |
| Purchase Order No: | CND   |                       |  |

The calibration was performed with measuring instrument/standards whose values are traceable directly or indirectly by derivation with admitted calibration procedures to standards maintained by the National Physical Laboratory UK / National Institute of Standards and Technology USA or to other recognised international standards bodies for the realization of physical unit in line with the International System of Units (SI).

The reported expanded uncertainty of measurement is stated as standard uncertainty multiplied by coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95 %. The uncertainties relate only to the measured values and do not carry any implication regarding the long term stability of the instrument.

The calibrated item has been marked with a calibration label, the user is obliged to have the object recalibrated at appropriate intervals.

This report applies only to the item identified and shall not be reproduced except in full, unless permission for the publication of an approved abstract is obtained in writing from the calibration organisation issuing this report.

### Standard Used

| Description         | Model         | Serial Number | Certificate No. | Due Date  | Traceability |
|---------------------|---------------|---------------|-----------------|-----------|--------------|
| Acoustic Calibrator | D&K Type 4231 | 1914753       | CDK1002565      | 20-Nov-19 | DANAK        |



Date Issued: 20-Apr-2019

Anaum International Electronics L.L.C, P.O.Box 133636, ICAD-1, Musaffah M41, Abu Dhabi, United Arab Emirates  
Tel No: 0097125537701, Fax No: 0097125537703, email: calibration@anaum.ae, website: www.anaum.ae  
ISO 9001:2015 Certified by Applus Velosi under DAC accreditation.

Page 1 of 2

# APPENDIX E

## Soil Analysis Laboratory Results





# Lonestar Alpha Laboratories

Muscat : P.O. Box 1197, P.C. 130, Muscat, Sultanate of Oman - Tel.: +968 24501524 / 5590, Fax: +968 24503814  
 Muscat Chemistry Lab : P.O. Box 1197, P.C. 130, Muscat, Sultanate of Oman - Tel.: +968 24504206, 24504924, Fax: +968 24502635  
 Sohar : P.O. Box 84, P.C. 327, Sohar Industrial Estate, Sultanate of Oman - Tel.: +968 26751755 / 920 / 976, Fax: +968 26751331  
 Duqm : Tel.: +968 99278040, E-mail: duqm.lab@lonestartalpa.com  
 Salalah : P.O. Box 1887, P.C. 211, Tel.: +968 23213390, Fax: +968 23213391, E-mail: salalah.lab@lonestartalpa.com  
 E-mail : info@lonestartalpa.com, Website: www.lonestartalpa.com

## TEST CERTIFICATE - ANALYSIS OF SOIL

|            |                   |               |             |
|------------|-------------------|---------------|-------------|
| Report No. | LMCHE - 19-0866/1 | Date Reported | 27 Jul 2019 |
| Cust Ref.  | -                 | Date Received | 19 Jun 2019 |

### 1. Information Provided By Customer

|                    |  |
|--------------------|--|
| Customer           | YAHYA ENGINEERING<br>Muscat Sultanate of Oman                  |
| Project            | Ibri 2 IPP Sohar   |
| Sample Description | Soil - Sample 1, 30cm Depth                                    |
| Sampling Location  | COORDINATES:23°23'38.5"N,56°13'56.4"E (NORTHERN BOUNDARY WADI) |

|                   |          |                      |                     |
|-------------------|----------|----------------------|---------------------|
| Sampled By        | Customer | Sampling Date & Time | 12/06/2019; 09:20am |
| Sample Brought By | Customer | Sampling Method      | Using Hand Auger    |

### 2. Information Provided By Laboratory

|               |                           |                  |            |
|---------------|---------------------------|------------------|------------|
| Date Tested   | 19 Jun 2019 ~ 27 Jul 2019 | Method Variation | NIL        |
| Test Location | MCT                       | LAL Sample No.   | CHE / 2469 |
| Remarks       | None                      |                  |            |

### 3. Test Results

| TEST                                | UNIT  | TEST METHOD         | MDL  | RESULTS |
|-------------------------------------|-------|---------------------|------|---------|
| <b>Chemical Tests</b>               |       |                     |      |         |
| Antimony                            | mg/Kg | USEPA SW 846/6010 C | 1    | <1      |
| Arsenic                             | mg/Kg | USEPA SW 846/6010 C | 0.3  | <0.3    |
| Barium                              | mg/Kg | USEPA SW 846/6010 C | 1    | 30.5    |
| Cadmium                             | mg/kg | USEPA SW846/6010 C  | 0.2  | <0.2    |
| Chromium                            | mg/Kg | USEPA SW 846/6010 C | 1    | 30.1    |
| Cobalt                              | mg/kg | USEPA SW846/6010 C  | 1    | <1      |
| Copper                              | mg/kg | USEPA SW846/6010 C  | 1    | 30.4    |
| Lead                                | mg/kg | USEPA SW846/6010 C  | 1    | <1      |
| Magnesium                           | mg/Kg | USEPA SW 846/6010 C | 0.2  | 33870   |
| Manganese                           | mg/Kg | USEPA SW 846/6010 C | 1    | 109     |
| Mercury                             | mg/kg | USEPA SW846/6010 C  | 0.1  | <0.1    |
| Molybdenum                          | mg/Kg | USEPA SW 846/6010 C | 0.1  | <0.1    |
| Nickel                              | mg/kg | USEPA SW846/6010 C  | 1    | 68.9    |
| Vanadium                            | mg/kg | USEPA SW846/6010 C  | 1    | <1      |
| Zinc                                | mg/Kg | USEPA SW 846/6010 C | 2    | 53.1    |
| <b>Total petroleum Hydrocarbons</b> |       |                     |      |         |
| n-Octane                            | mg/kg | USEPA SW 846/8015B  | 0.05 | <0.05   |
| n-Nonane                            | mg/kg | USEPA SW 846/8015B  | 0.05 | <0.05   |
| n-Decane                            | mg/kg | USEPA SW 846/8015B  | 0.05 | <0.05   |
| n-Undecane                          | mg/kg | USEPA SW 846/8015B  | 0.05 | <0.05   |
| n-Dodecane                          | mg/kg | USEPA SW 846/8015B  | 0.05 | <0.05   |
| n-Tridecane                         | mg/kg | USEPA SW 846/8015B  | 0.05 | <0.05   |





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 E-mail : info@lonestartalpa.com, Website: www.lonestartalpa.com

|            |                   |               |             |
|------------|-------------------|---------------|-------------|
| Report No. | LMCHE - 19-0866/1 | Date Reported | 27 Jul 2019 |
| Cust Ref.  | -                 | Date Received | 19 Jun 2019 |

| TEST                 | UNIT  | TEST METHOD        | MDL  | RESULTS |
|----------------------|-------|--------------------|------|---------|
| n-Tetradecane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Pentadecane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Hexadecane         | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Heptadecane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| Pristane             | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Octadecane         | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| Phytane              | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Nonadecane         | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Eicosane           | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Heneicosane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Docosane           | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Tricosane          | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Tetracosane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Pentacosane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Hexacosane         | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Heptacosane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Octacosane         | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Nonacosane         | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Triacontane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Hentriacontane     | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Dotriacontane      | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Tritriacontane     | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Tetratriacontane   | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Pentatriacontane   | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Hexatriacontane    | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Heptatriacontane   | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Octatriacontane    | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Nonatriacontane    | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Tetracontane       | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| <b>PAH</b>           |       |                    |      |         |
| Acenaphthene         | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Acenaphthylene       | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Anthracene           | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Benz(a)anthracene    | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Benzo(a)pyrene       | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Benzo(b)Fluoranthene | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Benzo(g,h,i)perylene | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Benzo(k)Fluoranthene | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |



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E-mail : info@lonestaraalpha.com, Website: www.lonestaraalpha.com

|            |                   |               |             |
|------------|-------------------|---------------|-------------|
| Report No. | LMCHE - 19-0866/1 | Date Reported | 27 Jul 2019 |
| Cust Ref.  | -                 | Date Received | 19 Jun 2019 |

| TEST                    | UNIT  | TEST METHOD        | MDL  | RESULTS |
|-------------------------|-------|--------------------|------|---------|
| Chrysene                | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Dibenz(a,h)anthracene   | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Fluoranthene            | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Fluorene                | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Indeno(1,2,3,-cd)pyrene | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Naphthalene             | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Phenanthrene            | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Pyrene                  | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |

MDL = Method Detection Limit



*Tejali Parsekar*

For and behalf of Lonestar Alpha Laboratories  
Muscat

**Tejali Parsekar**

\*\*\* Laboratory Manager  
Chemistry & Microbiology

End of the test report



# Lonestar Alpha Laboratories

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 E-mail : info@lonestartalpa.com, Website: www.lonestartalpa.com

## TEST CERTIFICATE - ANALYSIS OF SOIL

|            |                   |               |             |
|------------|-------------------|---------------|-------------|
| Report No. | LMCHE - 19-0866/2 | Date Reported | 27 Jul 2019 |
| Cust Ref.  | -                 | Date Received | 19 Jun 2019 |

### 1. Information Provided By Customer

|                    |  |
|--------------------|--|
| Customer           | YAHYA ENGINEERING<br>Muscat Sultanate of Oman                          |
| Project            | Ibri 2 IPP Sohar   |
| Sample Description | Soil - Sample 2, 30cm Depth  |
| Sampling Location  | COORDINATES:23°21'33.2"N,56°14'29.9"E (NEAR SOUTH BOUNDARY CAMEL FARM) |

|                   |          |                      |                     |
|-------------------|----------|----------------------|---------------------|
| Sampled By        | Customer | Sampling Date & Time | 12/06/2019; 10:05am |
| Sample Brought By | Customer | Sampling Method      | Using Hand Auger    |

### 2. Information Provided By Laboratory

|               |                           |                  |            |
|---------------|---------------------------|------------------|------------|
| Date Tested   | 19 Jun 2019 ~ 27 Jul 2019 | Method Variation | NIL        |
| Test Location | MCT                       | LAL Sample No.   | CHE / 2470 |
| Remarks       | None                      |                  |            |

### 3. Test Results

| TEST                                | UNIT  | TEST METHOD         | MDL  | RESULTS |
|-------------------------------------|-------|---------------------|------|---------|
| <b>Chemical Tests</b>               |       |                     |      |         |
| Antimony                            | mg/Kg | USEPA SW 846/6010 C | 1    | <1      |
| Arsenic                             | mg/Kg | USEPA SW 846/6010 C | 0.3  | <0.3    |
| Barium                              | mg/Kg | USEPA SW 846/6010 C | 1    | 37.5    |
| Cadmium                             | mg/kg | USEPA SW846/6010 C  | 0.2  | <0.2    |
| Chromium                            | mg/Kg | USEPA SW 846/6010 C | 1    | 51.2    |
| Cobalt                              | mg/kg | USEPA SW846/6010 C  | 1    | <1      |
| Copper                              | mg/kg | USEPA SW846/6010 C  | 1    | 33.1    |
| Lead                                | mg/Kg | USEPA SW846/6010 C  | 1    | <1      |
| Magnesium                           | mg/Kg | USEPA SW 846/6010 C | 0.2  | 42418   |
| Manganese                           | mg/Kg | USEPA SW 846/6010 C | 1    | 109     |
| Mercury                             | mg/kg | USEPA SW846/6010 C  | 0.1  | <0.1    |
| Molybdenum                          | mg/Kg | USEPA SW 846/6010 C | 0.1  | <0.1    |
| Nickel                              | mg/kg | USEPA SW846/6010 C  | 1    | 68.2    |
| Vanadium                            | mg/kg | USEPA SW846/6010 C  | 1    | <1      |
| Zinc                                | mg/Kg | USEPA SW 846/6010 C | 2    | 56.7    |
| <b>Total petroleum Hydrocarbons</b> |       |                     |      |         |
| n-Octane                            | mg/kg | USEPA SW 846/8015B  | 0.05 | <0.05   |
| n-Nonane                            | mg/kg | USEPA SW 846/8015B  | 0.05 | <0.05   |
| n-Decane                            | mg/kg | USEPA SW 846/8015B  | 0.05 | <0.05   |
| n-Undecane                          | mg/kg | USEPA SW 846/8015B  | 0.05 | <0.05   |
| n-Dodecane                          | mg/kg | USEPA SW 846/8015B  | 0.05 | <0.05   |







