

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

Environmental and Social
Impact Assessment -
Volume 2 – Main Text,
Tables & Figures

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5Cs PROJECT MANAGER	Hardik Ramaiya (Yahya Engineering) Monishankar Prasad (5 Capitals)
5Cs PROJECT DIRECTOR	Ken Wade (5 Capitals)

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LIST OF ABBREVIATIONS

ABBREVIATION	MEANING
AIIB	Asian Infrastructure investment Bank
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
IUCN	International Union for Conservation of Nature
Leq (A)	A-weighted Equivalent Continuous Sound Level
LTSO	Licensed Transmission System Operator
MECA	Ministry of Environment and Climate Affairs
MD	Ministerial Decision
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
UNESCO	United Nations Educational Scientific and Cultural Organization
WHO	World Health Organisation
5 Capitals	5 Capitals Environmental and Management Consulting

1 INTRODUCTION

As part of Oman's 2040 Strategy and in line with the overall economic diversification plans in the country, the government of the Sultanate of Oman has engaged in a successful programme over the past two decades to restructure and develop the private sector involvement in the electricity and water sectors of Oman in order to expand and improve delivery of electricity and water services in the Sultanate.

In March 2019, the Oman Power & Water Procurement Company (OPWP) 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 known as; the Ibri II Solar Independent Power Plant (herein referred to as 'the Project'). This solar PV Power Plant will be developed as an Independent Power Project using bi-facial PV module technology and is expected to operate for 15 years according to the Power Purchase Agreement (PPA).

ACWA Power has appointed 5 Capitals Environmental & Management Consultancy (5 Capitals) on behalf of the Project Consortium to prepare this Environmental & Social Impact Assessment (ESIA) for the Project. The ESIA has been informed by the Environmental & Social Scoping Report (Ref Appendix A) prepared by 5 Capitals and has been prepared in accordance with Omani environmental regulations and the expected environmental & social requirements of the prospective Lenders.

This ESIA Report will be submitted to the Ministry of Environment and Climate Change (MECA) in Oman as well to the international project lenders. The submission in Oman will be made by MECA registered consultant "Yahya Engineering" engaged by 5 Capitals to collaborate in preparing the ESIA studies.

ACWA Power are seeking project finance from International lenders, including AIIB who have established internal environmental and social standards in relation to their investments. Other lenders involved in the Project are expected to be Equator Principles Financial Institutions (EPFIs) or those that have investment policies largely consistent with the IFC Performance Standards (also required for compliance under the Equator Principles). As such, this ESIA has been prepared in accordance with the expected environmental requirements of the prospective international lenders including AIIB and also to align with the EP's, IFC Performance Standards, IFC EHS Guidelines. Notably, in addition to MECA (the Omani environmental regulator) requirements, this includes consideration of potential 'social' impacts attributable to the Project, and the on-going management of these risks & impacts.

It should however be noted that for the purpose of this document the term ESIA is considered to be inclusive of the Environmental Impact Assessment (EIA) requirements of MECA as well as the Environmental & Social Impact Assessment requirements of the lenders. As such, references to the impact assessment of environmental and social parameters are termed as ESIA, unless there is specific reference to the EIA requirements of MECA. Also, topics such as community health & safety, labour and working conditions, resettlement, etc. are discussed herein so conduct an integrated assessment of the Project's E&S risks and define relevant management measures accordingly, in line with lenders' requirements.

1.1 Objectives of the ESIA

The objectives of this ESIA in relation to this Project include the following:

- Assessment of baseline conditions prior to the development of the Project through review of available data and conducting surveys;
- Assessment of the project's environmental & social impacts for the construction and operational phases;
- Review of compliance obligations, including applicable Omani regulations and international regulations & standards as well as international lender requirements.
- To engage with key stakeholders and project affected people to disclose Project information, study outcomes, gain lay knowledge about the local environmental & social context, seek feedback on proposal and to understand & map any resettlement requirements.
- Determination of applicable mitigation and management measures to be implemented in order to avoid or minimise potential impacts.
- Consideration of alternatives that can be used for the project leading to greater social and environmental gains. This has notably included consideration of different Project layouts to avoid wadis identified at the scoping stage.
 - It was determined that an alternative plot configuration would reduce flood risk. There were also concerns regarding the camel race track located on the initial project layout which is recreationally and culturally significant in the regional context.
- Prepare a framework from which the construction phase and operational phase respective management systems and plans can be developed and implemented.

1.2 Structure of the ESIA

In order to comply with the requirements for environmental & social assessment established by MECA and international good practice, this report is presented in the following format developed by 5 Capitals:

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

Volume 1 provides a Non-Technical Summary of the ESIA, including the main outcomes, and conclusions.

Volume 2 comprises the main text of the ESIA and full impact assessment, with mitigation, management and monitoring measures identified. Volume 2 follows the following chapter structure:

1. Introduction
 - ESIA Objectives
 - ESIA Structure
 - Key Project Information
2. Project Information
 - Project Background and Rationale
 - Project Location
 - Land Use and Site Conditions
 - Project Description
 - Project Construction Requirements
 - Project Operational Requirements
 - Project Alternatives
3. Regulatory Framework
 - National Requirements
 - Lenders Requirements
 - Environmental Standards
4. Approach to ESIA
 - ESIA Scope of Work & Key Deliverables
 - Delineation of Study Boundary and Scope of Assessment
 - ESIA Methodology
 - Stakeholder Consultations
5. Air Quality (same structure for environmental aspects 6 to 8, 10 to 12 and 15 to 16)
 - Standards and Regulatory Requirement
 - Observations and Baseline Conditions
 - Receptors
 - Potential Impacts
 - Impact Significance, Mitigation and Management Measures and Residual Impacts
 - Monitoring.

6. Noise and Vibration
7. Terrestrial Ecology
8. Geology, Soil, Hydrology and Groundwater
9. Solid and Liquid Waste Management (same structure for environmental aspects 13 to 14)
 - Standards and Regulatory Requirement
 - Observations and Baseline Conditions
 - Potential Impacts
 - Mitigation and Management Measures
 - Monitoring
10. Archaeology and Cultural Heritage
11. Landscape and Visual Quality
12. Socio-Economics
13. Community, Health, Safety and Security
14. Labor and Working Conditions
15. Resettlement Requirements
16. Climate Affairs
17. Cumulative Impact Assessment
18. References

Volume 3 provides the Framework for developing the Environmental & Social Management and Monitoring systems for effective implementation of the mitigation and management measures outlined in Volume 2 following impact assessment.

The Volume 3 will provide a framework for the development of the CESMP or Construction Environmental & Social Management System (CESMS), and the OEMP or Operational Environmental & Social Management System (OESMS) to be developed and implemented at a later stage.

The intention is for Volume 3 to be used by the EPC Contractor and O&M Company to develop the project specific environmental management plans (stakeholder engagement plan and resettlement action plan), based on the specific findings and recommendations of the ESIA.

The CESMS and the OESMS will include responsibilities and procedures to ensure a systematic preventative to environmental and social management. It also will establish monitoring requirements to ensure adequate performance.

Volume 4 comprises Appendices, which are as follows:

- Appendix A – Environmental and Social Scoping Report
- Appendix B - Krooki of the Project Land Area
- Appendix C- Ambient Air Quality
- Appendix D - Noise Calibration Certificates
- Appendix E – Soil Analysis from Laboratory

- Appendix F - ACWA Power Framework HSSE Management System

1.3 Key Project Information

Table 1-1 Key Project Information

PROJECT TITLE	Ibri II Solar Independent Power Plant (Ibri II Solar IPP), Sultanate of Oman
PROJECT PROPONENT	Oman Power & Water Procurement Company (OPWP)
PROJECT OWNER	ACWA Power & Gulf Investment Corporation and Alternative Energy Projects Company
EPC CONTRACTOR	Consortium of Powerchina and Powerchina Huadong
O&M COMPANY	The First National Operation and Maintenance Company (NOMAC)
ENVIRONMENTAL CONSULTANT COMPANY NAME AND ADDRESS	Yahya Engineering (MECA Consultant) P.O.Box 1537 Sultanate of Oman Postal Code 131, Al Hamriya Tel: +968 (0) 9 179 9170
	5 Capitals Environmental and Management Consulting (Sponsors Consultant) PO Box 119899 Dubai, UAE Tel: +971 (0) 4 343 5955 Fax: +971 (0) 4 343 9366 www.5capitals.com

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 Site Location (Blue Polygon)

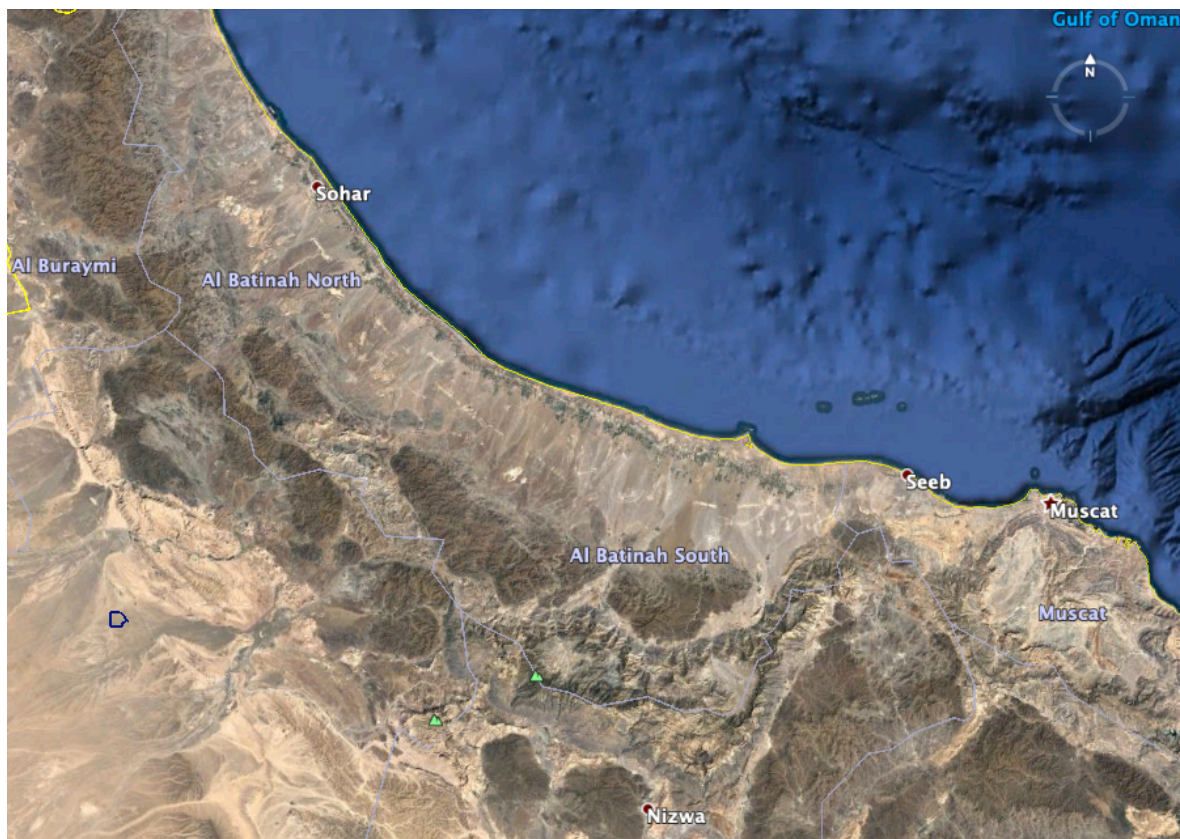
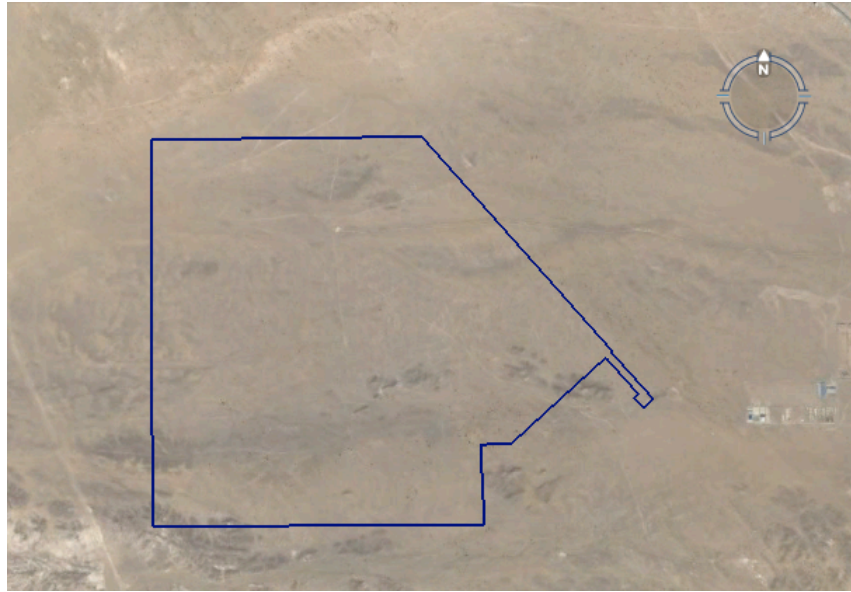


Figure 2-2 Proposed Project Site Layout (Blue Polygon)



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	2586239.887	422551.669
2	2586238.887	420111.465
3	2582759.820	420111.465
4	2582759.820	423044.508
5	2583471.422	423044.508
6	2583471.422	423307.248
7	2584242.374	424180.715
8	2583913.414	424467.983
9	2583880.526	424430.321
10	2583790.145	424509.260
11	2583869.070	424599.646
12	2584288.660	424233.229
13	2584298.083	424243.920
a	2586239.887	418694.793
b	2584413.725	418946.292
c	2580975.112	420465.641
d	2581373.927	421074.164
e	2582671.520	425615.149
f	2583685.823	424542.289
G	2582978.180	423740.551

Note: There was a previous alignment of the project site layout which was considered and included to the scoping report submitted to MECA. This was subsequently amended to optimise alignment with the interests of the local community and some local wadi's have been avoided to minimise the flood risk aspect to the project – as explained herein.

The overall project layout of the adjusted layout is presented in the figure below in relation to other potential potentially proposed future land uses:

Figure 2-3 Project Interim Krooki

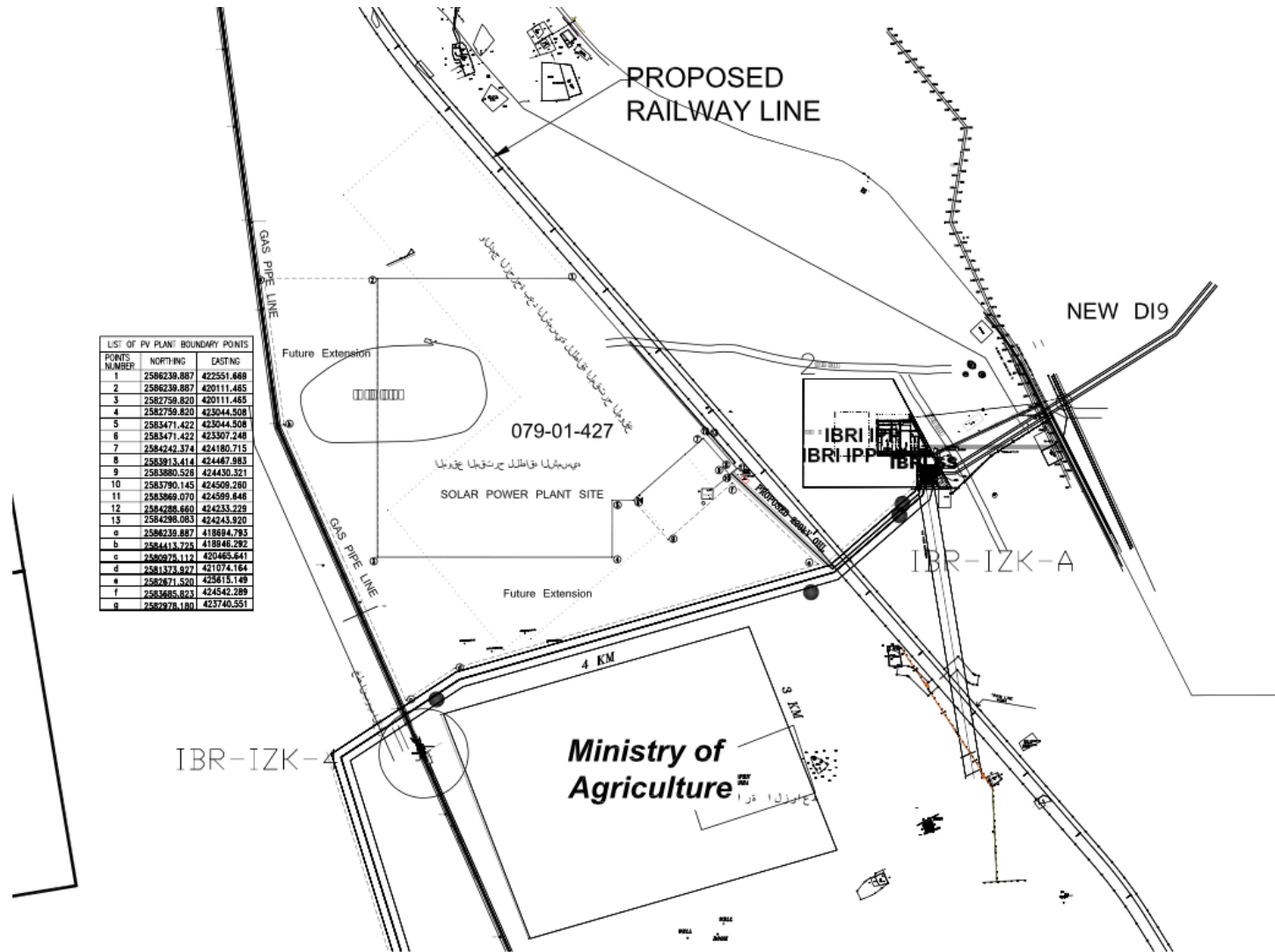
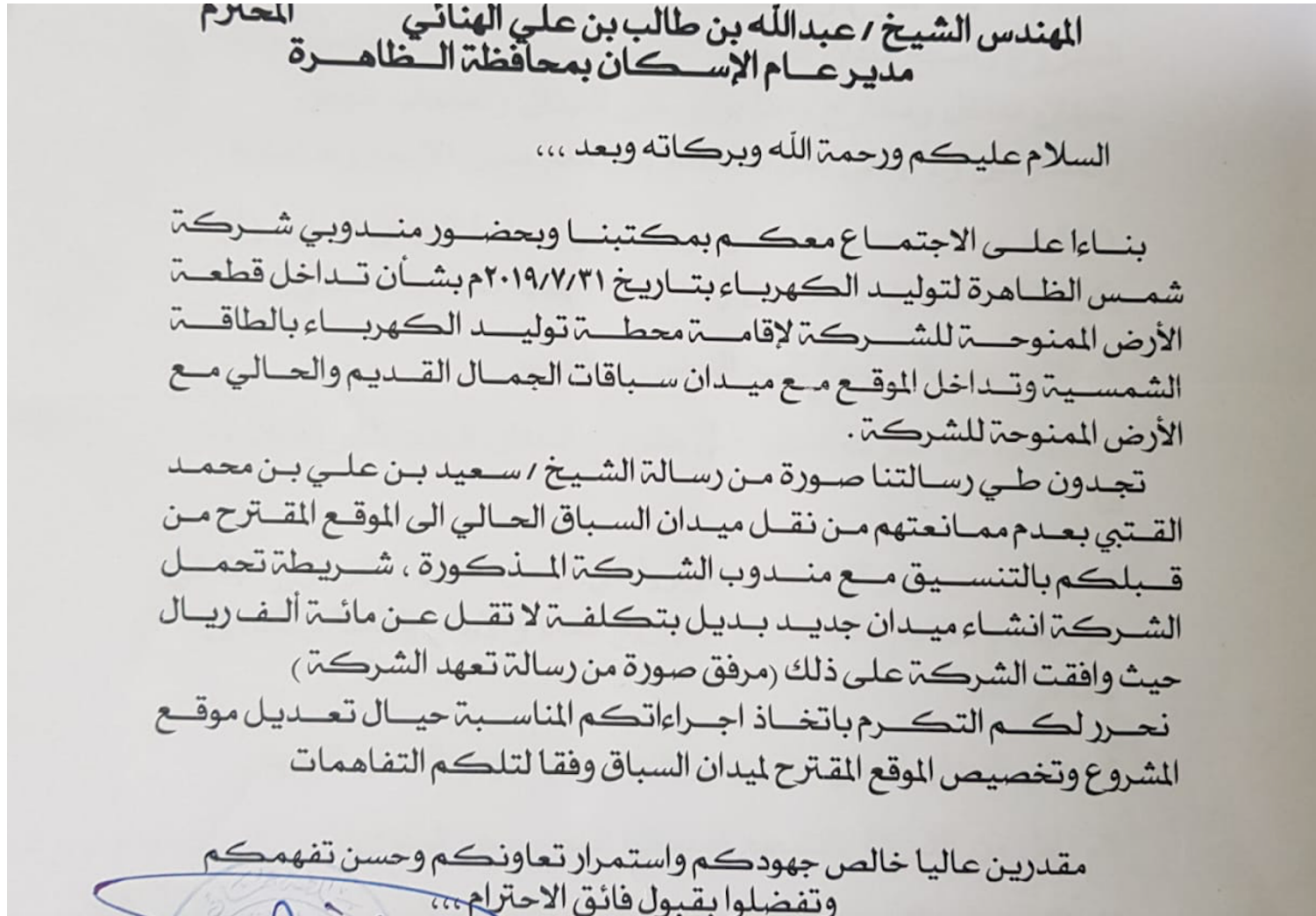


Figure 2-4: Letter from The Wali of Ibri's Office regarding agreement to the amendment in Project Layout



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 Ministry of Housing through a Land Lease Agreement with the Project Company has granted 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.

An interim image of the Krooki, (also be referred to as the project affection plan) for the Project's land area issued by the Ministry of Housing is presented in Figure 2-2. This document shows the current owner of the land to be used for the development of the proposed project.

Unoccupied land in the Sultanate of Oman is owned by the State, and any utilization of land by local sheikhs is through temporary permits. The nature of such permits is not confirmed in the context of the Ibri II IPP land area, however given the use of the land for several decades (as a minimum – advised during consultations) informal/customary land uses are considered to be applicable despite the land not being owned.

2.3.2 Topography and Land Use

Topography

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 external areas to the Project site. There are a few mounds observed on site during the site visits which would largely be flattened during the site preparation phase for ensuring horizontal alignment of the tracker systems.

Runoff/wadi areas were identified to the north western and south western areas of the Project site during an initial site visit on 1st 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 wider area is prone to water flow and/or accumulation at times of direct rainfall, or during rainfall on the mountains in proximity to the north of the Project area.

Following the scoping stage and identification of the wadi channels in the Project footprint, ACWA Power agreed with OPWP and the Ministry of Housing to adjust the layout to avoid these wadis. An example image of the wadi (off site – to the north) a few days after runoff flow is presented in the photo set below.

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



Figure 2-5 Wadi (off-site) – 23rd May 2019



Land Use

Findings from site visits undertaken in October 2018 & May/June/July 2019 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;
- Partial section of current camel race track;
- Old (disused) camel race track;
- Grazing camels;
- An unidentified concrete feature;
- Several disused or seasonally used camel pens; and
- Evidence of vehicle tracks.

Based on informal consultation with land users during the site visit in May 2019, it was understood that the camel farms/pens have been active on this land for at least 25 years. Historic satellite imagery from 2009 to 2018 showed that all structures with the exception of the abandoned camel farm were evident on satellite imagery from 2009 to 2018. However, from the year 2016 onwards, the abandoned camel farm became evident on the satellite imagery. 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.

In addition to the above land uses, review of satellite imagery and initial site visit undertaken on 1st October 2018 reveals that there are no expansive residential settlements within the project footprint. The nearest residential receptor i.e. expansive residential settlements 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 within the Project site, whilst tending to camels; understood to belong to the local Sheikh.

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

Lap Checkpoint Gantry at the Camel Racetrack



Small Concrete Seating Area at the Camel Racetrack



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



Plate 2-5 Vehicle and Camel Tracks (October 2018)



Plate 2-6 On-site Accommodation Hut used by Expatriate Labourers – 23rd May 2019



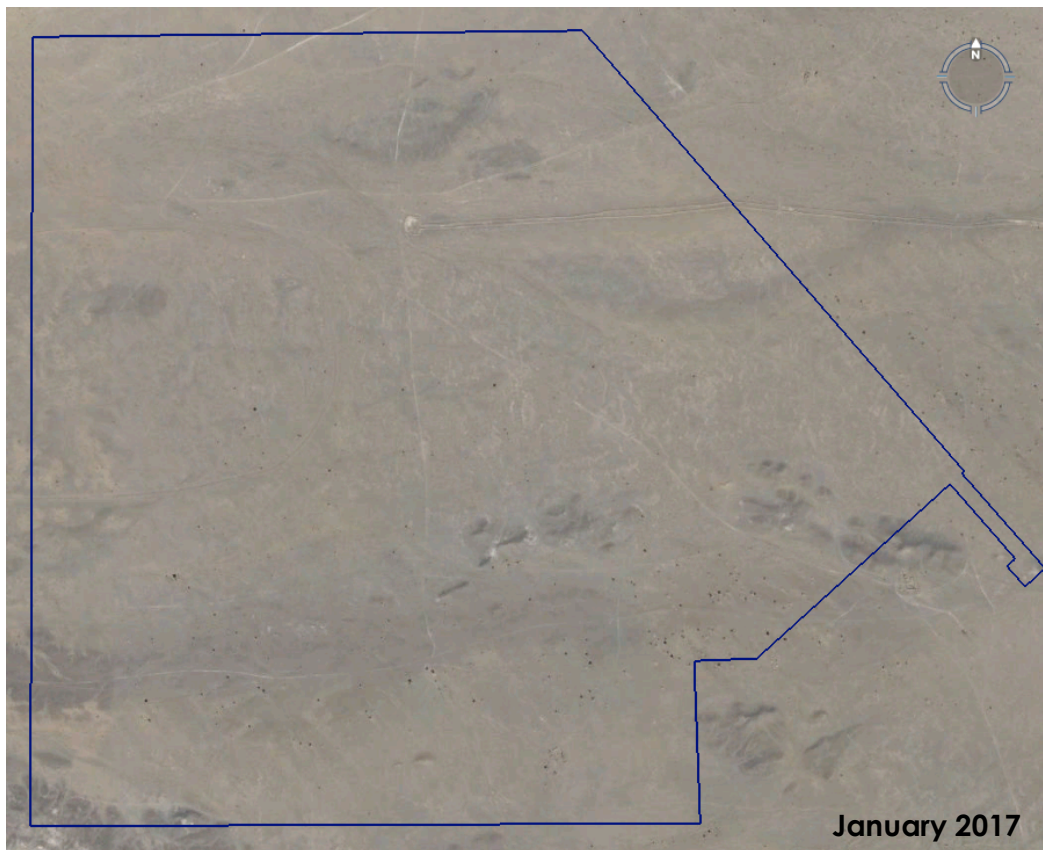
Historical Land Users

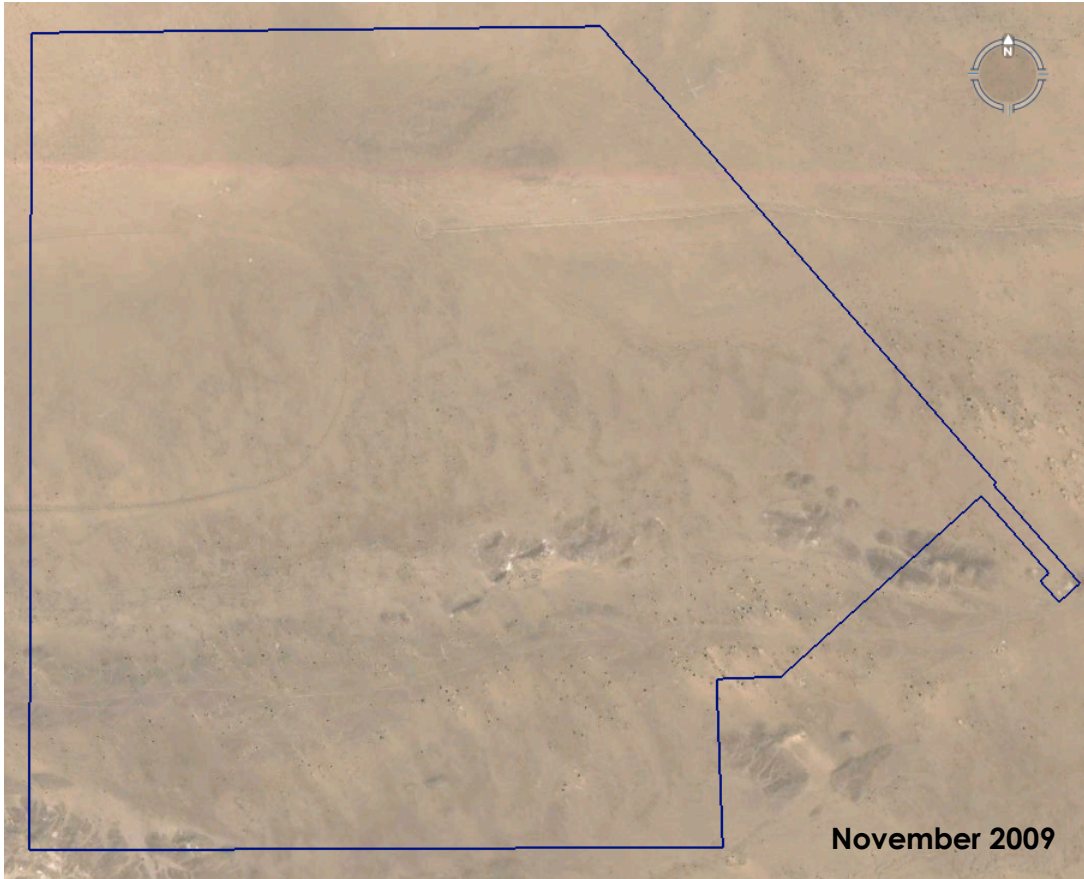
Besides what has been identified above, there does not appear to be other specific or dedicated uses on-going at this site, besides that for camel herding and camel racing in the recent past. For instance, there is no evidence of other development, industry or commerce, in what is a relatively natural landscape.

Upon review of historical satellite imagery dating back to October 2005 (presented below), the land remains undeveloped with few noticeable changes. The only noticeable changes relate to the variation in the location of the temporary camel pens and temporary structures (similar to others that have been observed on site throughout the last year). At present the site appears to have fewer of these structures currently in place than in the recent past (based on the available imagery).

Consultation with the local Wali has indicated that land has historically been used for camel herding and camel racing. Evidence of this is shown as above, and includes the original sand berm used for the camel race track. The newer race track with fenced lanes and small seating area is also present and visible on the imagery below. It has been confirmed that the land is government owned, but is open accessible land without specific land use rights attached. The informal use by the local Sheikh's is understood to have taken place over many years, an account also provided by the herders interviewed on-site (who are employed to tend the camels).