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|            |                   |               |             |
|------------|-------------------|---------------|-------------|
| Report No. | LMCHE - 19-0866/2 | Date Reported | 27 Jul 2019 |
| Cust Ref.  | -                 | Date Received | 19 Jun 2019 |

| TEST                 | UNIT  | TEST METHOD        | MDL  | RESULTS |
|----------------------|-------|--------------------|------|---------|
| n-Tridecane          | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Tetradecane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Pentadecane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Hexadecane         | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Heptadecane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| Pristane             | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Octadecane         | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| Phytane              | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Nonadecane         | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Eicosane           | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Heneicosane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Docosane           | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Tricosane          | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Tetracosane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Pentacosane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Hexacosane         | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Heptacosane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Octacosane         | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Nonacosane         | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Triacontane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Hentriacontane     | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Dotriacontane      | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Tritriacontane     | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Tetratriacontane   | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Pentatriacontane   | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Hexatriacontane    | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Heptatriacontane   | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Octatriacontane    | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Nonatriacontane    | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Tetracontane       | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| <b>PAH</b>           |       |                    |      |         |
| Acenaphthene         | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Acenaphthylene       | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Anthracene           | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Benz(a)anthracene    | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Benzo(a)pyrene       | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Benzo(b)Fluoranthene | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Benzo(g,h,i)perylene | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |





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E-mail : info@lonestaraalpha.com, Website: www.lonestaraalpha.com

|            |                   |               |             |
|------------|-------------------|---------------|-------------|
| Report No. | LMCHE - 19-0866/2 | Date Reported | 27 Jul 2019 |
| Cust Ref.  | -                 | Date Received | 19 Jun 2019 |

| TEST                    | UNIT  | TEST METHOD        | MDL  | RESULTS |
|-------------------------|-------|--------------------|------|---------|
| Benzo(k)Fluoranthene    | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Chrysene                | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Dibenz(a,h)anthracene   | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Fluoranthene            | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Fluorene                | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Indeno(1,2,3,-cd)pyrene | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Naphthalene             | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Phenanthrene            | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Pyrene                  | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |

MDL = Method Detection Limit



*Tejali Parsekar*

For and behalf of Lonestar Alpha Laboratories  
Muscat  
End of the test report

**Tejali Parsekar**  
Laboratory Manager  
Chemistry & Microbiology





# Lonestar Alpha Laboratories

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## TEST CERTIFICATE - ANALYSIS OF SOIL

|            |                   |               |             |
|------------|-------------------|---------------|-------------|
| Report No. | LMCHE - 19-0866/3 | Date Reported | 27 Jul 2019 |
| Cust Ref.  | -                 | Date Received | 19 Jun 2019 |

### 1. Information Provided By Customer

|                    |  |  |  |
|--------------------|--|--|--|
| Customer           | YAHYA ENGINEERING<br>Muscat Sultanate of Oman                            |  |  |
| Project            | Ibri 2 IPP Sohar   |  |  |
| Sample Description | Soil - Sample 3, 30cm Depth  |  |  |
| Sampling Location  | COORDINATES:23°23'09.9"N,56°16'33.3"E (NORTH EAST BOUNDARY PROJECT SITE) |  |  |

|                   |          |                      |                     |
|-------------------|----------|----------------------|---------------------|
| Sampled By        | Customer | Sampling Date & Time | 12/06/2019; 10:50am |
| Sample Brought By | Customer | Sampling Method      | Using Hand Auger    |

### 2. Information Provided By Laboratory

|               |                           |                  |            |
|---------------|---------------------------|------------------|------------|
| Date Tested   | 19 Jun 2019 ~ 27 Jul 2019 | Method Variation | NIL        |
| Test Location | MCT                       | LAL Sample No.   | CHE / 2471 |
| Remarks       | None                      |                  |            |

### 3. Test Results

| TEST                                | UNIT  | TEST METHOD         | MDL  | RESULTS |
|-------------------------------------|-------|---------------------|------|---------|
| <b>Chemical Tests</b>               |       |                     |      |         |
| Antimony                            | mg/Kg | USEPA SW 846/6010 C | 1    | <1      |
| Arsenic                             | mg/Kg | USEPA SW 846/6010 C | 0.3  | <0.3    |
| Barium                              | mg/Kg | USEPA SW 846/6010 C | 1    | 35.6    |
| Cadmium                             | mg/kg | USEPA SW846/6010 C  | 0.2  | <0.2    |
| Chromium                            | mg/Kg | USEPA SW 846/6010 C | 1    | 41.1    |
| Cobalt                              | mg/kg | USEPA SW846/6010 C  | 1    | <1      |
| Copper                              | mg/kg | USEPA SW846/6010 C  | 1    | 55.5    |
| Lead                                | mg/kg | USEPA SW846/6010 C  | 1    | <1      |
| Magnesium                           | mg/Kg | USEPA SW 846/6010 C | 0.2  | 35045   |
| Manganese                           | mg/Kg | USEPA SW 846/6010 C | 1    | 110     |
| Mercury                             | mg/kg | USEPA SW846/6010 C  | 0.1  | <0.1    |
| Molybdenum                          | mg/Kg | USEPA SW 846/6010 C | 0.1  | <0.1    |
| Nickel                              | mg/kg | USEPA SW846/6010 C  | 1    | 65.6    |
| Vanadium                            | mg/kg | USEPA SW846/6010 C  | 1    | <1      |
| Zinc                                | mg/Kg | USEPA SW 846/6010 C | 2    | 46.3    |
| <b>Total petroleum Hydrocarbons</b> |       |                     |      |         |
| n-Octane                            | mg/kg | USEPA SW 846/8015B  | 0.05 | <0.05   |
| n-Nonane                            | mg/kg | USEPA SW 846/8015B  | 0.05 | <0.05   |
| n-Decane                            | mg/kg | USEPA SW 846/8015B  | 0.05 | <0.05   |
| n-Undecane                          | mg/kg | USEPA SW 846/8015B  | 0.05 | <0.05   |
| n-Dodecane                          | mg/kg | USEPA SW 846/8015B  | 0.05 | <0.05   |





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|            |                   |               |             |
|------------|-------------------|---------------|-------------|
| Report No. | LMCHE - 19-0866/3 | Date Reported | 27 Jul 2019 |
| Cust Ref.  | -                 | Date Received | 19 Jun 2019 |

| TEST                 | UNIT  | TEST METHOD        | MDL  | RESULTS |
|----------------------|-------|--------------------|------|---------|
| n-Tridecane          | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Tetradecane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Pentadecane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Hexadecane         | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Heptadecane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| Pristane             | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Octadecane         | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| Phytane              | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Nonadecane         | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Eicosane           | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Heneicosane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Docosane           | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Tricosane          | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Tetracosane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Pentacosane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Hexacosane         | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Heptacosane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Octacosane         | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Nonacosane         | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Triacontane        | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Hentriacontane     | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Dotriacontane      | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Tritriacontane     | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Tetratriacontane   | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Pentatriacontane   | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Hexatriacontane    | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Heptatriacontane   | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Octatriacontane    | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Nonatriacontane    | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| n-Tetracontane       | mg/kg | USEPA SW 846/8015B | 0.05 | <0.05   |
| <b>PAH</b>           |       |                    |      |         |
| Acenaphthene         | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Acenaphthylene       | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Anthracene           | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Benz(a)anthracene    | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Benzo(a)pyrene       | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Benzo(b)Fluoranthene | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Benzo(g,h,i)perylene | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |



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|            |                   |               |             |
|------------|-------------------|---------------|-------------|
| Report No. | LMCHE - 19-0866/3 | Date Reported | 27 Jul 2019 |
| Cust Ref.  | -                 | Date Received | 19 Jun 2019 |

| TEST                    | UNIT  | TEST METHOD        | MDL  | RESULTS |
|-------------------------|-------|--------------------|------|---------|
| Benzo(k)Fluoranthene    | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Chrysene                | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Dibenz(a,h)anthracene   | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Fluoranthene            | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Fluorene                | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Indeno(1,2,3,-cd)pyrene | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Naphthalene             | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Phenanthrene            | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |
| Pyrene                  | mg/kg | USEPA SW 846/8270D | 0.01 | <0.01   |

MDL = Method Detection Limit



*Tejali Parsekar*

For and behalf of Lonestar Alpha Laboratories  
 Muscat  
 End of the test report

**Tejali Parsekar**  
 \*\*\* Laboratory Manager  
 Chemistry & Microbiology

## APPENDIX F

### ACWA Power Framework HSSE Management System



# ACWA Power HSSE Management System Framework

## Document Revision and Approval

| Revision | Date     | Description  |
|----------|----------|--|
| 0        | 09/29/18 | ACWA Power HSSE Management System framework (First Issuance) |

|                 |   |
|-----------------|---|
| ACWA Power Ref: | AP-HSSE-SYS-FW-001                          |
| File:           | ACWA Power HSSE Management System Framework |

|              |  |       |            |            |                |
|--------------|--|-------|------------|------------|----------------|
| Developer    | Hammad Masood<br>GM – HSE Systems and Process  | Date: |            | Signatures |                |
| Reviewer I   | Umar Farooq<br>Process Safety Engineer   | Date: |            | Signatures |                |
| Reviewer II  | Dr. Rao Bankuru<br>Executive Manager –<br>Environment  | Date: |            | Signatures |                |
| Reviewer III | David Merriman<br>Sr. Exec Manager C&COM   | Date: |            | Signatures | David Merriman |
| Reviewer IV  | Rayan Mohammed Abdulghani<br>HSSE Director   | Date: |            | Signatures |                |
| Approver     | Thamer Al Sharhan<br>(on behalf of ACWA Power Exec.<br>HSE committee)<br>Managing Director – ACWA<br>Power | Date: | 26.11.2018 | Signatures |                |

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## 1. Definitions and Acronyms

### 1.1 Definition

| Sr.No. | Terms                                       | Definition   |
|--------|---|--|
| 1.     | ACWA Power HSSE MS                          | This term is interchangeable with ACWA Power HSSE Framework. The scope of ACWA Power HSSE MS includes Health, Safety, Security; Environment and Social aspects   |
| 2.     | ALARP<br>(As Low As Reasonably Practicable) | For guidance please refer to following link: <a href="http://www.hse.gov.uk/risk/theory/alarpglance.html">http://www.hse.gov.uk/risk/theory/alarpglance.html</a> |
| 3.     | One-off                                     | This refers to a task which is not recurring.  |
| 4.     | Across Project Lifecycle                    | This refers to the entire length of the project stretched across design all the way to operations phase and decommissioning where applicable                     |
| 5.     | Site  | Refers to facility in operation  |
| 6.     | Project                                     | Refers to facility under construction  |

### 1.2 Acronyms

| Acronym      | Definition / Explanation  |
|--------------|---|
| ALARP        | As Low As Reasonable Practicable  |
| BD           | Business Development  |
| BU           | Business Unit   |
| C&Com        | Construction and commissioning  |
| CEMP         | Construction Environmental Management Plan                                |
| CEO          | Chief Executive Officer   |
| EAIR         | Environmental Aspect & Impact Register                                    |
| EMCP         | Environmental Management Compliance Program                               |
| EMO          | Executive Management Officer  |
| EPCC         | Engineering, Procurement, Construction and Commissioning                  |
| ESAP         | Environmental and Social Action Plan                                      |
| ESIA         | Environmental and Social Impact Assessment                                |
| HAZCON       | Hazard – Construction   |
| HAZID        | Hazard Identification   |
| HAZOP        | Hazard Operability  |
| HSSE MS      | Health Safety, Security and Environment Management System                 |
| HSSE and CSR | Health, Safety, Security, Environment and Corporate Social Responsibility |
| HV           | High Voltage  |
| ICOD         | Intermediate Commercial Operation Day                                     |
| JSA          | Job Safety Analysis   |

|        |   |
|--------|---|
| KPI    | Key Performance Indicator                 |
| MD     | Management Director                       |
| MFS    | Minimum Functional Specification          |
| MOC    | Management of Change                      |
| MS     | Management System                         |
| MSW    | Management Safety Walkthrough             |
| MV     | Medium Voltage                            |
| O&M    | Operations and Maintenance                |
| OEMP   | Operational Environmental Management Plan |
| OM     | Operations Manager                        |
| OTS    | Owner Technical Specification             |
| PC     | Project Company                           |
| PGM    | Plant General Manager                     |
| PTW    | Permit to Work                            |
| QRA    | Quantitative Risk Analysis                |
| SIMOPS | Simultaneous Operations                   |
| SVA    | Security Vulnerability Analysis           |
| T&PE   | Technical and Project Execution           |

## 2. Introduction

At its core, ACWA Power develops, invests, co-owns, and operates a portfolio of Power generation and desalinated water production plants currently with presence in more than 10 countries including in the Middle East and North Africa, Southern Africa and South-East Asia regions.