Figure 2-6 Historical Imagery of the Project Site (Source: Google Earth)





2.3.3 Site Conditions and Local Receptors

Besides the above outlined receptors identified within the Project site, previous studies, review of satellite imagery (from Google Earth) and site visits undertaken in October 2018 and May/June/July 2019 identified several receptors 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.

A petrol filling station and the Highway 21 (Buraimi-Ibri highway) are both located approximately 4km and 5km 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 5.7 km, 8km and 7km from the north east of the Project boundary respectively.

Government licensed mechanised borewells are located directly adjacent to the southern extent of the Project site and approximately 500m from the southern boundary of the Project site. It is understood that these borewells serve the camel herding resident population present within the site with a narrow pipeline connecting the camel farm/pen and the borewell. One of the borewells on the boundary aligned with the Ibri Power Plant was abandoned.

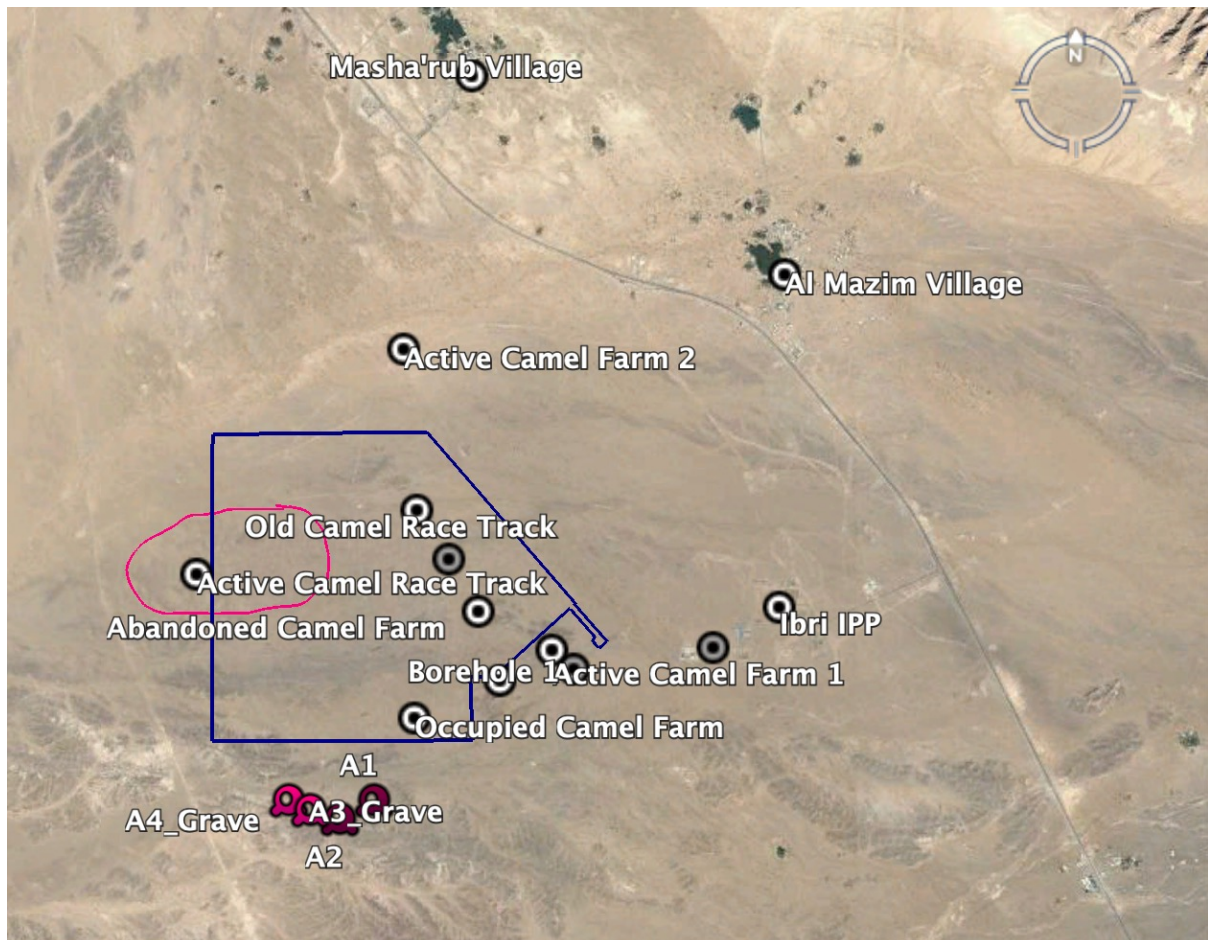
Approximately 1800m and 2km from the south east of the Project boundary is the Ibri IPP Worker Accommodation Area and Power Plant (a 1400MW natural gas power plant) currently undergoing commissioning.

Table 2-2 Potential Local Receptor

LOCATION	RECEPTOR	RECEPTOR TYPE	DISTANCE FROM PROJECT SITE
Within the Project Site	Occupied Camel Farm	Commercial	Within the western extent of the Project site although the camel track will be relocated by the EPC Contractor.
	Accommodation Hut	Residential	Within the eastern extent of the Project site beside the occupied camel farm
	Camel Race Track	Recreational	Partially on the site and other areas are directly adjacent to the western boundary Project site.
External to the Project Site	Active Camel Farm 1	Residential/ Commercial	Approximately 500m from the south-eastern boundary of the Project site.
	Active Camel Farm 2	Residential/ Commercial	Approximately 600m from the eastern boundary of the Project site.
	Petrol Filling Station	Commercial	Approximately 5 km from the north east boundary of the Project site.

LOCATION	RECEPTOR	RECEPTOR TYPE	DISTANCE FROM PROJECT SITE
	Highway 21 (Buraimi-Ibri highway)	Infrastructure	Approximately 4 km from the north east boundary of the Project site.
	Ibri IPP – Worker Accommodation Area	Residential	Approximately 1800m from the south east of the Project boundary.
	Al Ma'mur Village		Approximately 5.7km from the north east boundary of the Project site.
	Al Mazim Village		Approximately 7km from the north east boundary of the Project site.
	Masha'rub village		Approximately 8km from the north east boundary of the Project site.
	Borehole 1	Resource	Adjacent to the southern extent Project boundary (off-site)
	Borehole 2		Approximately 200m from the southern boundary of the Project site.
	Ibri IPP	Industrial	Approximately 2km from the south east of the Project boundary.
	Graves	Archaeological	Approximately 0.5km south west of the Project boundary

Figure 2-7: Receptor Locations



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.

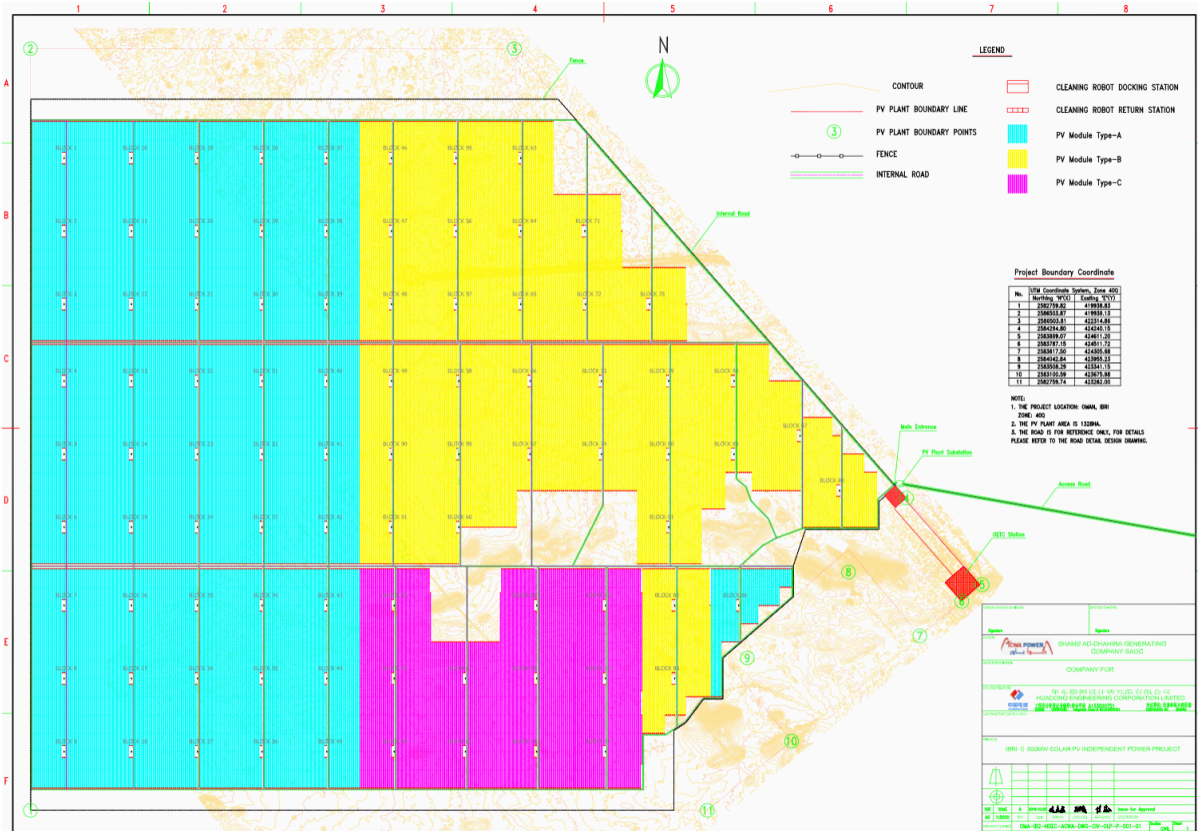
Photovoltaic Power Plants use photovoltaic cells to generate electricity upon exposure to sunlight. This power generation technology converts solar radiation into direct current electricity using semiconductor materials in the form of a panel that exhibits photovoltaic effects. A typical PV Plant mainly 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 ground covering in the solar project will comprise of a reflective geotextile layer to increase albedo for bifacial generation. The material will be of either HDPE or PVC material covering 80% of the ground covering on the site.

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.

Figure 2-8 Proposed Layout of PV Arrays (current as of December 2019)



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
Modules	395Wp (727846 modules/units)
Inverters	3204 units 185kTL Huawei string inverter
Transformers	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 layer of geotextile will cover 80 percent of the ground on the project site. The ground covering will be a HDPE or PVC liner in tarpaulin material. Based on review of the material's MSDS, it is stated that the material is non-hazardous, non-soluble and impermeable. Further it is understood to maintain a relatively high stability in light and heat. A separate short aspects & impacts supplement has been prepared for the material and includes recommended mitigation measures should rips and tears be identified in the material.

2.4.1 Project Auxiliary Facilities

Internal Access Road

In order to enable easy access within the Project site, the EPC Contractor will construct an internal road 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.

2.4.2 Project Associated Facilities

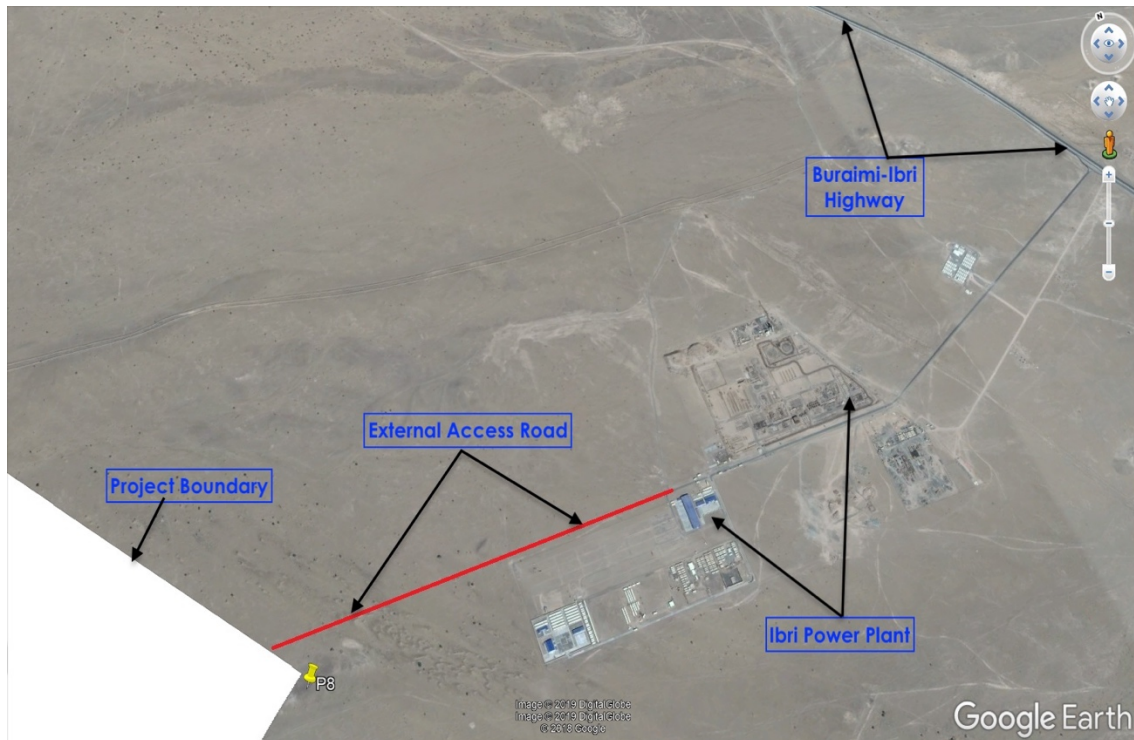
External Access Road

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 alongside 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 2-9 Connection to Main Road Concept (Ref. Red Line)



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).

For the connection of the PV plant to grid, two (2) GIS bays will be provided in the OETC 220 kV substation Ibri II Solar. The generation will be distributed equally on the bays where the maximum generation connected to one bay is limited to 500 MVA.

The 220 kV cables from the step-up transformers to the OETC 220 kV substation Ibri II Solar will include all accessories and installations of the cable terminations into the related switchgear housings and cable supporting systems also inside the OETC 220 kV substation Ibri II Solar. Details related to the cable terminations shall be coordinated with the OEM of the 220 kV GIS.

All cables in the substation will be laid in concrete trenches.

The auxiliary power supply of the OETC substation will be provided by the PV Plant free of charge. There was a concrete substation already in the vicinity of the project site catering to the Ibri 1 IPP.

Figure 2-10 Entrance to Constructed Substation (July 2019)



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.

2.5 Project Construction Requirements

2.5.1 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.

2.5.2 Temporary 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 southernmost extent of the Project site next to the proposed PV Plant Substation.

Worker accommodation

It is anticipated that the Project will utilise the existing Ibri IPP Worker Accommodation Area approximately 800m south east of the Project site to accommodate its workers. However, it is understood that only workers engaged directly by the EPC Contractor will be accommodated in this accommodation area.

Given that a large proportion of the sites labour force will comprise of sub-contractors staff, sub-contractors will be responsible for establishing/renting living accommodation (as appropriate) for their respective workers. As sub-contractors are yet to be formally engaged, the location of their temporary accommodation areas is 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.

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)

2.5.3 Construction Utilities

Water Supply

During site preparatory stage, the project will require portable water supply for the construction facilities & activities. A licensed potable water supply company will supply the water required to cover the water demand of the Project to the site via water tanker trunks.