The Company is registered and headquartered in the Kingdom of Saudi Arabia. ACWA Power operates voluntarily under global standards of corporate governance and risk management, to ensure reliability and trust with all key stakeholders.

During the feasibility assessment and development or acquisition phases for new assets, HSSE issues are identified and managed by undertaking HSSE due diligence assessments, such as Environmental and Social Impact Assessment (ESIA). Asset performance-related and technical issues with HSSE consequences are covered by ACWA Power's minimum functional specifications which are applied to all projects and are based on ensuring compliance with local legislation and other stakeholders' requirements such as lenders and off-takers.

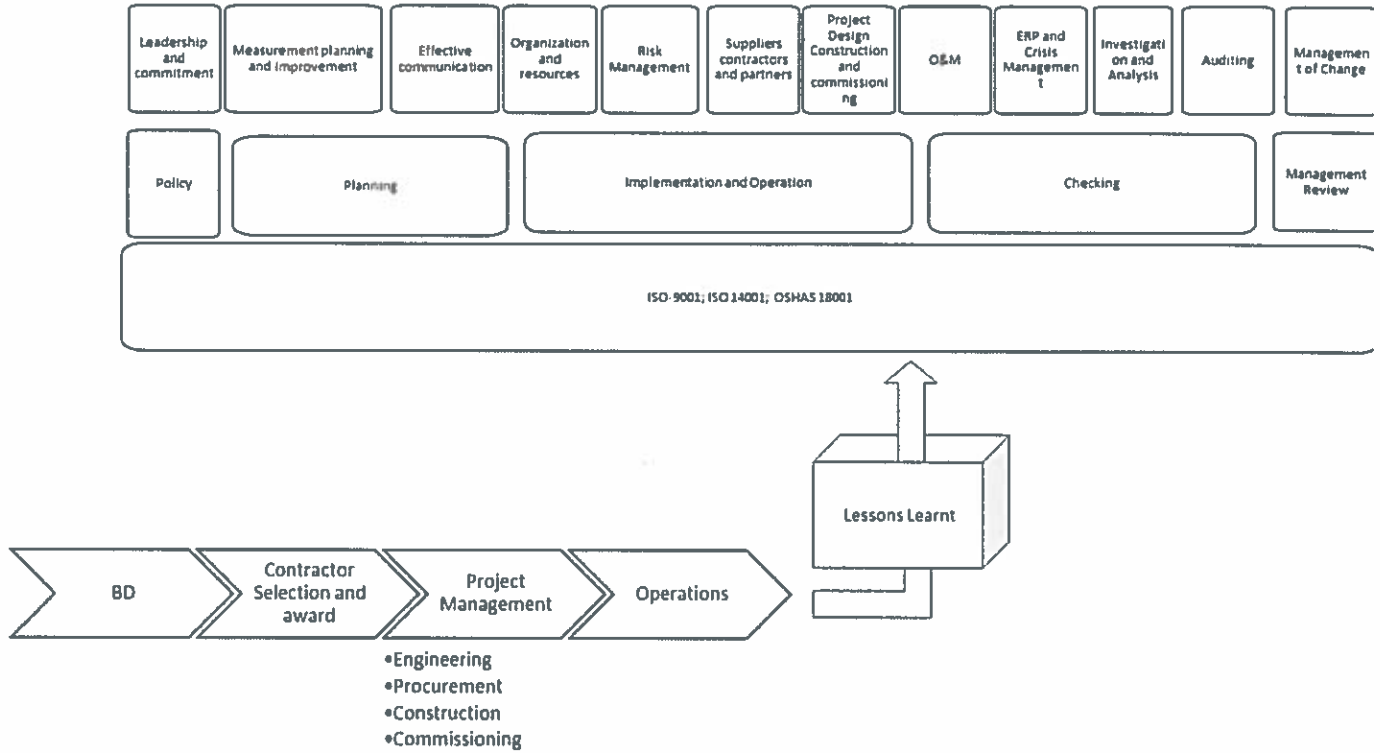
### 2.1 Purpose

The purpose of this document is to provide an overarching framework for all the above phases and set out the key requirements across the project lifecycle. The framework consists of 12 elements with a focus on:

- Provide a risk-based framework, consistent with ACWA Power HSSE and CSR policy, and with ISO 45001, ISO 14001 other internationally recognized standards, that support its implementation. Refer Figure-1 for pictorial demonstration of ACWA Power HSSE management system.

- Ensure a consistent approach to hazard identification, risk management, and promoting continual performance improvement.
- Set out HSSE performance requirements and provide auditable criteria, against which the performance can be measured.

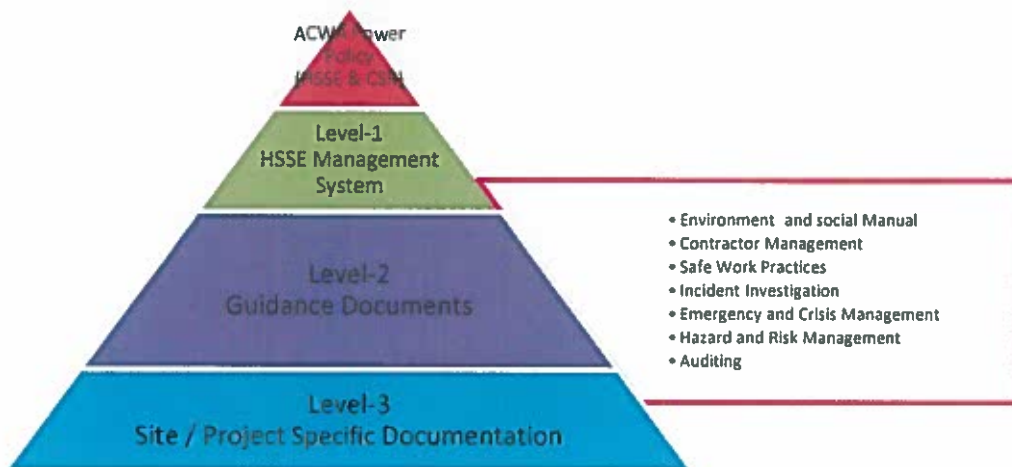
**Figure 1. ACWA Power HSSE FRAMEWORK**



### 3 SCOPE

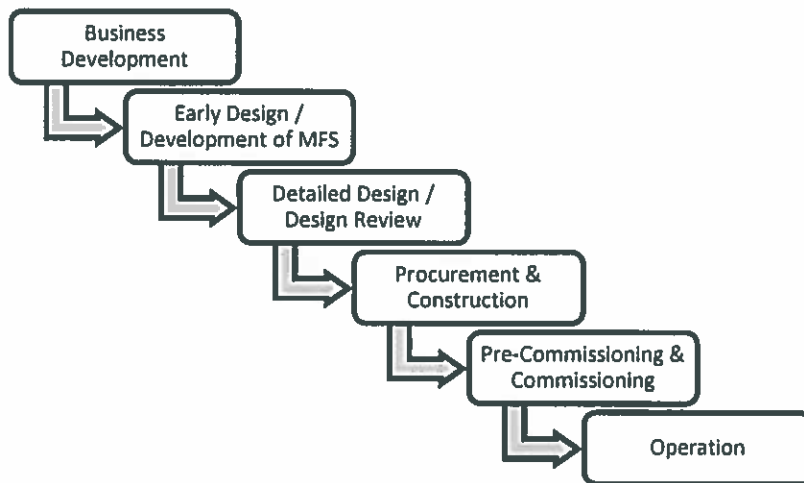
This document shall be considered as Level-1 document in the hierarchy of ACWA Power HSSE document structure. The document describes the minimum requirements across twelve elements, where required individual element shall be supplemented with detailed guidance. This may include but not limited to Environment and Social Management Manual; Contractor Management Guidance; Internal Reporting Procedure. The following diagram indicates the typical hierarchy of ACWA Power HSSE Management System documentation

**Figure 2. ACWA Power HSSE Document Hierarchy**



The scope of this documents applies to all ACWA Power functions such as Project Management, Design Reviews, Business Development, EPCC (Engineering, Procurement, Construction and Commissioning) Management and the associated activities for all types of power and desalination facilities.

**Figure 3. Typical Project Lifecycle**



## **4 Roles and responsibilities**

HSSE at ACWA Power is a shared responsibility which is driven from the top and shared by every function and individual in every capacity. The roles and responsibilities listed below reflect the complete ACWA Power organization supported by HSSE. However, for each element of ACWA Power HSSE management system, there are key performance requirements which have specific deliverables. The responsibility to achieve such deliverables is set out more fully in section-5 of this document.

### **4.1 ACWA Power**

#### **4.1.1 Executive Management**

- Participate in establishing HSSE, CSR policies and objectives.
- Ensure the effective communication and implementation of ACWA Power HSSE framework.
- Ensure overall compliance with the requirements of standards where applicable.
- Ensure appropriate focus on continual improvement and customer satisfaction, in relation to Health, Safety, Security, Environment and social matters.
- Evaluate the continued suitability and effectiveness of the HSSE MS.
- Review of HSSE and CSR KPI's and performance against strategic plans at regular intervals.
- Ensure accountability for the effectiveness of the environmental management system by setting up KPIs for all the controlled projects. For controlled sites, obtain alignment with the board of the Project Company to set similar HSSE and CSR KPIs.
- Communicate the importance of effective HSSE management system and of conforming to the HSSE management system requirements.
- Direct and support persons to contribute to the effectiveness of the HSSE management system Promoting continual improvement.
- Support other relevant management roles to demonstrate leadership as it applies to their areas of responsibility.
- Review and ratify the corporate performance indicators.

#### **4.1.2 HSSE Director**

- Ensure relevant requirements of the HSSE MS are effectively communicated.
- Ensure the required resources are provided to implement the HSSE MS.
- Maintain and monitor the effective implementation of the HSSE MS.
- Review the HSSE performance periodically and identify opportunities to improve.
- Promote awareness of individual responsibilities for implementation of safe working practices and environmental controls throughout the organization.
- Support other relevant management roles to demonstrate their leadership as it applies to their areas of responsibility.
- Propose corporate yearly performance indicators to the executive management for continuous improvement in the safety culture across the organization.

#### **4.1.3 HSSE Corporate Team**

- Develop supporting procedures, guidelines, forms / checklists to support the establishment of effective HSSE Management System to suit respective business unit operations.

- Support / cascade HSSE MS requirements while establishing Project HSSE Management system for implementation.
- Support and advise BD, Legal, Portfolio Management and T&PE department on the various HSSE issues/ requirements.
- Liaise with Project Company (both controlled and monitored sites) to ensure that all project specific HSSE requirements are addressed in the project specific HSSE MS.
- Interact and provide required support to various internal functional departments (e.g. Sub contracts, Proposals, Procurement, Engineering etc.) on HSSE issues.
- Develop improvement plans and coordinate with Projects for implementation and to achieve continual improvement.

#### 4.1.4 Site HSSE Management Team (Projects)

- Ensure development of Project specific HSSE, CSR and other plans & procedures in line with ACWA Power, Lenders and off takers HSSE MS requirements.
- Ensure executing all aspects of HSSE requirements in accordance with the Project HSSE plan, contract, scope of work and the regulatory framework applicable.
- Ensure all risks and opportunities associated with scope of work are analyzed and controls are implemented effectively.
- Provide day to day support and advice on HSSE issues to the Project / Construction Management.
- Establish and implement an effective communication strategy for HSSE.
- Measure, monitor and report HSSE performance to the corporate level in accordance with ACWA Power performance indicators and reporting procedure [reference 7.9]
- Responsible for achieving the project / site HSSE Key Performance Indicators.

#### 4.1.5 Line Management

HSSE is a line management responsibility. Key responsibilities include:

- Implement the requirements of the HSSE MS.
- Supervise and monitor the HSSE MS implementation and ensure work are executed in accordance with its requirements.
- Demonstrate leadership and commitment to continual improvement of HSSE performance.
- Provide necessary resources and budget for effective HSSE MS implementation.
- Fully support the implementation of all the HSSE procedures.
- Ensure corporate KPIs are cascaded in site / project KPIs
- Accountable for achieving the project / site Key Performance Indicators.

#### 4.1.6 All Employees

- All staff and contractors are expected to support the Company Policies, vision, values, objectives and comply with all policies, standards, procedures and the guidelines mentioned in this document.
- Employees are required to take responsibility not only for themselves, but also for colleagues and others who may be affected by their actions.
- Employees are required to continually assess the risks and opportunities inherent in any operation, implement a safe system of work and ensure it is maintained.
- Employees are expected to intervene and where appropriate stop any unsafe work activity or situation.



## 5 ACWA Power HSSE, CSR Management System Elements and Requirements

ACWA Power HSSE MS has 12 standard elements. These standard elements summarize the ACWA Power HSSE performance expectations and are explained in detail in the following sections.

|            |  |
|------------|--|
| Element 1  | Leadership Commitment                          |
| Element 2  | Measurement, Planning and Improvement          |
| Element 3  | Effective Communication                        |
| Element 4  | Organization and Resources                     |
| Element 5  | Risk Management                                |
| Element 6  | Suppliers, Contractors and Partners            |
| Element 7  | Project Design, Construction and Commissioning |
| Element 8  | Operations and Maintenance                     |
| Element 9  | Emergency Response and Crisis Management       |
| Element 10 | Incident Investigation and Analysis            |
| Element 11 | Auditing                                       |
| Element 12 | Management of Change                           |

### 5.1 Element 1: Leadership Commitment

The foundation of ACWA Power HSSE MS is leadership and commitment. All ACWA Power, Project Company employees and contractors understand their accountabilities, demonstrate leadership and commitment in pursuing the goal of zero harm culture through effective management.

#### 5.1.1 Requirements

- Demonstrate visible commitment, personal responsibility and take accountability for the effectiveness of HSSE MS.
- Integrate HSSE MS into the business processes and provide direction, support adequate resources (both physical and financial) needed for effective development, operation, review, maintenance and improvement of HSSE requirements to meet HSSE MS Standards / HSSE policy objectives.
- Support and implement CSR activities.
- Proactively engage in HSSE initiatives such as site visits, inspections, reviews, trainings, reward and recognition schemes, leading incident investigations, etc.
- Identify clearly individual roles, responsibilities, authorities and accountabilities for HSSE and communicate to all levels of employees.
- Train management and leadership positions to ensure they are competent to provide leadership in HSSE.
- Implement appropriate processes to recognize good HSSE performance by the individuals or Project Companies and apply consequence management where the behaviors do not meet requirements.
- Ensure the policy provides a framework for setting environmental objectives and includes a commitment protection of the environment, prevention of pollution and other specific

- commitments relevant to the context of the organization.
- Promote continual improvement.

### 5.1.2 Key Processes / Performance Measures

| 1    | Leadership and Commitment Requirement   | Who                          | When / Frequency             | Deliverable                           |
|------|---|------------------------------|------------------------------|---------------------------------------|
| 1.1  | A documented and an effectively communicated HSSE & CSR Policy  | Exec- HSE Committee Chairman | Available at all times       | Signed Policy Document                |
| 1.2  | HSSE & CSR Commitment Statement developed by the Project Management at each project / site.   | EMO                          | Before iCOD                  | Commitment Statement                  |
| 1.3  | Demonstration of HSSE leadership through personal actions, HSSE input into meetings, reviews, HSSE tours and active HSSE intervention | Exec- HSE Committee; EMOs    | Across Project lifecycle     | Formal Documented MSW records         |
| 1.4  | Evidence of implementation of HSSE programs / initiatives to achieve HSSE policy objectives   | HSSE Director                | Yearly                       | Internal Audit Report                 |
| 1.5  | Set CSR objectives and integrate both HSSE and CSR objectives to people performance   | Exec- HSE Committee; EMOs    | Yearly                       | Safety KPI for EMO / Project Director |
| 1.6  | Leadership workshop conducted annually to share HSSE lessons learned  | HSSE Core Team               | Yearly                       | Workshop                              |
| 1.7  | Ensure process safety requirements are adequately covered in MFS to ensure risks are managed within ALARP                             | GM-HSE Systems / T&PE        | Before award of EPC contract | HSE requirements document             |
| 1.8  | Assign adequate resources to review the design integrity and operational excellence at various stages of the project                  | T&PE                         | Across Project lifecycle     | Team names                            |
| 1.9  | HSSE Organization structure is in place for each Project Company and at each project / site.  | Project Director             | Across Project lifecycle     | HSSE Lead and Team                    |
| 1.10 | Structured HSSE Meetings are conducted all the projects / site.   | EMO / PGM                    | Monthly                      | HSSE Meeting Records                  |

## 5.2 Element 2: Measurement, Planning and Improvement

To ensure achievement of ACWA Power HSSE policies requirements by maintaining effective standards, set appropriate objectives and targets that are compatible with the strategic direction.

### 5.2.1 Requirements

- Establish and implement effective HSSE MS, which is in line with HSSE Framework standard elements to control the risks, processes and activities associated with the Business Unit activities.
- Ensure HSSE objectives are measurable, consistent with policy, controlled, communicated and maintained up to date.
- Ensure HSSE Management Plan documentation is maintained and kept up to date and controlled.
- Communicate ACWA Power HSSE policies to all employees, contractors and all other stakeholders.
- Establish HSSE objectives that are aligned with HSSE objectives and in line with BU activities, considering its risks, opportunities and associated compliance obligations.
- Ensure for every site / project the HSSE improvement plan is developed and reviewed.
- Identify HSSE Key Performance Indicators (Leading and Lagging) for the Business Unit is in line

with the HSSE objectives and cascade them up to site/ project level for implementation.

- Implement formal schedule for leadership meetings to review performance against objectives and targets and review the HSSE improvement plan periodically.
- Ensure compliance obligations are identified and documented for each of the country which the Project Company (PC) has the operations and ensure relevant legal are compiled at each project /site.

### 5.2.2 Key Processes / Performance Measures

| 2   | Measurement & Continuous Improvement Requirement  | Who                       | When / Frequency                    | Deliverable   |
|-----|---|---------------------------|-------------------------------------|---|
| 2.1 | Project specific HSSE Management plan / system is developed.  | EMO / PGM                 | Start of Construction / Before ICOD | 1. For Construction & Commissioning<br>2. For operation |
| 2.2 | HSSE MS documentation is reviewed, updated and maintained   | Project HSSE              | Across Project lifecycle            | Corporate HSSE Audit Report                             |
| 2.3 | HSSE Policies are communicated effectively through Inductions etc.,   | EMO / PGM                 | Across Project lifecycle            | Communication / Job description                         |
| 2.4 | Project specific HSSE Objectives and KPI's are established and monitored. Individual site / project objectives must be aligned with ACWA Power corporate objectives / KPIs. | HSSE Director / EMO / PGM | Yearly                              | Site HSSE objectives                                    |
| 2.5 | HSSE KPI's are cascaded to project / site and performance monitored on monthly basis as a minimum.  | EMO / PGM                 | Monthly                             | Corporate HSSE Report                                   |
| 2.6 | HSSE Plans are developed for each project / site considering ACWA Power HSSE MS and applicable off-taker HSSE MS requirements.  | Project HSSE              | Before Each Project Phase           | Project HSSE plan                                       |
| 2.7 | 'HSSE Records' are maintained as per the procedure at each project /site.   | Project HSSE              | Across Project lifecycle            | HSSE records  |

### 5.3 Element 3: Effective Communication

To maintain effective, transparent open communication and consultation with leadership, work force, off takers, communities and stakeholders associated with ACWA Power's activities.

#### 5.3.1 Requirements

- Ensure HSSE policies, objectives and targets related information is communicated to all interested parties such as employees, subcontractors (including visitors, workers) and external stakeholders on a regular basis with mechanisms provided for consultation and / or feedback.
- Establish an effective mechanism for internal and external communications with all interested parties and assess the effectiveness of the process regularly.
- Ensure mechanism is in place to register employee and stakeholder grievances.
- Ensure implementation of structured communication and consultation mechanisms including but is not limited to tool box talks, safety alerts, HSSE meetings, use of HSE software to report safety observations etc. at each of the project / site at all levels and functions.
- Establish and maintain safety committees for each of the project / site.
- Establish and maintain systems to encourage participation of employees, subcontractors and all stakeholders in HSSE matters such as hazard identification, risk assessments, determination of controls, incident investigation.

- Ensure lessons learned from all incidents and near misses are shared across the ACWA Power portfolio towards continual improvement.

### 5.3.2 Key Processes / Performance Measures

| 3   | Effective Communication Requirement   | Who                  | When / Frequency         | Deliverable                    |
|-----|---|----------------------|--------------------------|--------------------------------|
| 3.1 | HSSE Tool box talks are conducted at each project/ site ensure that hazards associated with job are effectively communicated.                 | Project HSSE         | Across project lifecycle | Tool Box Talks                 |
| 3.2 | HSSE Alerts are issued using group 'Lessons Learned' portal.  | Corporate HSSE       | Across project lifecycle | Lessons Learnt                 |
| 3.3 | All incidents / observations are recorded ' to share information.   | All                  | Across project lifecycle | Incident / Safety Observations |
| 3.4 | A mechanism is in place to register employees and other stakeholder grievances.   | Executive Management | Across project lifecycle | Information Portal             |
| 3.5 | HSSE integrated organization to be developed by establishing committees at different levels which connect the executives to grass root level. | PGM / EMO            | Across project lifecycle | HSSE Committees MOM            |

### 5.4 Element 4: Organization & Resources

To define, document and communicate the roles and responsibilities, authorities and necessary interrelations to implement HSSE MS. Employees, subcontractors and visitors are aware of all relevant HSSE requirements, hazards, risks and controls, and are trained and competent to conduct their activities safely.

#### 5.4.1 Requirements

- Ensure to provide required HSSE resources to support project / site to conduct activities safely.
- Develop Job descriptions for various HSSE and line management positions describing clear roles, responsibilities and accountabilities for HSSE.
- Establish and maintain role specific HSSE competency requirements / matrix for various HSSE and line management positions.
- Conduct periodic competency evaluations to identify HSSE training needs.
- Ensure personnel employed for specific job positions meeting the requirements of competency criteria, health or medical standards and any regulatory or license conditions as applicable.
- Determine training needs associated and the necessary competence that affects ACWA Power HSSE performance and its ability to fulfil its compliance obligations.
- Develop required HSSE training modules based on the critical tasks, personnel HSSE competencies and risk associated with the activities undertaken by the each of the BU.
- Provide HSSE inductions and trainings to all employees, contractors and visitors at each project / site and assess the effectiveness of HSSE trainings provided to improve where needed.

#### 5.4.2 Key Processes / Performance Measures

| 4   | Organization and Resources Requirement                | Who           | When / Frequency     | Deliverable      |
|-----|---|---------------|----------------------|------------------|
| 4.1 | HSSE Job Descriptions are developed and communicated. | HSSE Director | One-off Document (to | Job Descriptions |

|     |  |                  |  |                    |
|-----|--|------------------|--|--------------------|
|     |  |                  | be updated in case of change in HSE organization or 3 years frequency, whichever comes first |                    |
| 4.2 | HSSE competency matrix is developed and competency assessments are conducted for various HSSE and line management positions. | Training Manager | Across project lifecycle   | Competence Matrix  |
| 4.3 | HSSE training modules are developed and delivered.   | Training Manager | Biennial review of effectiveness and coverage of training modules                            | E-Learning Modules |
| 4.4 | Medical screening and fitness to work process implemented effectively.   | Project HSSE     | Across project lifecycle   | Medical Records    |

## 5.5 Element 5: Risk Management

To identify hazards, associated risks and opportunities and to ensure they are assessed and managed to reduce the risk to ALARP. Risks to the business from HSSE aspects, external issues, environmental conditions, needs and expectations of interested parties, compliance obligations are determined, and actions are taken to properly control the impacts on the organization.

### 5.5.1 Requirements

- Determine the risks, opportunities from significant aspects, compliance obligations, issues, needs and expectations of interested parties.
- Determine the actions for addressing the risks, opportunities to achieve intended outcome that follows obligations and objectives.
- Identify and evaluate HSSE aspects associated with all activities, processes / operations, products and services, considering the life cycle stages.
- Implement hazard management standards (methodologies / procedures) consistently and to ensure comprehensive assessments of HSSE hazards / aspects.
- Ensure HSSE studies / workshops / risk assessments are conducted by competent personnel for each of the project / site at appropriate stage of project cycle to identify potential hazards are managed by implementing appropriate mitigation measures to reduce the risk to an acceptable level.
- **Environmental Aspect and Impact:** Project Company, EPC and O&M shall identify, conduct environmental and social aspects & impacts assessment (EAIR) during the construction and operational phase based on respective site activities (list of processes), local regulatory authorities and lenders requirements. All identified significant environmental aspects must be treated and handled in compliance with legal body, lenders requirements and other applicable standards if any. For uncontrolled significant aspects if any, emergency response plan must be placed on site. The existing aspects to be evaluated every year to determine the adequacy and whether there are new aspects need to be added and controlled or if there are existing aspects which have no longer negative impact (insignificant aspect).
- Develop risk hierarchy, establish risk acceptance criteria and authorization by the appropriate level with in site/ project.
- Establish, maintain and ensure that the actions mentioned in risk register are reviewed to track

- close out.
- Ensure to review and update the risk registers periodically following any significant incidents / any changes occur.
- Establish responsibilities, time frame for close-out of corrective actions and follow-up actions from various risk assessments / studies.
- Ensure control measures identified in the risk assessments are communicated and implemented effectively.