2.5.4 Construction Timeline

Table 2-4 Anticipated Project Timeline

MILESTONE FOR THE CONSTRUCTION OF IBRI II SOLAR IPP	
MILESTONE	SCHEDULED DATE
Mobilisation Milestone	05.02.2020
Electrical System Study	08.12.2019
Scheduled connection date of Plant to Transmission System, at the Connection Point	01.01.2021
Scheduled energisation date of Plant from Transmission System, at the Connection Point	03.01.2021
Plant	
Commencement of Start-up Test	28.02.2021
Commencement of Reliability Run	28.03.2021
Commencement of Performance Test	04.04.2021
Scheduled Commercial Operation Date (SCOD)	01.06.2021
Last Commercial Operation Date	18.12.2021

2.5.5 Construction Logistics

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.

2.5.6 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.

2.6 Project Operational Requirement

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.

2.6.1 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.

2.6.2 Operational Utilities

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 water for PV panel cleaning, as well as raw water for domestic use, firefighting water demand and other non-potable water uses if required. At this stage the total annual volume of water required by the Project has not been finalised, but is expected to be sourced from either a municipal or private supplier. The source is unconfirmed at this stage. Potable drinking water will be provided by a potable water supplier and is expected to be bottled.

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).

The Project will include an emergency diesel generator for use during black-out situations.

2.7 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;
- Project Technology and;
- 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.

2.7.1 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.

2.7.2 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 sources and will contribute to reducing the dependence of the Sultanate, which gets freed up for export led income) 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;

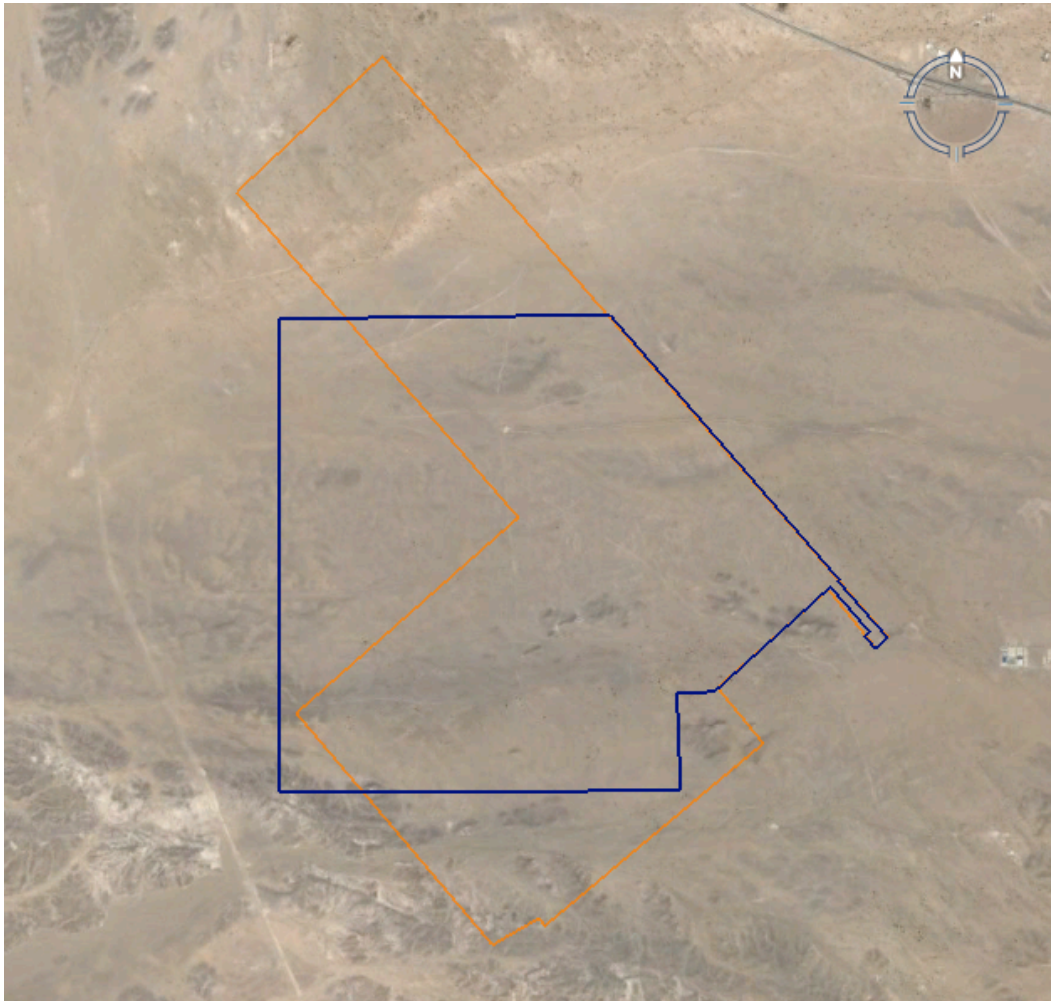
- Bi-facial type Solar PV Panels which generates energy from both top and rear sides
- Single axis tracker technology mounting system and
- String or central inverters.

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.

2.7.3 Project Layout

The Project layout has been adjusted throughout the process of the ESIA due to land use and flood risk concerns raised by the baseline studies. The previous layout is shown on the image below (in orange) and did include overlap with wadi channels in both the north and south west of the project site. The adjusted plot layout is in blue, which avoids the wadis to the north and south.

Figure 2-11 Project Layout (Current and Previous)



Satellite Image Source: Google Earth

Subsequent to the identification of the wadis, the ESIA Team raised this with ACWA Power who (with the agreement of the local Wali) adjusted the site layout to the current arrangements, as shown in blue (above). The resulting effect of this new layout ensures that there is no overlap of the Project footprint with potential flood sources, and there will be no direct interaction with flood flows through wadis.

The adjusted site layout (as assessed herein) remains overlapping with areas of the previous proposed layout, and still includes the need for resettlement of the identified camel herders. In agreement with the local Wali (and local Sheikhs – who own the camel herds and race

track), the adjusted plot will now overlap with the current racetrack, which will be required to be re-established off-site by the Project. It is noted that there will be no subsequent changes or adjustments to the Project associated facilities, or Project design as a result of the new footprint area.

3 REGULATORY FRAMEWORK

3.1 National Requirements

3.1.1 Applicable Oman Environmental Legislation & Standards

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 118 of 2004 on Regulations for Air Pollution
- Ministerial Decision 41 of 2017 on Regulations for Ambient Air Quality

- Ministerial Decision 48 of 2017 on Regulations for Organising Environmental Permitting

3.1.2 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.

3.1.3 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.

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.

3.1.4 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.

3.2 Lender Requirements

The Project will pursue an amount of its financing from one or more lenders. One of such prospective lenders expected to be involved in the financing of the Project is the Asian Infrastructure investment Bank (AIIB). Other international financial institutions (unknown at this stage) may be expected to either align their investment policies with international

environmental and social lending standards or be signatories to voluntary commitments such as the Equator Principles. In accordance with such policies and commitments, the Project is therefore required to ensure that the project will meet the following key requirements, during all project phases:

- Asian Infrastructure Investment Bank (AIIB) Environmental and Social Framework, including ESS 1 and ESS 2
- Equator Principles III (2013) (PS 1, PS 2, PS 3, PS 4, PS 5, PS 6 & PS8);
- World Bank Group - International Finance Corporation's (IFC) Performance Standards (2012);
- World Bank Group – IFC General Environmental Health and Safety (EHS) Guidelines (2007);

Performance Standard 7 regarding indigenous peoples is not applicable as there are no identified indigenous people in and around the Project area, or that may be potentially impacted by the Project.

3.2.1 Asian Infrastructure Investment Bank (AIIB)

The Asian Infrastructure investment Bank (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.

ENVIRONMENTAL AND SOCIAL STANDARDS	OVERVIEW
ESS 1	<p>Environmental & Social Assessment and Management</p> <p>It ensures the environmental & social soundness and sustainability of Projects and supports the integration of environmental and social considerations into the Project decision making process & implementation. It requires the Client to undertake an Environmental and Social Assessment of the Project in accordance with Section C of the ESP using appropriate studies proportional to the significance of potential risks & impacts.</p> <p>Requires the Client to undertake supplemental consultations with Project affected people and facilitate their informed participation in the consultations where necessary.</p> <p>Requires the Client to establish a suitable grievance redress mechanism to receive and facilitate resolution of the concerns of people who believe they have been adversely affected by the Project's environmental and social impacts and inform Project-affected people of its availability</p>

ENVIRONMENTAL AND SOCIAL STANDARDS	OVERVIEW
ESS 2	<p>Involuntary Resettlement</p> <p>Requires the Client to:</p> <p>Avoid involuntary Resettlement wherever possible by exploring Project alternatives. Where avoidance is not feasible, the client is required to enhance or at least restore the livelihoods of all displaced persons.</p> <p>Prepare a resettlement plan elaborating on displaced persons entitlements, income and livelihood restoration strategy, institutional arrangements, monitoring and reporting framework, budget and time-bound implementation schedule. Involve affected persons in consultation on the resettlement plan.</p> <p>Establish a grievance redress mechanism to receive and facilitate resolution of the concerns of persons displaced by the Project.</p>
ESS 3	<p>Indigenous Peoples</p> <p><u>(Not applicable for Ibri II IPP - as there are no identified indigenous people in the Project area, or those that may be impacted by the Project)</u></p> <p>Only applicable to Projects with indigenous people within the proposed site for development or are likely to be affected by the Project.</p> <p>It requires clients to prepare an Indigenous Peoples Plan where the Project site have indigenous people present or the Project is likely to affect indigenous peoples.</p>

3.2.2 Equator Principles III (2013)

The Equator Principles (EP) is a risk assessment framework used by financial institutions to determine, assess and manage the environmental and social risk in projects financing. Currently, over seventy-five major financial institutions from around the world have adopted the EPs. These financial institutions operate in more than 100 countries worldwide. As a result, the Equator Principles have become the project finance industry standard for addressing environmental and social issues in project financing globally.

The Equator Principles were updated in 2006 (EPII) 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 Association Steering Committee reviewed the Equator Principles in 2011 and approved the latest version, EP III on April 26th 2013. These became effective from June 2013.

The EPs establish the minimum standards to be adopted by the EP Financial Institution (EPFI) as those from IFC Performance Standards on Environmental and Social Sustainability (Performance Standards), the World Bank Group Environmental, Health and Safety Guidelines (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 principles:

Table 3-2 Equator Principles III (2013)

EQUATOR PRINCIPLE	OVERVIEW
<p>Principle 1</p>	<p>Review and Categorisation</p> <p>EPFIs will categorise a project proposed for financing based on the magnitude of its potential impacts and risks in accordance with the environmental and social screening criteria of the International Finance Corporation (IFC). These categories are:</p> <p>Category A- Projects with potential significant adverse social or environmental risks and/or impacts that are diverse, irreversible or unprecedented;</p> <p>Category B – Projects with potential limited adverse social or environmental risks and/or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures; and</p> <p>Category C – Projects with minimal or no social or environmental risks and/or impacts.</p> <p><i>The Ibri II IPP Project is consistent with Category B – as determined and conveyed by the Lenders Technical Advisor.</i></p>
<p>Principle 2</p>	<p>Environmental and Social Assessment</p> <p>For all Category A and Category B Projects, the EPFI will require the client to conduct an Assessment process to address, to the EPFI's satisfaction, the relevant environmental and social risks and impacts of the proposed Project (which may include the illustrative list of issues found in Exhibit II). The Assessment Documentation should propose measures to minimise, mitigate, and offset adverse impacts in a manner relevant and appropriate to the nature and scale of the proposed Project.</p> <p>The Assessment Documentation will be an adequate, accurate and objective evaluation and presentation of the environmental and social risks and impacts, whether prepared by the client, consultants or external experts. For Category A, and as appropriate, Category B Projects, the Assessment Documentation includes an Environmental and Social Impact Assessment (ESIA). One or more specialised studies may also need to be undertaken. Furthermore, in limited high-risk circumstances, it may be appropriate for the client to complement its Assessment Documentation with specific human rights due diligence. For other Projects, a limited or focused environmental or social assessment (e.g. audit), or straightforward application of environmental siting, pollution standards, design criteria, or construction standards may be carried out.</p>
<p>Principle 3</p>	<p>Applicable Environmental and Social Standards</p> <p>The Assessment process should, in the first instance, address compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues.</p> <p>EPFIs operate in diverse markets: some with robust environmental and social governance, legislation systems and institutional capacity designed to protect their people and the natural environment; and some with evolving technical and institutional capacity to manage environmental and social issues.</p> <p>The EPFI will require that the Assessment process evaluates compliance with the applicable standards as follows:</p> <ul style="list-style-type: none"> • For Projects located in Non-Designated Countries, the Assessment process evaluates compliance with the then applicable IFC Performance Standards on Environmental and Social Sustainability (Performance Standards) and the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) (Exhibit III). • For Projects located in Designated Countries, the Assessment process evaluates compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues. Host country laws meet the requirements of environmental and/or social assessments (Principle 2), management systems and plans (Principle 4), Stakeholder Engagement (Principle 5) and, grievance mechanisms (Principle 6).

EQUATOR PRINCIPLE	OVERVIEW
	<p>The Assessment process will establish to the EPFI's satisfaction the Project's overall compliance with, or justified deviation from, the applicable standards. The applicable standards (as described above) represent the minimum standards adopted by the EPFI. The EPFI may, at their sole discretion, apply additional requirements.</p>
<p>Principle 4</p>	<p>Environmental and Social Management System and Equator Principles Action Plan</p> <p>For all Category A and Category B Projects, the EPFI will require the client to develop or maintain an Environmental and Social Management System (ESMS). Further, an Environmental and Social Management Plan (ESMP) will be prepared by the client to address issues raised in the Assessment process and incorporate actions required to comply with the applicable standards. Where the applicable standards are not met to the EPFI's satisfaction, the client and the EPFI will agree an Equator Principles Action Plan (AP). The Equator Principles AP is intended to outline gaps and commitments to meet EPFI requirements in line with the applicable standards.</p>
<p>Principle 5</p>	<p>Stakeholder Engagement</p> <p>For all Category A and Category B Projects, the EPFI will require the client to demonstrate effective Stakeholder Engagement as an on-going process in a structured and culturally appropriate manner with Affected Communities and, where relevant, Other Stakeholders. For Projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. The client will tailor its consultation process to: the risks and impacts of the Project; the Project's phase of development; the language preferences of the Affected Communities; their decision-making processes; and the needs of disadvantaged and vulnerable groups. This process should be free from external manipulation, interference, coercion and intimidation.</p> <p>To facilitate Stakeholder Engagement, the client will, commensurate to the Project's risks and impacts, make the appropriate Assessment Documentation readily available to the Affected Communities, and where relevant Other Stakeholders, in the local language and in a culturally appropriate manner.</p> <p>The client will take account of, and document, the results of the Stakeholder Engagement process, including any actions agreed resulting from such process. For Projects with environmental or social risks and adverse impacts, disclosure should occur early in the Assessment process, in any event before the Project construction commences, and on an on-going basis.</p>
<p>Principle 6</p>	<p>Grievance Mechanism</p> <p>For all Category A and, as appropriate, Category B Projects, the EPFI will require the client, as part of the ESMS, to establish a grievance mechanism designed to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance.</p> <p>The grievance mechanism is required to be scaled to the risks and impacts of the Project and have Affected Communities as its primary user. It will seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate, readily accessible, at no cost, and without retribution to the party that originated the issue or concern. The mechanism should not impede access to judicial or administrative remedies. The client will inform the Affected Communities about the mechanism in the course of the Stakeholder Engagement process.</p>
<p>Principle 7</p>	<p>Independent Review</p> <p>Project Finance</p> <p>For all Category A and, as appropriate, Category B Projects, an Independent Environmental and Social Consultant, not directly associated with the client, will carry out an Independent Review of the Assessment Documentation including the ESMPs, the ESMS, and the Stakeholder Engagement process documentation</p>