### 5.5.2 Key Processes / Performance Measures

| 5   | Hazard Identification and risk management requirement   | Who   | When / Frequency  | Deliverable                                |
|-----|---|---|---|--|
| 5.1 | Required HSSE assessments/ studies (HAZID, ESIA, HAZCON, SIMOPS etc.,) conducted to identify the major hazards, associated controls and demonstration of ALARP. | T&PE  | During design phase   | Risk Assessment Study Reports              |
| 5.2 | Risk registers / hazard and effects registers developed for each phase. This includes process and operational hazards.  | EMO / PGM   | Across project lifecycle                                    | HIRA                                       |
| 5.3 | Environment aspect Impact registers developed for each phase.   | EMO / PGM   | Across project lifecycle                                    | EIA Register                               |
| 5.4 | Risk assessments / JHA's developed for all the activities for safe execution of work (Non-technical risk assessments)   | Project Director (During Const. and comm.)<br>EMO / PGM (O&M Phase) | For each work during implementation                         | Permit to Work                             |
| 5.5 | Safety critical controls / barriers and devices have been identified and managed appropriately.   | Project Director (During Const. and comm.)<br>EMO / PGM (O&M Phase) | Across project lifecycle                                    | Safety Critical Equipment and control list |
| 5.6 | Security threat and vulnerability assessments conducted for locations where applicable considering risk and local legislations                                  | Project Director / T&PE   | Before Construction   | SVA Study                                  |
| 5.7 | Environment and Social Impact Assessment study to be carried out and handed over to EPC where applicable.   | HSSE C&Com Manager<br>EMO (Post ICOD) for O&M                       | Before Construction<br>Ensure compliance after construction | ESIA study                                 |
| 5.8 | Control measures are communicated and implemented effectively.  | EMO / PGM   | Across project lifecycle                                    | Communication Records                      |
| 5.9 | Permit to work implemented at each of the project /site.  | EMO / PGM   | Across project lifecycle                                    | Safety Rules                               |

### 5.6 Element 6: Contractor Management

To ensure the contracting of services, purchase, hire or lease of equipment and materials; and activities associated with third parties are controlled within HSSE requirement to minimize any adverse HSSE consequences.

For Establishing, maintaining and implementing operational controls, to cover situations where their absence could lead to deviations from the HSSE policy, objectives and compliance obligations.

#### 5.6.1 Requirements

- Ensure the level of HSSE risks and opportunities associated with services, contracts, agreements or partnerships are assessed appropriately.
- Develop and implement an effective contractor management standard that includes:



Planning > HSSE prequalification assessment > Tender evaluation and award > Pre-mobilization > Mobilization and start up execution > Close out

- Provide clear HSSE expectations / requirements within the contracts / agreements / purchase orders etc., which must contain the relevant HSSE requirements in consistent with life cycle perspective.
- Manage interfaces effectively between various organizations providing various services.
- Ensure bridging documentation commensurate with the nature of the contract is established, approved, in place and formally communicated to relevant parties prior to execution of the services in the contract.
- Ensure that the equipment and materials used in ACWA Power activities are fit for purpose, inspected and approved for use by technically competent personnel and compliant with HSSE requirements considering life cycle stages.

### 5.6.2 Key Processes / Performance Measures

- Contractor HSSE management standard is developed.
- Pre-qualification and due diligence assessments on potential contractors / suppliers / vendors is done and data base is developed.
- HSSE requirements for contractors / suppliers / vendors are reviewed and included within each contract / purchase order as applicable.
- Effective 'Interface management' implemented.
- Periodic HSSE performance evaluations are conducted on each of the sub-contractor for the scope of work.
- Final close out evaluation is done on sub-contractors and feedback maintained in database.

| 6   | Contractor HSSE Management Requirement   | Who   | When / Frequency                               | Deliverable                      |
|-----|--|---|--|----------------------------------|
| 6.1 | Contractor HSSE Management Standard is developed.  | GM-HSE Systems and Processes                  | One-off Document (to be updated every 3 years) | Contractor Management Standard   |
| 6.2 | HSSE Requirements for contractors / suppliers / vendors are reviewed and included with each contract / purchase order as applicable. | HSSE C&Com Manager<br>EMO (Post ICOD) for O&M | Before Mobilization                            | HSSE Requirement for contractors |
| 6.3 | Pre-qualification and due diligence assessments of potential contractors / suppliers / vendors are done from HSSE perspective.       | HSSE C&Com Manager<br>EMO (Post ICOD) for O&M | During Pre-qualification phase                 | Contractor due diligence records |
| 6.5 | Periodic HSSE Performance evaluations are conducted on each of the contractor for the scope of work.                                 | Project HSSE                                  | As specified in Contractor Mgt Standard        | Contractor HSSE evaluation form  |
| 6.6 | Final close out evaluation is done on contractors and feedback maintained in database.   | Project HSSE                                  | After demobilization                           | Performance Appraisal            |

### 5.7 Element 7: Project Design, Construction and Commissioning

To design the facilities giving the highest priority to facilities integrity and to all HSSE design considerations to ensure an inherent safe design and risk is reduced to ALARP.

To construct and commission the site / project with HSSE as a priority and to ensure standards are met at each critical stage.

To plan operational controls considering interested parties' requirements, life cycle perspective which covers design, delivery, use and end of life treatment.

**Environmental Monitoring and Control:** Environmental procedures and plans shall be prepared and implemented which covers all environmental attributes (land, water, air, flora and fauna, archaeology, cultural heritage and social issues) during construction, commissioning and operational phase based on respective site activities, applicable local environmental regulations and lenders' requirements.

### 5.7.1 Requirements

#### a) Project Design

- Develop, approve, maintain, and use current standards, specifications, and practices that are appropriately:
  - ✓ Conform to applicable national & international standards;
  - ✓ Conform to good / acceptable engineering standards;
  - ✓ Address regulatory requirements or codes.
- Develop / approve and maintain methodologies and software's for various HSSE studies / assessments (HAZID, HAZOP, SIL etc.) to be undertaken for inherent safe design of the facilities.
- Ensure various HSSE studies and assessments are executed by the qualified personnel.
- Ensure to engage a third party audit to conduct a comprehensive study on environmental and social impact assessment (ESIA) report for new projects (advanced stage / expansion) to obtain environmental permit / clearance certificate / approval from local legal body to construct and operate power generation and desalination plants. Ensure to meet local environmental regulations during project activities. Lenders requirements shall be considered in ESIA report during the assessment study.
- Develop legal and regulatory compliance obligations register.
- Implement design reviews for constructability, operability and maintainability of plant, equipment and systems to ensure HSSE risks and opportunities are effectively identified, addressed and documented.

#### b) Construction and Commissioning

- Ensure to develop and implement project specific HSSE plans for the various phases (construction and commissioning) of the work activities undertaken at project / site.
- Ensure required safe operating procedures for various phases (construction / commissioning) are developed, documented and implemented consistently.
- Develop a safe system of work (permit to work) and implement consistently at each project / site.
- Identify and comply with the applicable legal / regulatory requirements for the various phases (construction / commissioning) work activities undertaken at each of the project /site.

- Ensure to develop interface management and transition plans between different phases of the project life cycle to have proper coordination and management of change of responsibilities, SIMOPS etc., effectively.
- Ensure lessons learned from previous projects, current operations are taken into consideration while executing to improve the HSSE performance.
- Ensure formal information management plan has been set up before commencing the engineering phase to capture all project specific information.

### 5.7.2 Key Processes / Performance Measures

| 7    | Build, commissioning and operational requirement   | Who                     | When / Frequency                            | Deliverable   |
|------|--|-------------------------|---|---|
| 7.1  | HSE Design philosophy developed for projects. The design philosophy shall include but not limited to identification of major hazards and associated controls. Firefighting philosophy, waste / effluent / emission management, security vulnerability, environmental aspects | T&PE / project Director | Before Detailed Design                      | HSE design philosophy   |
| 7.2  | Identify and understand legal, statutory requirements which are applicable for each phase  | Project director        | for each phase                              | HSSE related laws and regulations register                                      |
| 7.3  | PC ensure to obtain Environmental Permits for construction and operation from local environmental authorities  | EMO                     | Before project start                        | Issuance of Environmental permit from local environmental authority             |
| 7.4  | PC ensure to facilitate third party audit to conduct Environmental and Social Impact Assessment (ESIA) and approved by local regulatory authority  | EMO                     | Before project start                        | ESIA Report   |
| 7.5  | Ensure all safety critical elements such as high speed rotating equipment, pressurized vessels, safety valves, UPS, DCS are designed in line with fit for purpose performance standards  | T&PE / Project Director | Before detailed design                      | Performance Standard - SCE  |
| 7.6  | Ensure all changes in the project across project lifecycle are managed through MOC. All changes to be formally assessed for risk and informed to all relevant stakeholders   | T&PE / Project Director | Across project lifecycle                    | Change Management Record  |
| 7.7  | Ensure quality assurance and control plan is in place and effectively implemented  | T&PE / Project Director | QA / QC Plan and associated documentation   | Quality Assurance Plan  |
| 7.8  | Operability and Maintainability review has been carried out  | T&PE                    | During detailed design                      | O&M review study  |
| 7.9  | HSSE compliance obligations registers developed for each project / site and compliance at all the phases are monitored   | EMO                     | Across project lifecycle                    | Legal register (covering all requirements of construction / commissioning / OM) |
| 7.10 | Formal documentation is in place to ensure that all requirements has been achieved before transitioning from one phase to another. Most importantly a formal pre-startup safety review has been done before ICOD.  | T&PE / Project Director | Before entering new phase post design phase | Process safety information package (mechanical dossier, As-built drawings etc.) |
| 7.11 | Interface management is developed and implemented to ensure all project stakeholders are informed and managed effectively related to project documentation   | T&PE / Project Director | Before commencing the design phase          | Stakeholder Management Plan   |
| 7.12 | Construction Environmental Management Plan developed and implemented by PC / EPC   | C&Com Manager           | Project life cycle                          | CEMP plan approved by Project Director  |

## 5.8 Element 8: Operation and Maintenance

To ensure facilities are operated, maintained, inspected and tested using systems and procedures that manage risks and opportunities in consistent with life cycle perspective.

### 5.8.1 Requirements

- Develop and implement project / site specific operating and maintenance procedures and are made available in a language understood by users.
- Ensure personnel are trained and competent to use the procedures.
- Ensure plant and equipment are operated and maintained according to design data, operating criteria, performance standards, manufacturer and vendor specifications and ACWA Power HSSE controls.
- Ensure HSSE critical elements within facilities are identified, designed, procured and installed with due consideration to their service requirements throughout their life cycle stages.
- Develop processes to review integrity failures to identify performance trends that may require corrective action, including design changes or modifications.
- Ensure operational environmental and social management plan is adhered in line with local statutory and lenders' requirements.
- Develop interface management and transition plans between different phases of the project life cycle. (Commissioning > Operations > Maintenance)
- Ensure effective implementation of safety rules (permit to work / lock out and tag out) and controls to work on all types of equipment.
- Ensure there is a mechanism to manage Major Accident Hazards and a framework in place to progressively step towards operational excellence.

### 5.8.2 Key Processes / Performance Measures

| 8   | O&M Requirement  | Who       | When / Frequency  | Deliverable                                       |
|-----|--|-----------|---|---|
| 8.1 | Operating and maintenance procedures developed and implemented.  | EMO / PGM | 1 month before ICOD   | Operation procedures, Maintenance routines in SAP |
| 8.2 | HSSE compliance obligations register developed and legal / regulatory compliance including other obligations are ensured.  | EMO / PGM | During O&M phase  | Certificates by external parties                  |
| 8.3 | Major hazards are identified, and their control / assurance regimes identified in CMMS and effectively implemented. Examples PSV testing, function testing of SIL rated SIS, Fire-fighting equipment function testing etc. | EMO / PGM | During O&M phase  | CMMS records                                      |
| 8.4 | Operational Environmental Management Plan developed and implemented by O&M.  | OM        | Project life cycle  | OEMP plan approved by PGM                         |
| 8.5 | 'SIMOPS' workshops conducted and control measures implemented (where applicable)   | EMO       | As and when required (if construction activities are to be performed in connection with live plant) | SIMOP study                                       |

|     |  |                         |                  |                   |
|-----|--|-------------------------|------------------|-------------------|
| 8.6 | Permit to work is effectively implemented which ensures that all the energy is isolated, job hazards are adequately identified and communicated; change in person is managed appropriately | EMO / PGM / HSE Manager | During O&M Phase | Safety Rules      |
| 8.7 | Ensure the as-built information is available for equipment, process (data sheets, P&IDs, mechanical drawings)  | EMO / PGM               | Before ICOD      | As-built drawings |
| 8.8 | Equipment criticality defined and protocol in place to ensure that functionality, reliability and availability of all critical equipment are intact  | EMO / PGM               | During O&M phase | CMMS records      |

## 5.9 Element 9: Emergency Response & Crisis Management

To ensure procedures and resources are in place to effectively respond to crisis and emergency situations. Emergency preparedness to be established for each type of reasonably foreseeable emergency situations which includes but is not limited to process related emergencies, civil unrest, situations arising from natural or climatic conditions, neighboring plants etc.

### 5.9.1 Requirements

- Ensure project / site develop Emergency Response Plans (ERP's), written in all applicable languages, consistent with the level of risk and before relevant activity (e.g. construction, commissioning, start-up, and office occupation). Ensure it suits needs of the projects. A specific and separate emergency response plan to be in place for operations phase.
- Ensure crisis and emergency response plans are based on a tiered approach dependent on the severity of the emergency.
- Ensure emergency response arrangements are communicated to all stakeholders including employees, contractors, government authorities, off takers, community and other relevant groups as required.
- Site evacuation plans are developed based on location (city / region / country) in accordance with emergency and crisis management plan
- Provide sufficient resources to execute the emergency response plans and business continuity plans effectively, e.g. adequate equipment, facilities, trained personnel and ensure these resources are identified and readily available.
- Establish clear responsibilities and accountabilities to deal with all emergencies.
- Regular drills and simulations to be carried out to ensure the readiness of equipment, facilities, and personnel.
- Ensure lessons learned from planning, drills, simulations, responses to actual incidents are learned and shared with ACWA Power, interested parties, relevant industry and community emergency response organizations.
- Communication strategy is implemented and exercised which entails the communication with external stakeholders including but not limited to regulators, media.

### 5.9.2 Key Processes / Performance Measures

| 9   | Emergency Planning and Response Requirement                    | Who                                  | When / Frequency                              | Deliverable       |
|-----|--|--------------------------------------|---|-------------------|
| 9.1 | Project specific emergency response plan developed and tested. | Project Director / EMO / ERP Manager | for each phase (document should be kept live) | Site specific ERP |

|     |   |                        |  |                         |
|-----|---|------------------------|--|-------------------------|
| 9.2 | Emergency response plans (site / Project) are tested via drills.  | Project Director / EMO | 2 drills each year   | Emergency drill records |
| 9.3 | Adequate emergency response resources provided at each site/ project which demonstrate that risk is managed within ALARP. | EMO                    | Across project lifecycle (starting construction all the way) | Site ERP                |
| 9.4 | Emergency response trainings provided at each location to ensure personnel competent to deal with emergencies.            | Project Director / EMO | Across project lifecycle (starting construction all the way) | ERT training records    |
| 9.5 | Ensure communication strategy with external stakeholders (regulators, lenders, media etc.) is in place and implemented    | EMO                    | Across project lifecycle (starting construction all the way) | ERP – Crisis plan       |

## 5.10 Element 10: Incident Investigation and Analysis

To ensure HSSE incidents are reported, investigated, analyzed, corrective actions are taken, and lessons learnt are shared.

### 5.10.1 Requirements

- Develop clear process / procedure for Incident reporting (separate for operational phase and pre-operational phase), investigating, analyzing and documenting all HSSE incidents including near misses.
- Establish clear protocols for first notification within the business unit and to the ACWA Power, based on the severity of the incidents.
- Ensure all HSSE incidents including near misses occurring on site / project / where ACWA Power employees are involved / where ACWA Power have controlling influence are reported, classified and investigated as per the procedure with an appropriate level of management involvement and independence.
- Ensure awareness of compliance with any statutory requirements for incident reporting to regulatory agencies in their areas of operations.
- Utilize ACWA Power HSE management software (Synergi Life) for reporting, recording all the incidents and follow up on corrective and preventive actions.
- Ensure to provide required trainings on incident reporting, investigation, analysis, RCA to the personnel at various levels within the business unit to ensure competency.
- Ensure information from incidents, emergencies are analyzed and identify trends and learnings.
- Utilize group wide 'Lessons Learned' database for sharing the lessons learned from each of the major incidents across all the site / project.

### 5.10.2 Key Processes / Performance Measures

| 10   | Incident Investigation requirement   | Who                                 | When / Frequency                                     | Deliverable                             |
|------|--|-------------------------------------|--|---|
| 10.1 | Incident reporting and investigation procedure developed and communicated. | HSSE Performance Reporting Engineer | One-off document (incident reporting procedure to be | ACWA Power Incident Reporting Procedure |



|      |   |                        |  |   |
|------|---|------------------------|--|---|
|      |   |                        | updated every 3 years)                     |   |
| 10.2 | Incident first notification and reporting' protocol developed and implemented taking into account any local / off-taker requirements      | Project Director / EMO | Before start of mobilization of contractor | Incident reporting procedure for construction and operation phase |
| 10.3 | All Incidents including near misses are investigated and reports are issued on time.  | Project Director / EMO | Across project lifecycle                   | Timely completion of incident reports                             |
| 10.4 | ACWA Power HSE management software (Synergi Life) is used for reporting, recording all the incidents and follow up on corrective actions. | All employees          | Across project lifecycle                   | Incident reports  |
| 10.5 | Corrective / preventive actions are closed as per the agreed time frame.  | EMO / PGM              | Across project lifecycle                   | Timely completion of incident recommendations / actions           |
| 10.6 | Group wide 'Lessons Learned' database used for sharing the lessons  | HSSE Director          | Across project lifecycle                   | Lessons Learnt  |

## 5.11 Element 11: Auditing

To monitor, audit and review HSSE performance and systems to measure progress, identify trends, assess compliance and drive continual improvement.

Develop a systematic approach for identifying nonconformity, analyzing the cause of the nonconformity, and taking corrective actions.

### 5.11.1 Requirements

- Ensure structured compliance assurance program (internal and external) is established and implemented that provides:
  - ✓ Evaluation of the effectiveness of HSSE MS implementation.
  - ✓ Compliance with HSSE policy, objectives and frame work requirements.
  - ✓ Compliance with applicable standards such as: ISO 14001 and ISO 45001 system requirements as applicable.
- Ensure at each project / site, HSSE system audits and inspections are conducted at frequencies commensurate with project / site complexity and the level of HSSE risks involved.
- Review findings identified during the audits, assessments, inspections and ensure appropriate corrective actions are identified based on the root causes.
- Ensure HSSE performance is reviewed formally by the PC management on a regular basis (pre-determined frequencies) at different levels.
- Evaluate the need for action to eliminate the causes of the nonconformity in order that it does not reoccur or occur elsewhere.
- Ensure each project report the HSSE performance on monthly basis and results shall be analyzed and communicated.
- Ensure HSSE performance including progress against HSE objectives, goals, and status of HSE KPI's, are regularly measured, monitored and recorded.
- Review the site / project HSSE improvement plans periodically based on the performance including effectiveness of corrective actions and identify the improvement actions to achieve

continual improvement.

### 5.11.2 Key Processes / Performance Measures

| 11   | Auditing requirement   | Who                                     | When / Frequency  | Deliverable                        |
|------|--|---|---|------------------------------------|
| 11.1 | HSSE audit procedure is developed and implemented.   | GM-HSE System & Processes               | One-off Document (capturing terms of reference. Document shall be reviewed every 3 years) | Internal Audit Document            |
| 11.2 | Compliance assurance schedule is developed and implemented at each site / project which includes internal and external Audits / inspections as applicable.     | HSSE Director                           | Yearly  | Audit Schedule                     |
| 11.3 | HSSEMS audits conducted by ACWA Power corporate office on each project/ site at least annually.  | Corporate HSSE                          | Yearly  | Audit Reports                      |
| 11.4 | Compliance checks for environmental requirements of legal and lenders  | Executive Manager- Environment; EMO/PGM | Before mobilization, during construction and operation                                    | Internal & External Audit Reports  |
| 11.5 | Comply environmental regulations and lenders requirements  | PC/EPC/O&M                              | Project life cycle  | Compliance report (legal register) |
| 11.6 | Action tracking register(s) established and maintained to monitor corrective actions by addressing root causes at corporate office and at each site / project. | Project HSSE                            | Monthly   | HSSE Performance Report            |
| 11.7 | HSSE Performance is reported on monthly basis and trends monitored.  | HSSE Performance Reporting Engineer     | Monthly   | HSSE Monthly Report                |
| 11.8 | HSSE Improvement plans developed (where required subject to assessment from audit) and monitored, identified to achieve continual improvement.                 | Project / Site HSSE                     | As and when required (Review of improvement plan on quarterly basis for applicable sites) | HSSE Improvement Plan              |

### 5.12 Element 12: Management of Change

All temporary and permanent changes are identified and managed to ensure HSSE risks arising from these changes remain at an acceptable level.

#### 5.12.1 Requirements

- Develop a Management of Change procedure which shall include the process for assessing permanent / temporary changes to equipment, operating processes, procedures, personnel, or where the potential for HSSE impact exists and identifying the action plan to control any adverse impact.
- Ensure all changes are subjected to risk assessment appropriate to the nature of the change and must include HSSE implications, interested parties' requirements, regulatory and standards compliance, etc. as applicable to the change requirement.
- Ensure risks including opportunities from a proposed change have been formally assessed and reviewed by competent technical and operational personnel.
- Establish and document approval authority levels commensurate with the risk of the change.

- Ensure the management of all proposed changes is documented from identification to satisfactory completion.
- Ensure documents, plans and records are updated to reflect changes, and that changes to these documents, plans and records are clearly identified.
- Ensure pre-startup safety review has been carried out prior to commence all major changes.
- Share lessons learned, both within the site / project and with other ACWA Power business units.

### 5.12.2 Key Processes / Performance Measures

| 12   | Requirement   | Who                                 | When / Frequency                             | Deliverable  |
|------|---|-------------------------------------|--|--------------|
| 12.1 | Management of change process developed                                      | GM-HSE System & processes           | MOC procedure (updated on 3 years frequency) | MOC Document |
| 12.2 | Level of Approval / Authorization for the change management is established. | T&PE / Project Director / EMO / PGM | Across Project lifecycle                     | MOC records  |
| 12.3 | Formal risk assessment on all MOC's conducted.                              | T&PE / Project Director / EMO / PGM | Across Project lifecycle                     | MOC records  |
| 12.4 | Required procedures, drawings are reviewed and updated.                     | T&PE / Project Director / EMO / PGM | Across Project lifecycle                     | MOC records  |
| 12.5 | Changes are effectively communicated.                                       | T&PE / Project Director / EMO / PGM | Across Project lifecycle                     | MOC records  |
| 12.6 | Lessons learned shared appropriately.                                       | T&PE / Project Director / EMO / PGM | Across Project lifecycle                     | MOC records  |

## 6 Records

## 7 References

- 7.1 ACWA Power HSSE and CSR Policy Statement
- 7.2 Environmental Protection Agency (EPA) - CFR-40
- 7.3 Centre for Chemical Process Safety (CCPS) [www.aiche.org/ccps](http://www.aiche.org/ccps)  
Guidelines for risk based process safety (RBPS) (April 2007).
- 7.4 British Standards Institution (BSI) [www.bsi-global.com](http://www.bsi-global.com)  
PAS 55 Asset management (2008).
- 7.5 Energy Institute (EI) [www.energyinst.org](http://www.energyinst.org)  
Technical workshop proceedings: Initial report – Framework for high-level process safety management (March 2010).
- 7.6 International Organization for Standardization (ISO) [www.iso.ch](http://www.iso.ch)  
ISO 9001 Quality management systems - Requirements (2008).
- 7.7 Office of Public Sector Information (OPSI) [www.opsi.gov.uk](http://www.opsi.gov.uk)  
Health and Safety at Work Act 1974 (HASAWA).
- 7.8 The Control of Major Accident Hazard Regulations 1999 (SI 1999/743) (as amended) (COMAH).