EQUATOR PRINCIPLE	OVERVIEW
	<p>in order to assist the EPFI's due diligence, and assess Equator Principles compliance.</p> <p>The Independent Environmental and Social Consultant will also propose or opine on a suitable Equator Principles AP capable of bringing the Project into compliance with the Equator Principles, or indicate when compliance is not possible.</p> <p>Project-Related Corporate Loans</p> <p>An Independent Review by an Independent Environmental and Social Consultant is required for Projects with potential high-risk impacts including, but not limited to, any of the following:</p> <ul style="list-style-type: none"> • Adverse impacts on indigenous peoples • Critical Habitat impacts • Significant cultural heritage impacts • Large-scale resettlement <p>In other Category A, and as appropriate Category B, Project-Related Corporate Loans, the EPFI may determine whether an Independent Review is appropriate or if internal review by the EPFI is sufficient. This may take into account the due diligence performed by a multilateral or bilateral financial institution or an OECD Export Credit Agency, if relevant.</p>
<p>Principle 8</p>	<p>Covenants</p> <p>An important strength of the Equator Principles is the incorporation of covenants linked to compliance. For all Projects, the client will covenant in the financing documentation to comply with all relevant host country environmental and social laws, regulations and permits in all material respects. Furthermore, for all Category A and Category B Projects, the client will covenant the financial documentation:</p> <ol style="list-style-type: none"> a) To comply with the ESMPs and Equator Principles AP (where applicable) during the construction and operation of the Project in all material respects; and b) To provide periodic reports in a format agreed with the EPFI (with the frequency of these reports proportionate to the severity of impacts, or as required by law, but not less than annually), prepared by in-house staff or third-party experts, that i) document compliance with the ESMPs and Equator Principles AP (where applicable), and ii) provide representation of compliance with relevant local, state and host country environmental and social laws, regulations and permits; and c) To decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan. <p>Where a client is not in compliance with its environmental and social covenants, the EPFI will work with the client on remedial actions to bring the Project back into compliance to the extent feasible. If the client fails to re-establish compliance within an agreed grace period, the EPFI reserves the right to exercise remedies, as considered appropriate.</p>
<p>Principle 9</p>	<p>Independent Monitoring and Reporting</p> <p>Project Finance</p> <p>To assess Project compliance with the Equator Principles and ensure on-going monitoring and reporting after Financial Close and over the life of the loan, the EPFI will, for all Category A and, as appropriate, Category B Projects, require the appointment of an Independent Environmental and Social Consultant, or require that the client retain qualified and experienced external experts to verify its monitoring information which would be shared with the EPFI.</p> <p>Project-Related Corporate Loans</p> <p>For Projects where an Independent Review is required under Principle 7, the EPFI will require the appointment of an Independent Environmental and Social Consultant after Financial Close, or require that the client retain qualified and experienced external experts to verify its monitoring information which would be shared with the EPFI.</p>

EQUATOR PRINCIPLE	OVERVIEW
<p>Principle 10</p>	<p>EPFIs Reporting</p> <p>Client Reporting Requirements</p> <p>The following client reporting requirements are in addition to the disclosure requirements in Principle 5.</p> <p>For all Category A and, as appropriate, Category B Projects:</p> <ul style="list-style-type: none"> • The client will ensure that, at a minimum, a summary of the ESIA is accessible and available online. • The client will publicly report GHG emission levels (combined Scope 1 and Scope 2 Emissions) during the operational phase for Projects emitting over 100,000 tonnes of CO₂ equivalent annually. Refer to Annex A for detailed requirements on GHG emissions reporting. <p>EPFI Reporting Requirements</p> <p>The EPFI will report publicly, at least annually, on transactions that have reached Financial Close and on its Equator Principles implementation processes and experience, taking into account appropriate confidentiality considerations. The EPFI will report according to the minimum reporting requirements detailed in Annex B.</p>

3.2.3 IFC Performance Standards on Environment and Social Sustainability (2012)

The IFC Performance Standards are a key component of the IFC's Sustainability Framework and directed towards clients (i.e. party responsible for implementing and operating the project that is being financed), providing guidance on how to identify risks and impacts. 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 1st 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.

Separately, it is noted that as IFC is a shareholder in ACWA Power, all ACWA Power projects require compliance with the IFC Performance Standards including the IFC EHS Guidelines. The following presents the IFC Performance Standards (2012) and their main characteristics:

Table 3-3 IFC Performance Standards (2012)

PERFORMANCE STANDARD	OVERVIEW
PS 1	<p>Assessment and Management of Environmental and Social Risks and Impacts</p> <p>It underscores the importance of managing environmental and social performance throughout the life of a project. It requires the Client to conduct a process of environmental and social assessment, and establish and maintain an Environmental and Social Management System (ESMS) appropriate to the nature and scale of the project and commensurate with the level of its environmental and social risks and impacts. The ESMS must be a dynamic and continuous process initiated and supported by management, and involves engagement between the client, its workers, local communities directly affected by the project (the Affected Communities) and, where appropriate, other stakeholders.</p> <ul style="list-style-type: none"> • Requires stakeholder engagement beyond Affected Communities; • Clarifies levels of stakeholder engagement under different circumstances; • Requires development of a formal environmental and social policy reflecting principles of the Performance Standards; • Introduces participatory monitoring (when appropriate) as an option during implementation; and • Requires periodic performance reviews by senior management.
PS 2	<p>Labour and Working Conditions</p> <p>Recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. The requirements set out in this PS have been in part guided by a number of international conventions and instruments, including those of the International Labour Organization (ILO) and the United Nations (UN)</p> <ul style="list-style-type: none"> • Establishes requirement for comparable terms and conditions for migrant workers compared to non-migrant workers; • Introduces quality requirements for workers' accommodation; • Requires ongoing monitoring of working conditions for workers under the age of 18 years old; • Requires establishing policies and procedures to manage and monitor compliance of third parties with this PS; • Requires alternatives analysis in case of retrenchment; and • Requires ongoing monitoring and "safety" trigger in primary supply chain.
PS 3	<p>Resource Efficiency and Pollution Prevention</p> <p>Outlines a project-level approach to resource efficiency and pollution prevention and control in line with internationally disseminated technologies and practices. During the project life-cycle, the client will consider ambient conditions and apply technically and financially feasible resource efficiency and pollution prevention principles and techniques that are best suited to avoid, or where avoidance is not possible, minimize adverse impacts on human health and the environment.³ The principles and techniques applied during the project life-cycle will be tailored to the hazards and risks associated with the nature of the project and consistent with good international industry practice (GIIP).</p> <ul style="list-style-type: none"> • Introduces a resource efficiency concept for energy, water and core material inputs; • Strengthens focus on energy efficiency and greenhouse gas measurement; • Reduces greenhouse gas emissions thresholds for quantification and reporting to IFC from 100,000 tons of CO₂ to 25,000 tons of CO₂ per year; • Introduces concept of "duty of care" for hazardous waste disposal; and • Requires determination of accountability with regards to historical pollution.

PERFORMANCE STANDARD	OVERVIEW
PS 4	<p>Community Health, Safety and Security</p> <p>Addresses the client's responsibility to avoid or minimize the risks and impacts to community health, safety, and security that may arise from project related-activities, with particular attention to vulnerable groups. This PS addresses potential risks and impacts to the Affected Communities from project activities. Occupational health and safety requirements for workers are included in PS 2, and environmental standards to avoid or minimize impacts on human health and the environment due to pollution are included in PS 3.</p> <ul style="list-style-type: none"> • Requires evaluation of the risks and impacts to the health and safety of the Affected Communities during the project life- cycle and the establishment of preventive and control measures consistent in line with GIIP • Considers risks to communities associated with use and/or alteration of natural resources and climate change through an ecosystems approach.
PS 5	<p>Land Acquisition and Involuntary Resettlement</p> <p>Recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) as a result of project-related land acquisition and/or restrictions on land use. Where involuntary resettlement is unavoidable, it should be minimized and appropriate measures to mitigate adverse impacts on displaced persons and host communities should be carefully planned and implemented.</p> <ul style="list-style-type: none"> • Extends scope of application to restrictions on land use; • Strengthens requirements regarding consultations; and • Introduces a requirement for a completion audit under certain circumstances.
PS 6	<p>Biodiversity Conservation and Sustainable Management of Living Natural Resources</p> <p>Addresses how clients can sustainably manage and mitigate impacts on biodiversity and ecosystem services throughout the project's lifecycle in order to protect and conserve biodiversity; to maintain the benefits from ecosystem services; and to promote the sustainable management of living natural resources through the adoption of practices that integrates conservation needs and development priorities.</p> <ul style="list-style-type: none"> • Clarifies definitions of and requirements for various types of habitats; • Introduces stronger requirements for biodiversity offsets; and • Introduces specific requirements for plantations and natural forests as well as for management of renewable natural resources.
PS 7	<p>Indigenous People</p> <p><i>(Not applicable for Ibri II IPP - as there are no identified indigenous people in the Project area, or those that may be impacted by the Project)</i></p> <p>It requires clients to anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts and to promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner. It also requires the client to establish and maintain an on-going relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life cycle.</p>

PERFORMANCE STANDARD	OVERVIEW
	<ul style="list-style-type: none"> Expands consideration of Indigenous Peoples' specific circumstances in developing mitigation measures and compensation; Introduces requirement for land acquisition due diligence with regards to lands subject to traditional ownership or under customary use; and Introduces the concept of Free, Prior and Informed Consent under certain circumstances.
PS 8	<p>Cultural Heritage</p> <p>Aims to ensure that clients protect cultural heritage from the adverse impacts of project activities and support its preservation and promote the equitable sharing of benefits from the use of cultural heritage in line with the Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage,</p>

3.2.4 IFC EHS Guidelines (2007)

IFC and the World Bank have developed Environmental, Health and Safety Guidelines (EHS Guidelines) for its members, which provide general and sector-specific guidance which must be put into consideration during the Environmental and Social Impact Assessment (ESIA) for this project. The following are relevant to this project:

- General EHS Guidelines, Environmental:
 - Air Emissions and Ambient Air Quality;
 - Energy Conservation;
 - Wastewater and Ambient Water Quality;
 - Water Conservation;
 - Hazardous Materials Management;
 - Waste Management;
 - Noise; and
 - Contaminated Land.
- General EHS Guidelines, Occupational Health & Safety:
 - General Facility Design and Operation;
 - Communication and Training;
 - Physical Hazards;
 - Chemical Hazards;
 - Biological Hazards;
 - Radiological Hazards;
 - Personal Protective Equipment (PPE);
 - Special Hazard Environment; and
 - Monitoring.
- Community Health & Safety:
 - Water Quality and Availability;
 - Structural Safety of Project Infrastructure;

- Life and Fire Safety (L&FS);
 - Traffic Safety;
 - Transport of Hazardous Materials;
 - Disease prevention; and
 - Emergency Preparedness and Response.
- Construction and Decommissioning:
 - Environment;
 - Occupation Health & Safety; and
 - Community Health & Safety.

3.3 Environmental Standards

The environmental standards applicable to the Project as per the national regulations and lender guidelines are outlined below. Full reference of the applicable standards is provided in each relevant chapter herein.

Table 3-4 Applicable Standards & Guidelines

ENVIRONMENTAL PARAMETER	OMANI STANDARDS	LENDER GUIDELINES
Ambient Air Quality	MD 41/2016 includes Ambient Air Quality Standards	IFC EHS General Guidelines: Table 1.1.1 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 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. Soil quality baseline performance has been benchmarked against Dutch standards as there are no domestic standards for soil quality in the Sultanate. All the other baseline activity especially air quality and noise have been referenced against both local and lender standards.

In accordance with lender requirements, where specific national standards do not exist, an international good practice standard should be applied. This may apply to parameters such as soil, where Oman and the lenders have no specific standards/guidelines.

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 ESIA Scope of Work and Key Deliverables

The main deliverables of the ESIA process are the Environmental & Social Scoping (ESS) report and Environmental & Social Impact Assessment (ESIA) Report (this report).

This ESIA follows on from the Environmental & Social Scoping (ESS) study for the Project, which was written to identify sensitive receptors and key environmental and social impacts related to the construction and operational phases of the project at an early stage in order to ensure that the baseline surveys and assessment techniques for the subsequent ESIA address these issues specifically.

The scoping report included:

- Preliminary identification and brief description of the existing environmental & social conditions of the Project site and surroundings;
- Identification of the structure and content of the ESIA report.
- The key features of the proposed project facilities.
- A gap analysis of existing information to determine the additional information that needs to be gathered for the ESIA report (air quality monitoring, soil sampling & analysis, noise monitoring etc.) and;
- Potential environmental issues, constraints and possible opportunities associated with the proposed project activities and facilities based on the existing information.

4.2 Delineation of Study Boundaries and Scope of Assessment

4.2.1 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 (project boundaries);

- The Project's area of influence and potential receptors (defined in specific sections herein);
- Associated Project Facilities:
 - Access road connection from existing Ibri Power Plant 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)
- Construction works, facilities/infrastructure within the defined Project footprint;
- The projects operational phase activities, aspects and impacts and;
- Impacts to the environment and defined receptors that are external to the project's footprint and within the zone of potential impacts (e.g. from air emissions, noise etc.)

4.2.2 Scope of Assessment

The ESIA has assessed the potential impacts related to the proposed projects construction phase and operations. The primary study area therefore comprises the footprint of the project, access roads to the site, internal roads, electrical connections and other associated infrastructures & facilities.

Where project impacts extend to areas external to the study area, (i.e. due to noise propagation, air emissions, dust impacts) these have also been assessed.

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 25 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. As such, the ESIA has not assessed the potential impacts related to the decommissioning phase of the Project.

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.

4.3 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.

This ESIA has been informed by a review of relevant desktop information as well as a series of physical site surveys which have been summarised in the relevant environmental and social impact assessment chapters of this report. The environmental baseline surveys carried out as part of the ESIA included:

Table 4-1 Site Surveys for ESIA

SITE SURVEYS	PERIOD
Site Familiarisation	October 2018
2nd Site visit and informal engagement with current land users	May 2019
Ambient Air Quality Monitoring	June 2019
3 rd Site Visit for Asset Inventory Mapping	June 2019
Noise Monitoring	June 2019
Soil Sampling	June 2019
Terrestrial Ecology Survey	June 2019
Site Visit for Archaeological Sites	July 2019

These surveys are described in the ESIA chapters herein, with analysis results provided, and included to the applicable appendices. The surveys were conducted with the intent to provide representative data in regard to the area that may potentially be impacted by the Project.

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 EIA 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 EIA stage in order to notify, gain views and enable a better understanding of the dynamics of the local environment.

All consultations were conducted by 5 Capitals and/or MECA Registered Environmental Consultant (Yahya Engineering). The bilateral consultation included 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?
- 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 included the following qualitative research tools popular in development planning:

- Structured Interviews with Public Authorities
- Participant Observation with Project Affected People
- Limited Surveys for Physical Asset Mapping

The data gathered in the stakeholder engagement process was used to inform the standalone Resettlement Action Plan (RAP) and the mitigation measures for the environmental and social management plan.