## 8. Revision History

| Revision Number | Revision Date | Details of changes |
|-----------------|---------------|--------------------|
| 00              |               | First issue        |

## APPENDIX G

### **E&S Disclosure Minutes and Records**



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# IBRI SOLAR IPP 2

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## PUBLIC DISCLOSURE AND MEETING NOTES

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DATE: 15 OCTOBER, 2019

YAHYA'S PROJECT REPRESENTATIVES:  
AHMED AL-AMRI AND HARDIK RAMAIYA

13- OCTOBER (PREVIOUS DAY) :

- Ahmed confirmed meeting with HE The Wali of Ibri for discussion on the public disclosure session via phone (Time: 12:30 PM).
- 5 Capitals confirmed to conduct the herder disclosure session as per lender requirements, RAP and SEP.
- Note: Ministry of Interior confirms Majilis Shura elections voting date for 27-october. Link below:  
<https://www.omanobserver.om/breaking-oman-majlis-a-shura-polls-date-announced/>

14- OCTOBER:

6:00 AM: YAHYA DEPARTS FOR IBRI FROM MUSCAT - 180 MINUTES

9:30 AM: MEETING WITH WALI 20 MINUTES

- Yahya thanked HE The Wali for allowing to meet at short notice with his busy schedule.
- Yahya submitted the ESIA, RAP, SEP and Arabic Non-Technical Summary (NTS) in hard copy and electronic CD to The Wali for his comments and review. The submission letter also requests him for facilitating the stakeholder disclosure meeting of the submitted documents (in Arabic, copy attached).
- Yahya briefed The Wali on the project company's financial closure deadline and insisted on accommodating a disclosure meeting in October at his earliest available date. Yahya conveyed the adverse consequences of a delayed meeting on the project's financials and progress.

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## IBRI SOLAR IPP 2

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### PUBLIC DISCLOSURE AND MEETING NOTES

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- The Wali informed that he had completed his duties for major coordination support work for the approvals from various authorities (and Sheikhs) for the project land, and that he is still open to support further as required. He claims the majority of the hurdles have been cleared for the project to proceed.
- The Wali informed that his priority was the Majilis Elections as it is organized and coordinated primarily by The Ministry of Interior, hence his role is directly involved with this event. Therefore, it was not possible to overlook his commitment on the elections slated for Oct-27 followed by counting process.
- The Wali was not too keen with the alternative suggestion for hard copy submissions to various government stakeholders. He informed that the onus was on us to proceed on this route. **(Note: Based on previous social consultations in June, all Ministries had directed us to coordinate through The Wali's Office for the project. Therefore, based on this experience, the alternate route of hard copy submissions may have to be directed through The Wali - who has played a pivotal role in supporting the project's progress).**
- The Wali agreed to extend his complete support for coordinating the meeting from November 1st onwards and organizing it no later than November 10th. This is due to his Wali Office's prior commitments with Oman's National Day preparation after November 10th. This message has been conveyed by The Wali with his handwritten message and signature on the ESIA Submission Letter (in Arabic, Copy attached).
- Further for the disclosure meeting, The Wali has requested Yahya, 5 Capitals and ACWA Power to present an overview of the proposed Solar PV Project in Arabic to the stakeholders. He insisted on presenting 3-D pictures of the proposed project with details on construction activities and proposed

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## IBRI SOLAR IPP 2

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### PUBLIC DISCLOSURE AND MEETING NOTES

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stakeholder engagement plan. The meeting is likely to be scheduled at The Governor's office as informed during Yahya's previous engagements with The Wali.

- The Wali proposed final stakeholders list for the meeting, as he wanted to ensure all Government departments work in unison to support the project.

1. Office of The Governor of Ad'Dahirah
2. Director of Ibri Municipality
3. Ibri Municipality Council Representative
4. Ibri Shura Council Representative
5. Ibri's Chief of Royal Oman Police
6. Ibri's Chief of CID (Investigation)
7. Director of Ministry of Housing
8. Local Director of Electricity Utility Provider
9. Ibri IPP -1 Representative

- **KEY MINUTE: The Wali has requested to assure the stakeholders including his office, that the project contractor should prioritize the construction of the new camel racing track either in parallel or prior to start of main project construction.**

10:15 AM: INFORMATION BRIEFLY CONVEYED TO 5 CAPITALS OVER PHONE

10:30 AM: DEPART FOR CAMEL FARM DISCLOSURE

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## IBRI SOLAR IPP 2

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### PUBLIC DISCLOSURE AND MEETING NOTES

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11:00 AM CAMEL HERDER DISCLOSURE SESSION

LOCATION: AT RAFIQUK ISLAM'S (LARGE) CAMEL FARM

- Gathered the camel herders  
  
(Herder #1: Mr. Rafiqul Islam, Herder #2: Mr. Nazir Hussain)
- Set up the discussion table and provided snacks.
- The herders were initially hesitant to participate in a bilateral consultation (feedback process) without their sponsor Sheikh's permissions.
- The herders requested Yahya to contact the Sheikh to obtain approval for participation. Yahya was able to get this approval from The Sheikh, Salim Rashid Al Kitubi (Mobile: +968-9666 9404).
- Key points conveyed by Yahya during the session:
  1. Conversation Language: Mix of Urdu and Arabic (herders were able to comprehend and reply in this language).
  2. Conveyed the purpose of the meeting: To inform the herders on construction and operation phase of new Solar project development and take note of their concerns, and importance of their feedback and willingness to support the project.
  3. Showed copies of ESIA, RAP and SEP - Assured the herders a structured plan has been developed to support their livelihood at the farms.
  4. Provided overview of the solar project development, such as construction, relocation of overlapping farms, and location of new camel race track.

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## IBRI SOLAR IPP 2

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### PUBLIC DISCLOSURE AND MEETING NOTES

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5. Informed on approval of various government authorities received for the project.
6. Showed layout maps with proposed new housing and farm locations. Informed that the project company has proposed to provide the herders with new concrete houses for their resettlement with robust camel pens, such as fencing structures.
7. Informed on provision of improved access to amenities ; water, electricity (commensurate lighting), cooking gas, sanitation.
8. Informed on grievance reporting procedures for any issues faced during the project; directly with their sponsor Sheikh and the site project manager, who would be introduced during the construction phase.
9. General Feedback:
  - 9.1. Willing to cooperate with the developers and contractors;  
Offered to lend a helping hand for minor tasks if assigned and open to accommodating the contractors work.
  - 9.2. Expressed concern on how/when they would be notified on their relocation. Yahya responded that the herders and their local sponsors would be given 2 months prior notification as per RAP.
  - 9.3. Expressed concern on the effect of project on their water source specific to bore well . Yahya informed the bore well shall remain at the same existing location as per the RAP. Any future changes shall be coordinated with them.

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## IBRI SOLAR IPP 2

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### PUBLIC DISCLOSURE AND MEETING NOTES

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#### 10. Feedback from Herder #1 - Rafiqul Islam:

10.1. Was concerned they would be shifted to new settlement locations with similar (to existing) facilities such as inadequate structures, lighting and amenities. Yahya re-iterated on provision of improved infrastructure as per RAP.

10.2. Was generally satisfied that would have a better house in near future with improved amenities. Agreed on the relocation and the temporary affect of project construction work on his daily routine.

10.3. Provided session acknowledgment signature (attached).

#### 11. Feedback from Herder #2 - Nazir Hussain:

11.1. Expressed desire for new employment opportunity for serving as security guard with project company.

11.2. Was generally satisfied that he will have a better house with improved amenities. Agreed on the relocation and the temporary affect of project construction work on his routine.

11.3. Provided session acknowledgment signature (attached).

12:30 PM DEPART FOR MUSCAT - 180 MINUTES

\*\*\*END OF NOTES\*\*



# IBRI SOLAR IPP 2

## PUBLIC DISCLOSURE AND MEETING NOTES

C.R.No : 1265866  
P.O.Box : 1537  
Postal Code : 131, Al Hamriya  
Sultanate of Oman

س.ت : ١٢٦٥٨٦٦  
ص.ب : ١٥٣٧  
الرمز البريدي : ١٣١، الحميرية  
سلطنة عمان

يحيى للهندسة  
YAHYA ENGINEERING

التاريخ : ١٤ أكتوبر، ٢٠١٩

الرقم المرجعي : ١٣٠٥/٠٠٢/٠٦٩

المحترم  
وزارة الداخلية،  
سعادة الوالي عبري  
سلطنة عمان

السلام عليكم ورحمة الله وبركاته،،،،،  
تحية طيبة وبعد،

إسم المشروع : مشروع إنشاء محطة عبري ٢ لتوليد الطاقة الشمسية الكهروناية  
الموضوع: تقديم تقرير البيئة، و اجتماع الإفصاح الحكومي

سعادة،  
مع هذه الرسالة، نرفق الوثائق التالية للمراجعة الرقيقة والتعليقات:  
(١) تقرير تقييم الأثر البيئي والاجتماعي ؛  
(٢) خطة إشراك أصحاب المصلحة ؛  
(٣) خطة عمل إعادة التوطين ؛  
(٤) ملخص المشروع باللغة العربية

ثانيا، نطلب منك السماح اكوا باور (شركة المشروع و مالك) و يحيى للهندسة، فايف كابينلس (الاستشاريين) بتنظيم اجتماع موجه للكشف عن التقرير البيئي أعلاه وتقديم تفاصيل عن المشروع - إنشاء لتوليد الطاقة الشمسية الكهروناية، مع الورارات المشاركة.

سوف نحيط علما بالتعليقات التي وردت من كل عضو في الورارة خلال الاجتماع. نطلب منك السماح بذلك وترتيب اجتماع قصير بمجرد أن يناسبك.

نشكركم على دعمكم لنا.

مخلصكم حقاً،  
أحمد العامري  
الرئيس - يحيى للهندسة  
(رقم الهاتف: ٩٢٨٨٢٢٢٢)

بالنية لعقد الاجتماع بحضور  
الجهات المهنية من الطرفين  
نتم التنبية لذلك مع بداية  
شهر نوفمبر

info@yahyaengineering.net  
www.yahyaengineering.net

ESIA, RAP, SEP, Arabic NTS Submission Proof To Wali

Handwritten Note and Acknowledgement from Wali;

Confirming Availability November 1st onwards

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## IBRI SOLAR IPP 2



### PUBLIC DISCLOSURE AND MEETING NOTES

IBRI SOLAR POWER PLANT PROJECT

সৌরশক্তিচালিত প্লান্ট নির্মাণের নতুন প্রকল্প

**Disclosure: ESIA, Stakeholder Engagement Plan,  
Resettlement Action Plan**

প্রকাশ: পরিবেশ ও সামাজিক প্রভাব মূল্যায়ন, স্টেকহোল্ডার  
জড়িত পরিকল্পনা, পুনর্বাসন কর্ম পরিকল্পনা

| (নাম) NAME  | (স্বাক্ষর) SIGNATURE  |
|---|---|
| <b>রাফিকুল ইসলাম</b><br>RAFIQUL ISLAM<br> |  |

NATIVE LANGUAGE: BENGALI



Herder #1: Rafiqul Islam,

Signing off on Disclosure Acknowledgement Sheet

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## IBRI SOLAR IPP 2

### PUBLIC DISCLOSURE AND MEETING NOTES

IBRI SOLAR POWER PLANT PROJECT

شمسی توانائی سے چلنے والے پلانٹ  
کی تعمیر کے لئے نیا پروجیکٹ

**Disclosure: ESIA, Stakeholder Engagement Plan,  
Resettlement Action Plan**

انکشاف: ماحولیات اور معاشرتی اثرات کی تشخیص ، اسٹیک  
ہولڈر شمولیت منصوبہ ، بحالی ایکشن پلان

| نام (NAME)  | دستخط (SIGNATURE)  |
|---|--|
| <b>نذیر حسین</b><br>NAZAR HUSSAIN<br> |  |

NATIVE LANGUAGE: URDU



Herder #2: Nazir Hussain,

Signing off on Disclosure Acknowledgement Sheet

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# IBRI SOLAR IPP 2

## PUBLIC DISCLOSURE AND MEETING NOTES



Pictures from Herder Disclosure Session

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# IBRI SOLAR IPP 2

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## PUBLIC DISCLOSURE MEETING NOTES

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DATE: 11 NOVEMBER, 2019

5 CAPITALS REPRESENTATIVES:

ANDREW BURROW

YAHYA'S PROJECT REPRESENTATIVES:

AIMAN AL-AMRI

AHMED AL-AMRI

HARDIK RAMAIYA

ACWA POWER REPRESENTATIVES:

YOUSEF ZOHAIR

AHMED MASOUD

6:00 AM: YAHYA DEPARTS FOR IBRI FROM MUSCAT - 180 MINUTES

9:30 AM: ASSEMBLY AND PROJECTOR SETUP AT GOVERNOR'S OFFICE

10:00 AM: START OF MEETING: MINUTES WALK THROUGH

- Kick-off from HE The Governor to initiates to chair the meeting proceedings in Arabic.
- Disturbed copies of Arabic ESIA non-technical summary to each attendee.
- 10 MINUTES: Opening Remarks and speech from Ahmed Al-Amri: Extended thanks and gratitude to each of the government officials and departments for attending and supporting the public disclosure meeting. Ahmed provided an overview of the proposed Solar PV project and briefly touched upon the important environmental aspects that were addressed in the ESIA Report; and assured the chair about the implementation of the CESMP and OESMP.
- Transferred to Yousef Zohair for project overview presentation

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# IBRI SOLAR IPP 2

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## PUBLIC DISCLOSURE MEETING NOTES

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- 20 MINUTES: Presentation by Yousef Zohair: Presented the company and operations overview of ACWA Power and how it would operate in the Dharirah region for the proposed Solar PV Project. Provided a 3-D concept drawings of the proposed project.
- 15 MINUTES: Question and Answer Session (directed at ACWA Power): All responses were provided by Yousef Zohair.