Table 4-2: Stakeholder Consultation Register

STAKEHOLDERS	JUSTIFICATION FOR CONSULTATION	DATES OF CONSULTATION	CONSULTATION TECHNIQUE
Ministry of Environment and Climate Affairs (MECA)	Statutory Authority for Environmental Permitting in the Sultanate of Oman	Scoping Report feedback	Formal Feedback on Scoping Report
		23 rd May 2019	Bi-lateral meeting
The Wali of Ibri's Office	Competent Authority responsible for local affairs	In general, over the months of June and July 2019 with multiple calls and in person meetings regarding the local stakeholders including the Sheikhs. Feedback regarding local concerns regarding the project layout is coordinated via The Wali of Ibri's Office.	Unstructured Interview but with a targeted discussion agenda.
		On 8th July 2019, a meeting with HE The Wali was held in Ibri where The Wali informed the consultant team that he has held consultations with the local sheikhs, and suggested three alternatives for the project layout to avoid impact on the camel race track.	
		On 10th July 2019, the project company met with HE The Wali in the presence of the consultant to further discuss the change in project layout and the potential configuration of the new project layout, which is essentially the project layout at the current juncture.	
		On 24th July 2019, the project company met with officials in the Wali's Office at Ibri in the presence of the consultant to submit a formal letter from the Ministry of Housing regarding the change in project layout. The Wali himself was absent in the meeting.	
Ministry of Regional Municipal and	Local Municipality for Ibri	12 th June 2019	Unstructured Interview

STAKEHOLDERS	JUSTIFICATION FOR CONSULTATION	DATES OF CONSULTATION	CONSULTATION TECHNIQUE
Water Resources (MRMWR), Ibri Town			
Ministry of Housing Office, Ibri Town	The local office for the government agency that owns the Project land.	12 th June 2019	Unstructured Interview
Expatriate are Camel Herders	Project Affected People (PAP) living on the site. Long-term residents.	23 rd May 2019	Unstructured Interviews & Participant Observation
		12 th June 2019	Physical Asset Inventory Mapping & Participant Observation
Local Sheikh's	Owner of the Camel Herds/Farm/Race Track	Not known - In order to align with a culturally relevant process for consultation in the s region of Oman, the ESIA team was advised by the HE The Wali of Ibri that he would directly communicate with the local Sheikh's on all Project matters.	
Ibri IPP	Neighbouring industrial facility. Combined Cycle Gas fired Power Plant	12 th June 2019	Unstructured Interview

Findings from the stakeholder consultation process are detailed in the Table below. ACWA Power approved all consultation prior to being undertaken. Summaries of their responses/ comments are presented in the table below.

Table 4-3 Overview of Responses from Consulted Stakeholders

STAKEHOLDERS	RESPONSES/COMMENTS
Ministry of Environment and Climate Affairs (MECA)	<p>Feedback received on the ESIA Scoping Report. In summary, MECA agreed to proceed with ESIA on the basis of the scoping, but requested specific consideration of the wadi channels that overlapped areas of the north and south of the previous Project plot. A round table focus group was held on the 23rd of May 2019, and the environmental permitting expectations were mapped.</p> <p>On this basis, discussions were held with ACWA Power, which led to various meeting with MoH and HE the Wali of Ibri to agree a new Project layout, as has been assessed in this ESIA.</p>
HE The Wali of Ibri's Office	<p>Multiple rounds of discussions have been held with The Wali's Office and have included general discussion on the Project, specific discussions in regard to the need to resettle the camel herders & race track, as well as adapting the layout of the Project site to ensure that the identified wadi channels do not fall within the Project footprint.</p> <p>Key feedback from the office of the Wali of Ibri has included:</p> <ul style="list-style-type: none"> • A request of CSR activities in the Project area to benefit local populations and the economy.

STAKEHOLDERS	RESPONSES/COMMENTS
	<ul style="list-style-type: none"> A request for the Project to prioritise potential employment for local graduates. <p>In regard to the need for resettlement, HE the Wali of Ibri has consulted with the local Sheikh's regarding their land uses especially in regard to the camel herds and camel race track. HE the Wali of Ibri has since attained a non-objection from the Sheikh's in regard to the relocation of both the camel herds and the camel racetrack, and has agreed that the resettlement and relocation will occur in parallel with the construction of the Ibri II IPP, with costs of the process being borne by the Project.</p>
Ministry of Regional Municipal and Water Resources (MRMWR), Ibri Town	<p>Upon meeting with MRMWR in Ibri, it was advised that all matters of consultation in regard to the Project should be directed via HE The Wali of Ibri's office; which is under the Wali's mandate.</p>
Ministry of Housing Office, Ibri Town	<p>Upon meeting with MoH in Ibri, it was advised that all matters of consultation in regard to the Project should be directed via HE The Wali of Ibri's office; which is under the Wali's mandate.</p>
Camel Herders	<p>The ESIA Team met incidentally with the camel herders informally in May on the site, and under a more structured interview process in June 2019. General discussion and targeted questions were performed to understand their history, their livelihoods, their access to utilities, facilities and employment situation. A specific survey of assets was also undertaken in June 2019 for feed into the standalone Resettlement Action Plan (RAP).</p> <p>Key feedback from the herders included:</p> <ul style="list-style-type: none"> Potential considerations for enhanced living & employment conditions and access to utilities & resources as a benefit from the Project (including water, sanitation, electricity etc). Consideration of the herders for Project related roles, where these may be available.
Owner of the Camel Herds/Farm/Race Track – Local Sheikh's	<p>In order to align with a culturally relevant process for consultation in this region of Oman, the ESIA team was advised by the HE The Wali of Ibri that he would directly communicate with the local Sheikh's on all Project matters.</p> <p>HE the Wali of Ibri has since attained a non-objection from the Sheikh's in regard to the relocation of both the camel herds and the camel racetrack, and has agreed that the resettlement and relocation will occur in parallel with the construction of the Ibri II IPP, with costs of the process being borne by the Project.</p>
Ibri 1 IPP HSE Manager	<p>The HSE Manager of Ibri IPP advised that there would be a need for the EPC Contractor staff to be culturally sensitive to the needs and practices of local people, to avoid confrontation and friction.</p> <p>He advised that traffic management for the Project would be a concerning the Ibri area more generally and stated that Ibri is an accident-prone area.</p> <p>He stated a need to ensure effective coordination with the EPC Contractor of the Ibri 2 IPP during the construction phase, especially if they would be an international company with expatriate manpower (largely based on his past experiences).</p>

4.3.3 Impact Assessment Significance Criteria

In order to obtain a credible assessment of environmental 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 an International Best Practice guideline¹ 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);
- 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;
- **Step 3** – Determining the significance of impacts

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

¹ See for example Scottish Natural Heritage (2009) A handbook on environmental impact assessment or Highways Agency (2008) Assessment and Management of Environmental Effects design manual for roads and bridges HA 205/08 Volume 11, Section 2, Part 5.

Table 4-4 Environmental Value of Receptor or Resource

VALUE (SENSITIVITY)	DESCRIPTION OF VALUE
Very High	<ul style="list-style-type: none"> • High importance and rarity on an international scale and limited or no potential for substitution. • 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. • Locations or communities that are highly vulnerable to the environmental impact under consideration or critical for society (e.g. indigenous peoples, hospitals, schools).
High	<ul style="list-style-type: none"> • High importance and rarity on a national scale, and limited potential for substitution. • 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. • Locations or communities that are particularly vulnerable to the environmental impact under consideration (e.g. residential areas, vulnerable/marginalized groups).
Medium	<ul style="list-style-type: none"> • High or medium importance and rarity on a regional scale, limited potential for substitution. • 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. • Locations or groups that are relatively vulnerable to the environmental impact under consideration (e.g. commercial areas).
Low	<ul style="list-style-type: none"> • Low or medium importance and rarity on a local scale. • 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. • Locations or groups that show a low vulnerability to the environmental impact under consideration (e.g. industrial areas).
Very Low	<ul style="list-style-type: none"> • Very low importance and rarity on a local scale. • 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. • 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

The following types of impacts have been considered in line with 5 Capital's assessment methodology:

- 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 – 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 – Impacts that are detrimental and have a negative influence on sensitive resources or receptors;
- Event Related Impacts - Potential unplanned or accidental impacts stemming from an unintentional event such as fire, explosion, oil spill, etc. taking into consideration likelihood of occurrence;
- Cumulative Impacts - The additive potential impacts that may result from the incremental potential impacts of the planned Project plus the potential impacts of reasonably anticipated future projects or future phases of a same development.

The magnitude of the impact refers to the extent of change that is anticipated to occur for the receptor(s) under consideration and is considered as a function of:

- Extent/scale;
- Duration;
- Frequency and;
- Likelihood of occurrence.

In other words, the criterion that has been used for assessing the magnitude of impacts includes: the geographical scale of the impact, the permanence of impact and the reversibility of the impacted condition. A brief description of the magnitude of the impacts is provided in the Table below.

Table 4-5 Criteria for Magnitude of Impacts

MAGNITUDE OF IMPACT	DESCRIPTION OF MAGNITUDE
Major	<p><u>Adverse</u>: 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><u>Beneficial</u>: Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality.</p>
Moderate	<p><u>Adverse</u>: 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><u>Beneficial</u>: Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.</p>
Minor	<p><u>Adverse</u>: 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><u>Beneficial</u>: 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>
Negligible	<p><u>Adverse</u>: Very minor loss or detrimental alteration to one or more characteristics, features or elements.</p> <p><u>Beneficial</u>: Very minor benefit to or positive addition of one or more characteristics, features or elements.</p>
No change	<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 Table 4-5.

Table 4-6 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 4-7 Definition of Impact Significance

SIGNIFICANCE CATEGORY	CRITERIA
Very Large	Only adverse effects are assigned this level of importance as they represent key factors in the decision-making process. Effects are associated with sites and features of national or regional importance. Effects exceed statutory limits. Mitigation measures are unlikely to remove such effects.
Large	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. Mitigation measures and detailed design work are unlikely to remove all of the effects upon the affected communities or interests.
Moderate	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. They represent issues where effects will be experienced but mitigation measures and detailed design work may ameliorate or enhance some of the consequences upon affected communities or interests. Some residual effects will still arise.
Slight	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.
Neutral	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 E&S Disclosure

As part of AIB's process to reach board agreement and in line with other lending banks international good practices for environmental & social management, ESIA disclosure sessions took place with relevant Project stakeholders in October and November 2019.

The purpose of these sessions were to invite Project Affected People and other relevant stakeholders to present an overview of the Project, the Environmental & Social assessment process undertaken; prepared management plans (RAP and SEP – including the grievance

mechanism) and to receive feedback, where applicable to be incorporated to finalise the E&S documents.



An overview of both disclosure meetings are outlined on the following pages. Full minutes of each session are provided in ESIA Volume 4, Appendix G.

It is further noted that the full ESIA package (Volumes 1 – 4), including Arabic Non-Technical Summary, SEP and RAP have been made available publicly online at ACWA Power's website since 11/11/2019. They can be accessed at the following links:

<https://www.acwapower.com/en/projects/ibri-2-ipp/>

<https://www.acwapower.com/en/sustainable-responsibility/hsse-management/>

Table 4-8 E&S Disclosure Sessions

DATE	LOCATION	STAKEHOLDERS	LANGUAGE	OVERVIEW OF SESSION	PHOTO
14/10/2019	Camel Herder Compound (on-site)	Camel Herders (to be resettled) Meeting provided separately as the herders had been identified as potentially vulnerable due to language and social status.	Bangla & Arabic	PAPs were provided with an overview of the Project, the ESIA process that had been undertaken, the relevance to them. In terms of their resettlement, they were already aware, but advised of the process that would be undertaken, the approximate location of their new accommodation and race track (as per RAP). Future engagement was explained to them (as per the SEP), as was the process by which they can raise grievances or other queries to the Project (as per SEP). Feedback and queries were sought. The PAPs were generally positive and very happy to be included to the disclosure process.	
11/11/2019	Governor of Ibri Office	Governor of Ibri, Wali of Ibri, Royal Oman Police, CID, Security and Armed Forces leaders, Majan Electricity (Ibri IPP) personnel, Majilis Shura, Oman Power	Arabic	The meeting commenced with a welcome from the Governor of Ibri, followed by opening remarks from Yahya Engineering on Project, ESIA, RAP, SEP and Grievance Mechanism. ACWA Power provided a presentation of the Project, which was followed by a questions and answer session. A press release to advise on the Project and the meeting was inserted to several local publications by the local media on 12/11/2019 (ref. ESIA Appendix G).	

5 AIR QUALITY

This chapter describes and assesses the potential impacts that may occur as a result of the projects construction and operational activities on air quality and identifies measures to be undertaken and implemented in order to mitigate and manage such impacts.

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 ₂)	0.124	350	1
	0.0532	150	24
Hydrogen Sulphide (H ₂ S)	0.020	30	1
Nitrogen Dioxide (NO ₂)	0.123	250	1
	0.0642	130 (24 hours)	24
Ozone (O ₃)	0.0568	120	8
PM ₁₀	-	150	24
PM _{2.5}	-	65	-
Carbon Monoxide (CO)	24.3	30mg/m ³ (24 hours)	-
	8.11	10mg/m ³	-
Non-Methane Hydrocarbon (NMHC)	0.24	160	-
Lead (Pb)	-	1.5	-
NH ₃	-	200	-

5.1.2 Lender Requirements

International financial institutions providing project finance will require adherence to the World Health Organisation Ambient Air Quality requirements, as detailed in the IFC General EHS Guidelines.

**Table 5-2 WHO Ambient Air Quality Guidelines (ref: IFC General EHS Guidelines)
($\mu\text{g}/\text{m}^3$ unless otherwise specified)**

PARAMETER	WHO STANDARDS	
	24 HOUR	ANNUAL
PM ₁₀	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)
PM _{2.5}	75 (Interim target 1)	35 (Interim target 1)
	50 (Interim target 2)	25 (Interim target 2)
	37.5 (Interim target 3)	15 (Interim target 3)
	25 (guideline)	10 (guideline)
Nitrogen Dioxide (NO ₂)	200 (1 hour)	40
Sulphur Dioxide (SO ₂)	125 (Interim target 1)	500 (10-minute guideline)
	50 (Interim target 2)	
	20 (guideline)	
Ozone (O ₃)	100 (8 hour daily maximum guideline)	

5.2 Observations and Baseline Conditions

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

Air quality and in particular instances of poor air quality are influenced less by geographical considerations and more by proximity to pollution sources (e.g. cities, highways and industrial facilities). Typically, the air shed closer to a pollution source is of poorer quality than at a greater distance (due to pollutant dispersion), however air quality at a particular location is generally dependent on weather conditions particularly wind direction and wind strength; which has a large effect on the direction and dispersion of the pollutant plume.

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, NO₂, SO₂, VOC's, CO and Particulate Matter (i.e. PM_{2.5} & PM₁₀) 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_x (as NO and NO₂) 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 NO₂ and CO, but an increase in SO₂ 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.

Ambient Air Quality Monitoring

Ambient air quality monitoring was undertaken from 12th of June, 2019 to 22nd of June, 2019 at one monitoring locations near the Project site. The survey was conducted during day and night using a continuous stationary high-volume mass sampler to monitor ambient concentrations of carbon monoxide (CO), nitrogen dioxide (NO₂), sulphur dioxide (SO₂), ozone (O₃), and particulate matter (PM_{2.5} and PM₁₀) at each location (note: calibration certificates are presented in presented in the report in Appendix

The monitoring survey was carried out as follows:

Table 5-3 Air Quality Monitoring Schedule

LOCATION SURVEYED	DATE OF SURVEY
AQ	12-22 June 2019

The monitoring campaign ran for ten (10) days at each location to ensure that conditions could be benchmarked with hourly and 24-hourly standards, as well as observing any diurnal fluctuations in ambient air quality, or influences due to local weather conditions.

Figure 5-1 Ambient Air Quality Monitoring Station



The location of the air quality monitoring station is presented as follows:

Figure 5-2 Location of Ambient Air Quality Monitoring Station

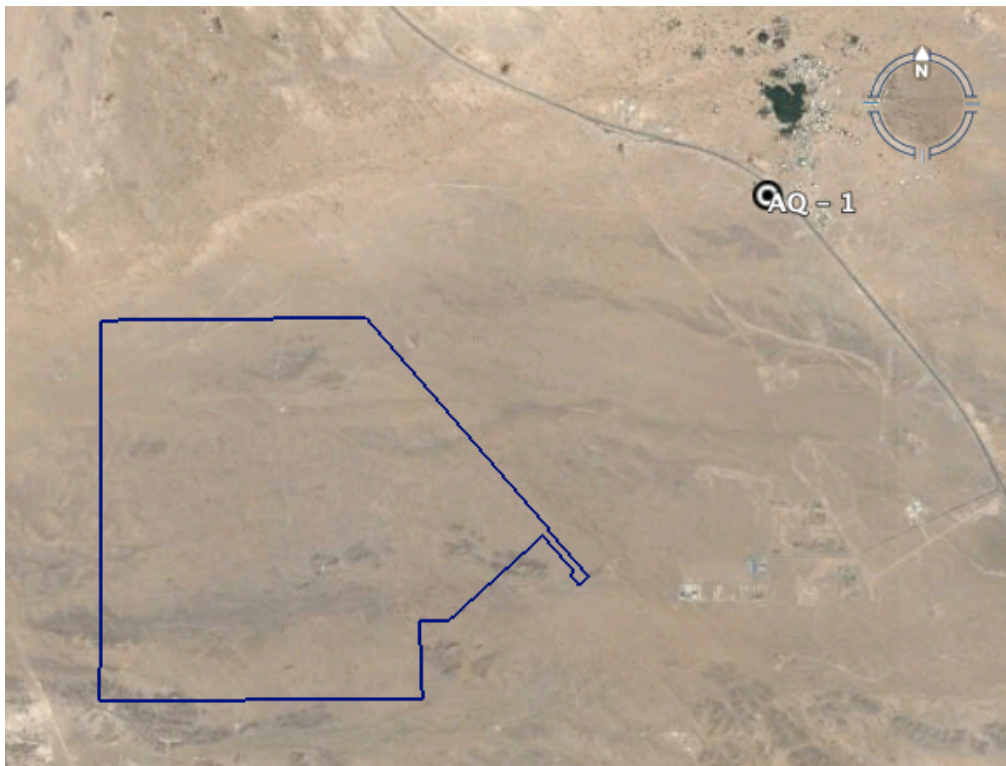


Table 5-4 Ambient Air Quality Monitoring Location

ID	CO-ORDINATES	
	EASTING	NORTHING
AQ-1	56° 16' 42.8"	23° 23' 39.71"

Ambient Air Quality Monitoring Results

Ambient Air Quality Monitoring Results

The average results obtained for the ambient air quality monitoring survey conducted in the vicinity of the project site are presented in the table below showing the concentration of CO, NO₂, O₃, SO₂, particulate matter (PM_{2.5} and PM₁₀) and meteorological data. The 24-hour average results are presented in the table below showing concentration of all parameters analysed. These results have been compared with ambient air quality standards established by Oman and WHO.

The complete ambient air quality laboratory results are provided in Appendix B of ESIA Volume 4.

Meteorological Data

Table 5-5: Meteorological Average Data Obtained from AQ Monitoring Station

TIME	°C	RH %	MBAR
Morning (6AM-6PM)	30.2	57.0	1002.7
Night (7PM-5AM)	27.0	67.8	1002.1
Daily	28.7	61.9	1002.4

The predominant wind direction is in a south-easterly direction as per the wind rose generated from the meteorological station data set.

Figure 5-3: Wind Rose for the Monitoring Period

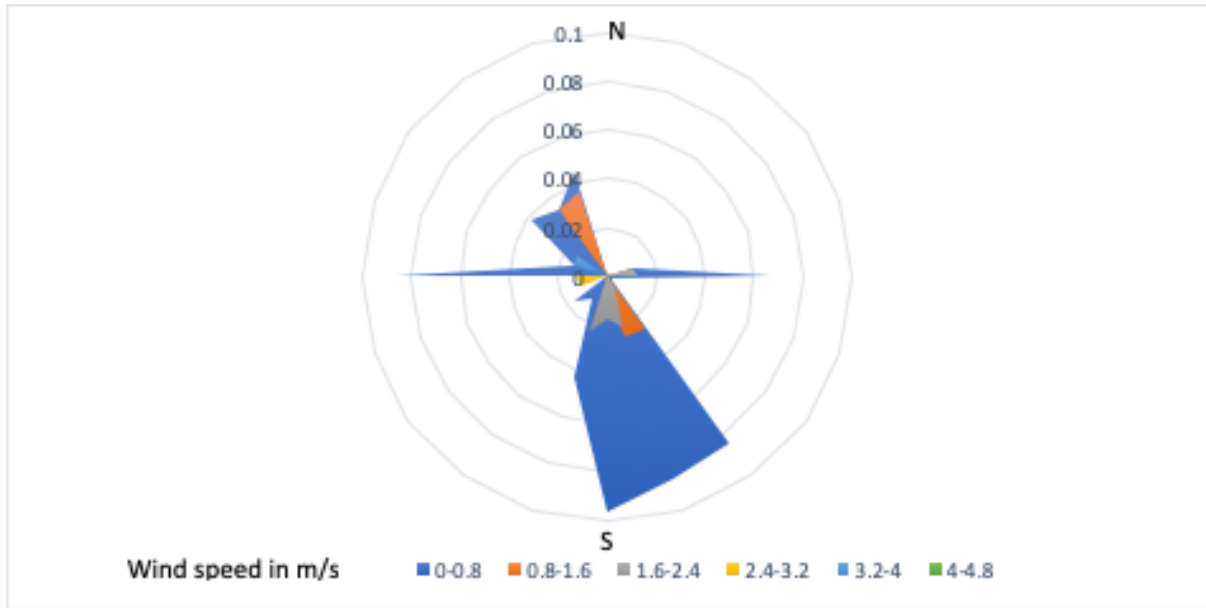


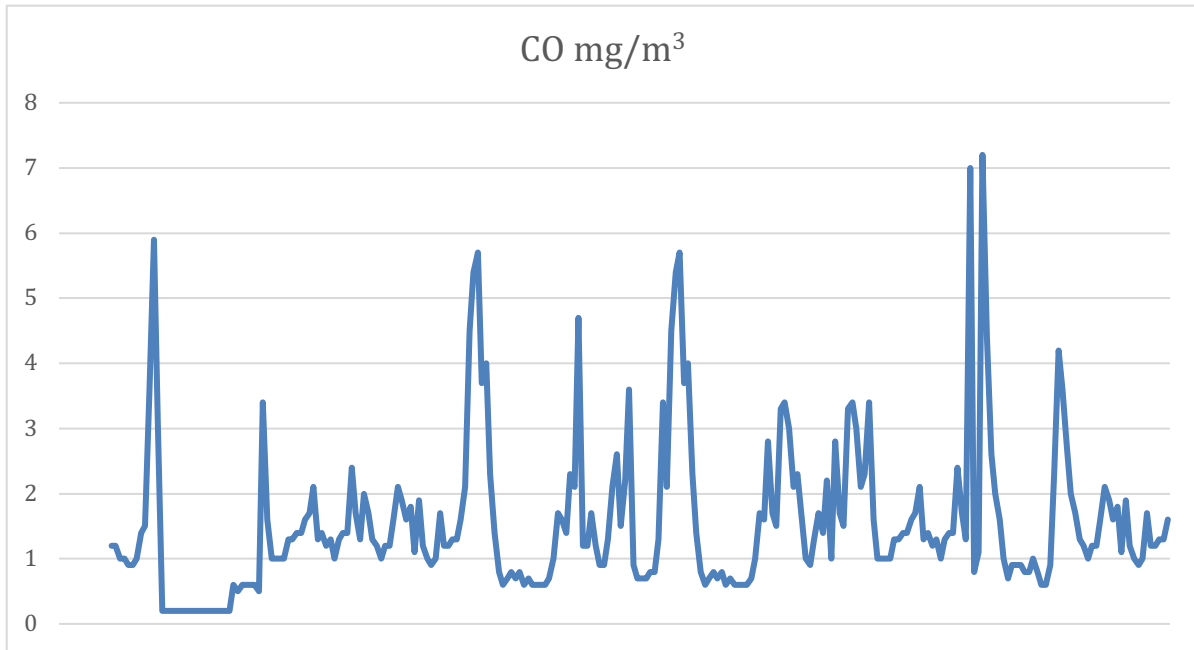
Table 5-6 Average Ambient Air Quality Data over Monitoring Period

POLLUTANT	OMAN STANDARD (MD 41/2016)	WHO LIMIT ($\mu\text{G}/\text{M}^3$)	MONITORING VALUE ($\mu\text{G}/\text{M}^3$)	OBSERVATION
PM10	150 ($\mu\text{g}/\text{m}^3$) 24 hour	50	41.3	Below Omani and WHO Limit
PM 2.5	65 ($\mu\text{g}/\text{m}^3$) 24-hour	25	9.09	Below Omani and WHO Limit
CO	30 (mg/m^3) 8-hour	n/a	1.33 (mg/m^3)	Below Omani and WHO Limit
O ₃	120 ($\mu\text{g}/\text{m}^3$) 8-hour	100	46.41	Below Omani and WHO Limit
NO ₂	130 ($\mu\text{g}/\text{m}^3$) 8-hour	200	22.56	Below Omani and WHO Limit
VOC	No applicable limit	n/a	0.63 (ppm – 3 hour)	n/a
CH ₄	No applicable limit	n/a	2.27 (ppm – 3 hour)	n/a
H ₂ S	0.02 (ppm) 1-hour	n/a	0.001	Below Omani and WHO Limit
SO ₂	150 ($\mu\text{g}/\text{m}^3$) 24-hour	20	5.27	Below Omani and WHO Limit

All the parameters are below Omani regulatory limits and WHO standards (the horizontal axis is the number of days), however individual date data sets are plotted graphically below:

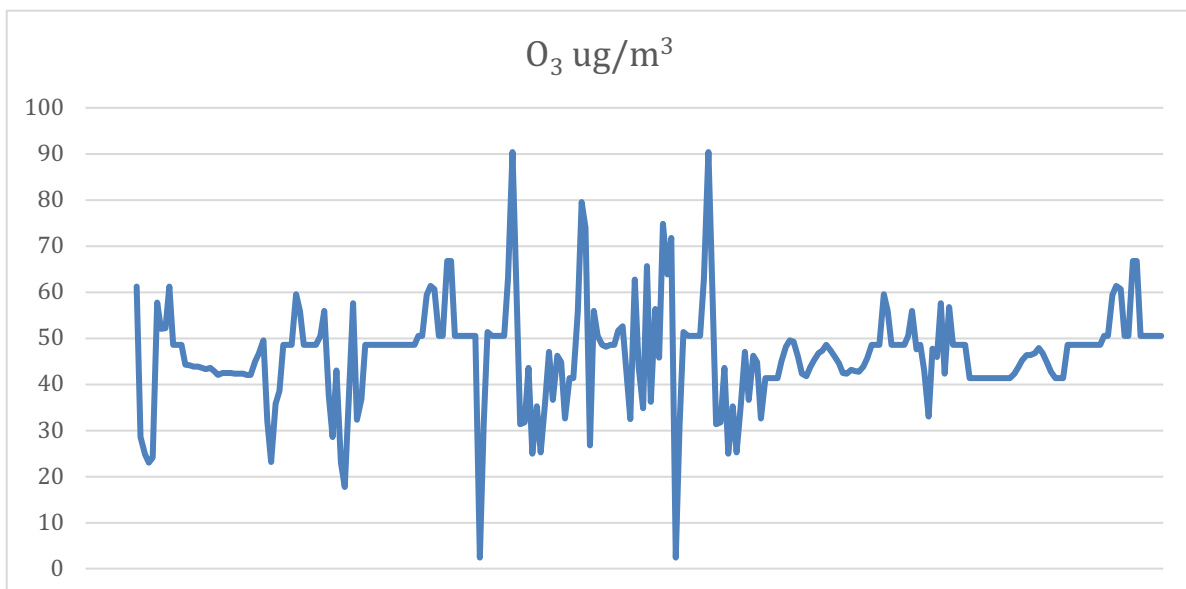
Note: please be advised that the following graphs do not include 'x' axis labels, however the graphs portray time series data from 12th - 22nd June 2019 as monitored during this period, and as a result include 10 days of continuous monitoring.

Figure 5-4: CO Trend Over Monitoring Period



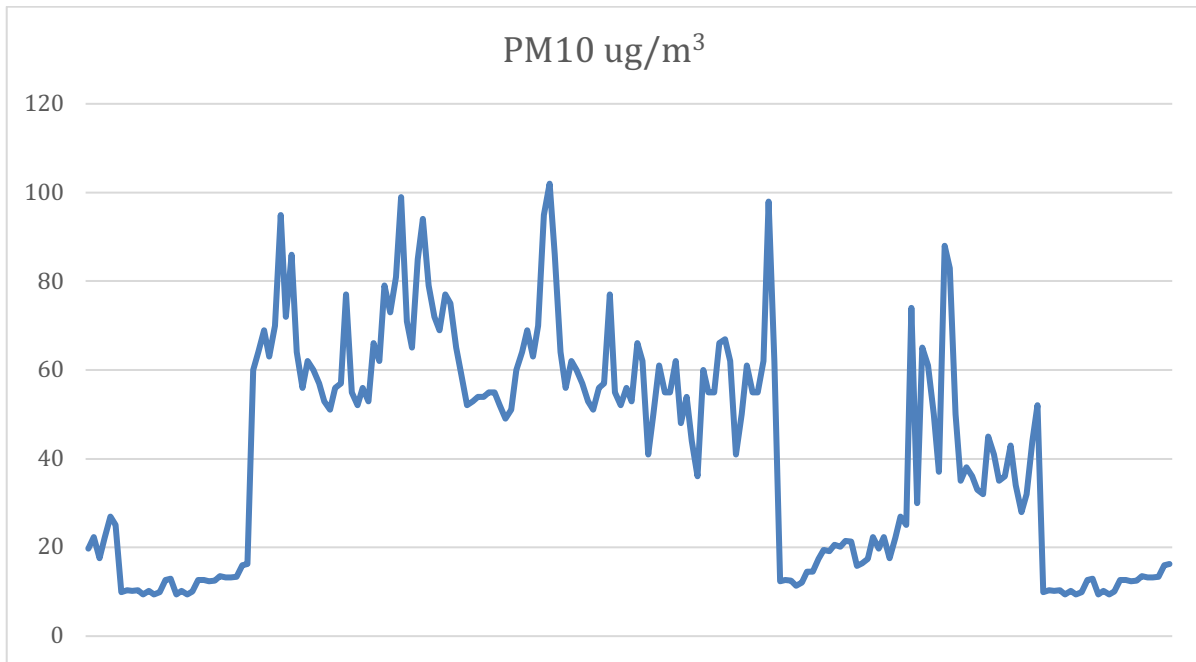
The CO concentrations spike around noon on four days during the ten-day monitoring period.