### 1. Questions Raised by HE The Governor:

- ✓ Duration of the Project
- ✓ Investment Figures for the project
- ✓ Area of the project
- ✓ Consideration of new ideas for power generation by the project company

### 2. Questions Raised by HE The Wali:

- ✓ Financing Source for the Project

### 3. Questions Raised by Majilis A'Shura Council Member:

- ✓ The technical basis for the project to proceed with Solar PV
- ✓ Effect on the existing operations at Ibri IPP-1 (Gas Plant); whether it would continue to generate power

### 4. Questions Raised by Police Department:

- ✓ Total number of stakeholders and investors for the project



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## IBRI SOLAR IPP 2

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### PUBLIC DISCLOSURE MEETING NOTES

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- ✓ Percentage breakdown of each investor

#### 5. Questions Raised by Oman Power and Water:

- ✓ Project company to provide assurance of contracting approximately 40 Omani Persons during the construction phase.
- ✓ Project company to provide assurance of 15% Omanization content for the overall project.

#### 6. Questions Raised by Majan Electricity Company;

- ✓ Functioning of panels during winters and overcast conditions
- ✓ Requested ACWA Power to obtain the list of qualified experienced engineers/operators from leading Omani companies for employment at the project.

- 10 MINUTES: Closing Remarks from HE The Governor: The Governor was very happy with the conduct of the company and its advisors by seeking public disclosure and awareness with the local community.
- End of Meeting

11:15 PM DEPART FOR MUSCAT - 180 MINUTES

\*\*\*END OF NOTES\*\*





# IBRI SOLAR IPP 2

## PUBLIC DISCLOSURE MEETING NOTES

### Arabic Meeting Minutes

Meeting Minutes Arabic

#### محضر الاجتماع

#### اجتماع الإفصاح العام

موقع: مكتب المحافظ، محافظة الظاهرة، سلطنة عمان

تاريخ الاجتماع: 11 نوفمبر 2019

مدة الاجتماع: 10 صباحًا إلى 11 صباحًا

جدول أعمال الاجتماع: مناقشة تحديثات المشروع الشمسي في عبري

#### الحضور للاجتماع:

- سعادة الشيخ/ سيف بن حمير آل مالك الشحي. محافظ محافظة الظاهرة المحترم .
- سعادة الشيخ الدكتور/ خلف بن سالم الإسحافي والي ولاية عبري المحترم .
- أصحاب السعادة أعضاء مجلس الشورى .
- القادة العسكريون والأمنيون بمحافظة الظاهرة .
- مدراء عموم المديريات بمحافظة الظاهرة
- مدراء الدوائر الحكومية .
- الأفاضل أعضاء المجلس البلدي .
- الحضور الكرام .
- شركة كهرباء مجان
- شركات الاستشارات البيئية للمشروع: شركة يحيى للهندسة، شركة فايف كابيتالز إنفايرنومنثال أند مانيجمنت الإستشارية.
- مالك المشروع: شركة اكوا باور.

السلام عليكم ورحمة الله وبركاته. في يوم الاثنين بتاريخ 2019/11/11 قد عقد اجتماع في محافظة الظاهرة بولاية عبري تحت رعاية الشيخ سيف بن حمير آل مالك الشحي محافظ محافظة الظاهرة المحترم وسعادة الدكتور خلف بن سالم الإسحافي والي ولاية عبري المحترم وسعادة الأعضاء مجلس الشورى قادة وأمنيون الجهات العسكرية بالمحافظة ومدراء عموم الجهات الحكوميه وأعضاء المجلس البلدي ولجنة شؤون البلدي...



## IBRI SOLAR IPP 2

### PUBLIC DISCLOSURE AND MEETING NOTES

#### Meeting Minutes Arabic

افتتح الاجتماع سعادة الشيخ سيف بن حمير آل مالك الشحي محافظ محافظة الظاهرة المحترم وبعد ذلك ترك لنا التعريف بالمشروع وتفصيل كل ما يدور حول المشروع وقد بدأ شركة يحيى للهندسة بالكلمه الترحيبه للحضور وبعد ذلك ألقو نيده مختصره عن الاستشاره البيئيه في موقع المشروع وتم تعريفهم بكل ما قدمناه من الأعمال البيئيه...

وبعد فامو ممثلو شركة اكوا باور يعرض المرئيه مع الصور التوضيحيه للحضور...

بدأ المناقشه حول المشروع وقد شمله عدة أسئله ومنها كم عدد الشركات المستثمره في المشروع، كم تكلفه المشروع، كم النسب كل الشركات المستثمره، كم نسبة التوظيف المحتمله في مرحله الانشاء وكذلك كم عدد المهندسين سوف يكون في مرحله تشغيل المحطه وكان في مداخلات من قبيل مهندسين شركة مجان للكهرباء ومنها هل تتأثر المحطه أثناء الغيوم وهل تكون مآثره على التخزين وماهي الحلول المقترحه أثناء وجود الغيوم فهل في محطات تنتج الكهرباء ام تتوقف عملية الإنتاج وكان كل النقاشات التي طرحه أثناء الاجتماع قام مدير عام يوسف زهير بالاجوبه عليه...

وفي الاخير تم شكر كل الحضور الكريم على تلبية الدعوه لحضور الاجتماع...



# IBRI SOLAR IPP 2

## PUBLIC DISCLOSURE MEETING NOTES

### English Meeting Minutes

Meeting Minutes English

#### MINUTES OF A MEETING

#### PUBLIC DISCLOSURE MEETING

**Venue:** Office of The Governor – Dhahirah Governorate – Sultanate of Oman

**Date of Meeting:** 11 November 2019

**Duration of Meeting:** From 10:00 AM to 11:00 AM

**Agenda:** Discuss updates of the solar energy roject in Ibri

**Attendees:**

- HE. Shaikh / Seif bin Hamyar Al Malik Al Shihi – Governor of Dhofar Governorate .
- Dr. Shaikh / Khalf bin Salim Al Issaci – Wali of Wilyat Ibri
- Members of Shura Council
- Military and Security leaders – Dhahira Governorate
- Directors of Government Departments
- Members of the Municipality Council
- Majan Electricity Company
- Environmental Consultants: Yahya Engineering, 5 Capitals Environmental and Management Consultancy
- Project Owner Company: ACWA Power

A meeting was held on Monday 11/11/2019 in the Wilayat Ibri – Governorate of Dhahira under the patronage of HE Shaikh / Seif bin Hamyar Al Malik Al Shihi – Governor of Dhofar Governorate and the presence of Dr. Shaikh / Khalf bin Salim Al Issaci Wali of Wilyat Ibri, members of Shura Council, Police and Security leaders in Dhahirah Governorate, Directors of Government Departments, Members of the Municipality Council Committee.



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## IBRI SOLAR IPP 2

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### PUBLIC DISCLOSURE MEETING NOTES

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Meeting Minutes English

HE. Shaikh / Seif bin Hamyar Al Malik Al Shihi – Governor of Dhahira Governorate opened the meeting and welcomed the attendees and then allowed us to highlight the project and present the details of all issues about the project .

Yahya Engineering presented a brief introduction about the environmental consultancy at the site of the project and the achievements made regarding environmental works and after that ACWA Power company made a visual presentation with illustrative pictures of the project.

Discussions about the project involved several questions such as the number of companies investing in the project, cost of the project, investment percentage of each company, employment ratio during the construction phase, number of engineers.

The engineers of Majan Electricity Company enquired about the effect of clouds on the solar energy station and the storage of electricity and what are the proposed solutions in such cases and if there are any other stations to generate electricity.

The General Manager of ACWA Power, Mr. Yousef Zuhair replied to all questions and issues raised during the discussions.

The chairman thanked the attendees.



## IBRI SOLAR IPP 2

### PUBLIC DISCLOSURE MEETING NOTES

Newspaper Publication of the Disclosure Meeting



■ محافظ الظاهرة يترأس الاجتماع

## مناقشة مستجدات محطة توليد الطاقة الشمسية بعبري

عبري- سعد الشندودي

توفير الطاقة البديلة، والذي تنفذه شركة اكوا باور بإشراف من الشركة العمانية لشراء الطاقة والمياه وهي إحدى شركات مجموعة نماء، ومن المرجح أن يبدأ العمل تجارياً في المشروع في منتصف عام ٢٠٢١م بقدرية إنتاجية تصل إلى ٥٠٠ ميغا واط، وذلك لتزويد حوالي ٣٣٠٠٠ ألف منزل بالطاقة، وبتكلفة تصل إلى حوالي ٣٥٠ مليون دولار. تجدر الإشارة إلى أن مشروع محطة كهرباء عبري لتوليد الطاقة يعتبر نقلة جذرية في مشاريع الطاقة النظيفة بمحافظة الظاهرة وسيعمل على الحد من الانبعاث الكربونية بحوالي ٣٤٠٠٠٠ طن/سنويا وسيعزز توجه السلطنة نحو التوجه إلى الطاقة البديلة.

عقد بمكتب محافظ الظاهرة أمس اجتماعاً، لمناقشة آخر مستجدات مشروع محطة كهرباء عبري لتوليد الطاقة الشمسية. ترأس الاجتماع سعادة الشيخ سيف بن حمير آل مالك الشحي محافظ الظاهرة وسعادة الشيخ الدكتور خلف بن سالم الإسحاقني والي عبري والمعنيين بالشركة المنفذة لمشروع محطة كهرباء عبري لتوليد الطاقة الشمسية. تم خلال الاجتماع تقديم عرض مرئي حول مشروع محطة كهرباء عبري لتوليد الطاقة الذي يعتبر من المشاريع الضخمة في مجال

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## IBRI SOLAR IPP 2

### PUBLIC DISCLOSURE MEETING NOTES

English Translation of Newspaper Publication of the Disclosure Meeting

#### **Governor of Dhahira Governorate chairs a meeting**

##### **Discuss updates of the Solar Energy Project in Ibri**

Ibri – Saad Al Shandodi

A meeting was recently held in the office of the governor of Dhahira to discuss the latest updates of the Ibri electricity station for the generation of solar energy.

The meeting was chaired by HE. Shaikh / Seif bin Hamyar Al Malik Al Shihi – Governor of Dhofar Governorate and the presence of Dr. Shaikh / Khalf bin Salim Al Issaci Wali of Wilyat Ibri and the concerned representatives from the company implementing Ibri electricity station for solar energy .

A visual presentation was displayed during the meeting about the solar energy station in Ibri, which is regarded as one of the largest projects in the field of generating alternative energy. The project is to be implemented by ACWA Power Company under the supervision of Oman Power and Water Procurement Company (OPWP), one of Nama Group of Companies.

It is expected that the solar energy shall start commercially in mid of the year 2021 with a production capacity up to 500 megawatts at a total cost of nearly 350 million US. dollars to supply power to more than 33000 houses.

It is worth mentioning here that that Ibri Solar Power project shall be a radical shift for the supply of clean energy in Dhahira Governorate and shall eliminate carbon emissions by 340000 ton / annually and enhance the sultanate's trend towards alternative energy.

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