Figure 5-5: Ozone Trend Over Monitoring Period



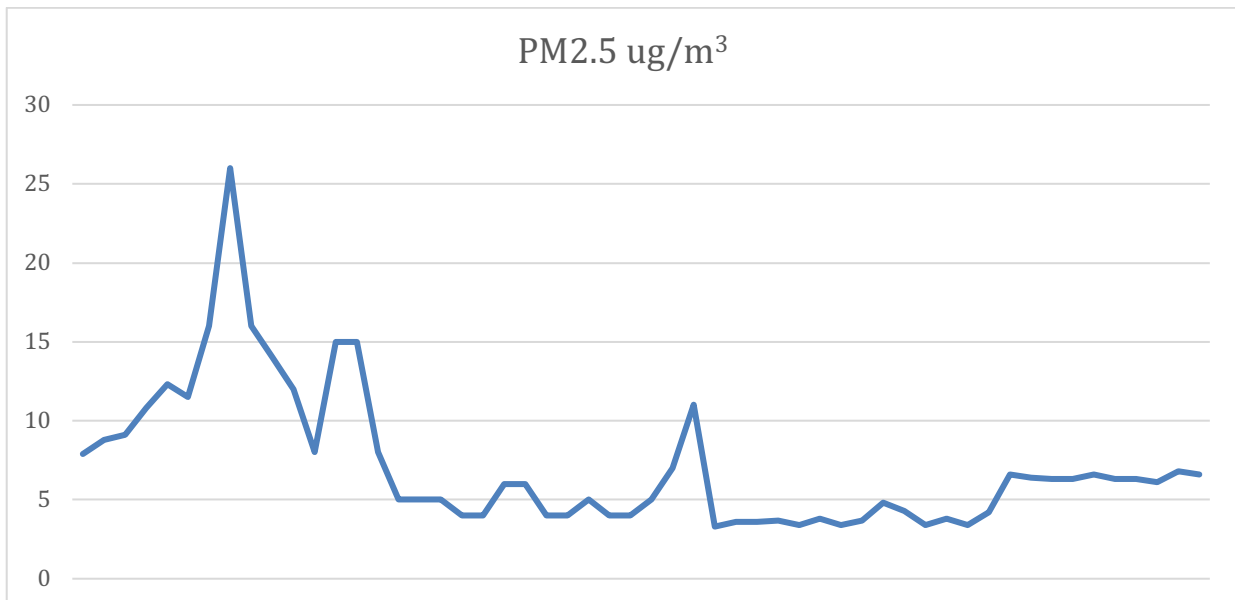
The ozone concentrations vary from 5 ug/m³ to 90 ug/m³ during the ten-day monitoring period

Figure 5-6: PM10 Trend Over Monitoring Period



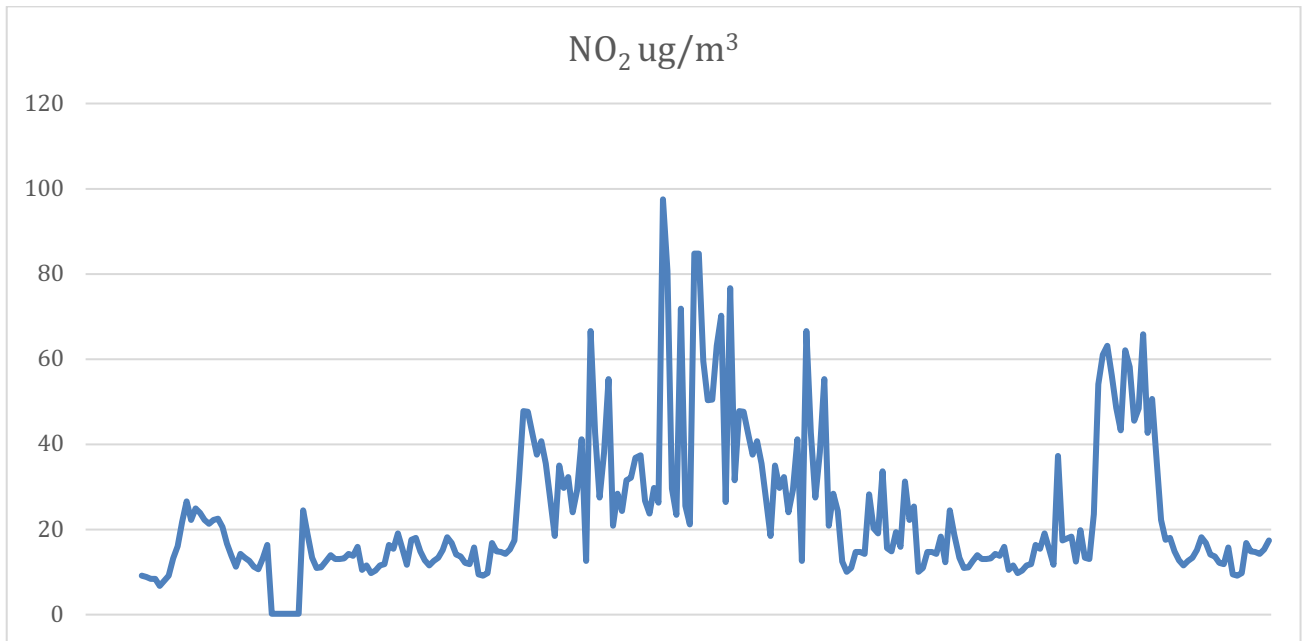
PM10 concentration over the ten-day monitoring period peaked in the majority of the period at hand.

Figure 5-7: PM2.5 Over the Monitoring Period



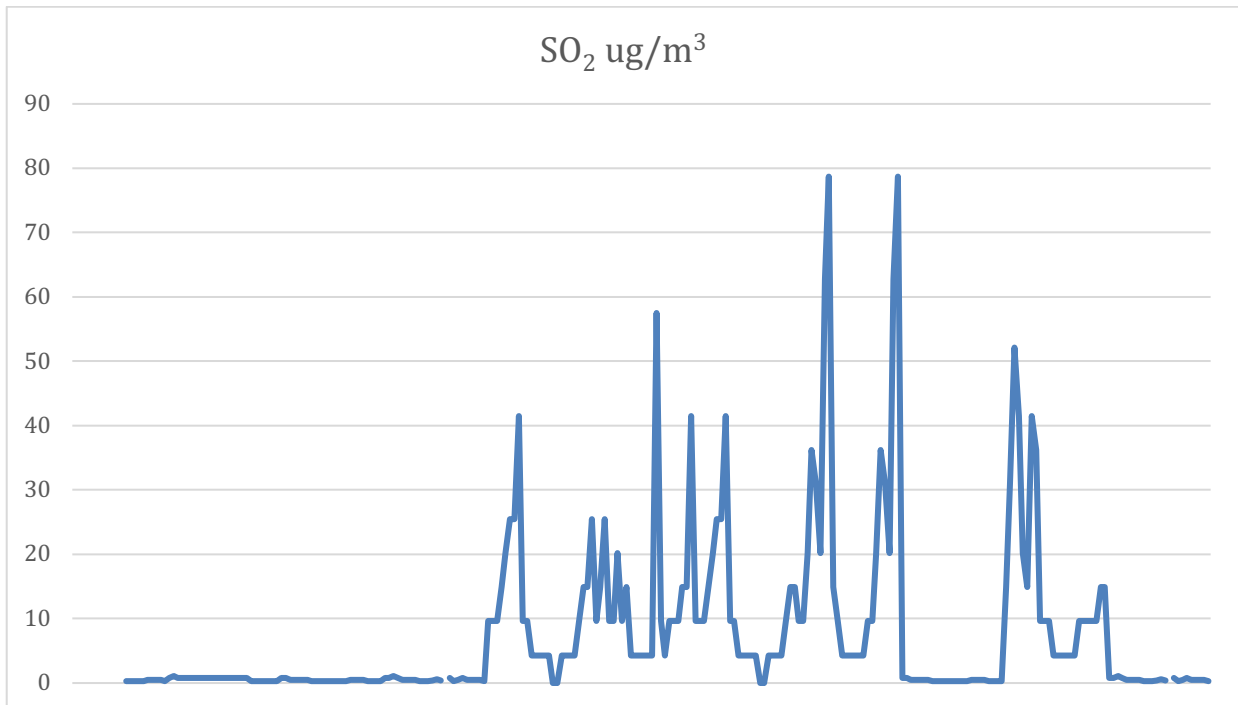
The PM2.5 concentration level over the ten-day monitoring period has been flat apart from one spike in the initial quarter.

Figure 5-8: NO₂ Trend Over Monitoring Period



All the spikes of NO₂ over the monitoring period were below Omani and WHO regulatory standards.

Figure 5-9: SO₂ Trend Over Monitoring Period



SO₂ concentration peaked in the latter half of the monitoring period with maximum concentration spikes on two consecutive days.

5.3 Receptors

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 operational air emissions (besides possible emergency diesel generator use). 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 & May/June/July 2019 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 located north of the Project site, the active camel farm 1 & 2 200m south east & 500m east of the Project site respectively, lbri IPP contractor camp approximately 800m south east, and the lbri IPP currently undergoing commissioning approximately 1km south east of the Project site.

Table 5-7 Air Quality Receptors

RECEPTOR	SENSITIVITY	RECEPTOR TYPE	JUSTIFICATION
lbri IPP Worker Accommodation Area	High	Residential	The existing lbri IPP camp will be re-used during the lbri 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	Medium	Recreational	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
Occupied & Active Camel Farm	High	Residential & Agricultural	The camel farm(s) includes a residential attachment and camel pens which are sensitive to changes in air quality.
Farmland 1	Medium	Agricultural	Users of this farmland are relatively vulnerable to changes in ambient air quality as a result of development of the Project
lbri IPP	Low	Industrial	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 commissioning and operational activities.

5.4 Potential Impacts, Mitigation, Management & Residual Impacts

5.4.1 Construction Phase

During construction, local ambient air quality may potentially be affected by increased dust, particularly during the site preparation stage (site clearance, levelling of sand dunes areas and earthworks) and by the exhaust fumes of construction vehicles, equipment and temporary power generators. The typical air emissions resulting from these activities include: nitrogen oxides, sulphur dioxides, carbon monoxide, carbon dioxide, VOCs, particulates and BTEX.

The principle sources of dust, particulate and gaseous emissions during construction will be:

- Excavations and earthworks, such as ground breaking, cutting, filling and levelling;
- Vehicle movements on unpaved, or compacted surfaces;
- Particulate matter dispersion from uncovered truckloads;
- Vehicle and Construction equipment emissions (e.g. NO_x, SO_x and CO, CO₂, VOCs, particulates and BTEX) and particulates from vehicles, generators and other mechanical equipment;
- Stored VOCs and other volatile hazardous materials and;
- Odour from temporary wastewater facilities, or containment

Dust Generation

The principle sources of dust and particulate emissions during construction will be:

- Excavations and earthworks, such as ground breaking, cutting, filling and levelling;
- Vehicle movements on unpaved, or compacted surfaces; and
- Particulate dispersion from uncovered truckloads.

Dust Emissions from Site Preparation

Dust resulting from excavations and earthworks typically comprises large diameter particles, which settle rapidly and close to the generation source.

According to the screening guidance of the UK's Institute of Air Quality Management (IAQM) for construction dust, detailed assessment relating to dust generation is required where there is a 'human receptor' within 350m of the boundary of the site. In the instance of this Project and with respect to the screening criteria above, the camel racetrack and active camel farm 1 are within 350m of the project site boundary. As such, there is the potential for impacts relating to dust emissions as a result of site preparatory activities upon these receptors.

However, the magnitude of such dust impacts from site preparatory works will depend on the wind speed and wind direction at the Project site which have been observed to predominantly

come from the west to east direction; as indicated by the wind direction data presented above.

Dust Emissions & Particulate Emissions from Movement of Vehicles

In addition to vehicle movements on unpaved surfaces, dust generation from truck movements and particulate dispersion from uncovered truckloads would only occur where mitigation measures are not effectively implemented at the site, or by contractors bringing materials to the site.

Uncontained and/or un-sheeted trucks may be subject to losses of material where the containment is not effective (e.g. spills), or where wind or other air turbulence may disturb the contents and result in dispersion of materials. Such impacts have the potential to degrade local air quality in the immediate area of such movements.

In accordance with the UK's IAQM Guidance on the Assessment of Dust from Demolition and Construction, detailed assessment of vehicle movements should only be required where 'human' receptors are located within 50m of the route used by construction vehicles on public roads, up to 500m from the project site entrance.

In the instance of this Project, the receptors within 50m of the route to be used by construction vehicles are the Ibri IPP worker accommodation area and the Ibri IPP. As such there is the potential for impacts relating to dust generation or particulate emissions as a result of increase vehicle movement on this route.

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 and plant. Such vehicles and equipment are likely to include, but not be limited excavators, graders, pavers, cranes, vibratory rollers, generators, etc. The quantity of gaseous emissions from this equipment will depend on the numbers deployed on site and the hours of operation; but they are expected to be relatively few in number with respect to the geographic extent of the project site.

Any emissions from construction vehicles, plant and equipment are expected to mix in ambient air close to the point of origin and are unlikely to be discernible thereby resulting in emissions that are not distinguishable from the background concentrations or emissions that will not result in an exceedance in ambient air quality standards/concentration.

However, where old or poorly maintained equipment is operated, there is potential for noticeable and/or cumulative impacts to occur. Such impacts are not expected to be discernible at receptor locations over 500m from the project boundary and over 50m from the site access road.

Volatile Organic Compounds (VOC's)

Small quantity 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. If not adequately contained, such substances have the potential to result in the dispersion of volatile emissions to the immediate air shed. Given that the likely storage of such volatile substances will be in small volumes, such impacts will be limited to the immediate surrounding area of the Project boundary. Impacts may occur to areas immediately outside of the site such as the adjacent camel race track, where inappropriate storage or use of substances is in close proximity to the construction site boundaries.

Odours

The construction phase of the project will likely include a number of toilet facilities on site for site staff and construction workers. There is the potential for release of odour to the immediate surrounding areas associated with inappropriate containment and coverage associated with wastewater holding/septic tanks. However, such impacts are likely to be temporary, negligible and limited to the immediate surrounding area such as the adjacent camel race track. As human receptors are located at greater distance from the Project boundary, Odour is not expected to be discernible at these locations.

Table 5-8 Air Quality- Impact Significance, Mitigation & Management Measures and Residual Impacts – Construction

POTENTIAL IMPACTS	MAGNITUDE OF IMPACT	RECEPTOR	SENSITIVITY	POTENTIAL IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACT
Dust emissions within 500m of the project boundary – Generated as a result of site preparatory works and movement of vehicles on unpaved surfaces	Minor Negative	Ibri IPP Worker Accommodation Area	High	Minor to Moderate	<ul style="list-style-type: none"> Any land grading, excavations and moving of uncovered waste/materials should be undertaken during periods of low winds (e.g. <15 km/h is recommended as a threshold when a review of works is conducted). Vehicle speeds on all site roads will be restricted to 20km/h. Where sand and other dusty materials are transported to the site, trucks will not be overloaded and will be appropriately covered / sheeted to avoid losses en-route. Cement and other fine powders should be sealed or covered after use, stored and transported in enclosed or banded containers. Dusty material stockpiles (i.e. any fine sands and powders) dust generating activities (stone cutting) are to be located away from the site boundaries and be contained or covered with suitable netting to avoid dust dispersion during storage or use. Vehicle routes will be clearly demarcated and appropriate signage displayed around the site. Wetting down of any unpaved site roads in order to reduce dust generation. The provision of a wheel-washing facilities or high-pressure hose to ensure all vehicles leaving the site are in a satisfactory state of cleanliness. No burning of wastes will be allowed onsite 	Minor
	Minor Negative	Camel Race Track	Medium	Minor		Minor
	Minor Negative	Active Camel Farm	High	Minor to Moderate		Minor
	Minor Negative	Ibri IPP	Low	Negligible to Minor		Negligible
Gaseous Emissions –	Minor Negative	Ibri IPP Worker Accommodation Area	High	Minor to Moderate	<ul style="list-style-type: none"> Construction roads in the site will be designated and made clear to the drivers with signage for 	Minor

POTENTIAL IMPACTS	MAGNITUDE OF IMPACT	RECEPTOR	SENSITIVITY	P \ OTENTIAL IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACT
From exhaust of vehicles	Minor Negative	Active Camel Farm 1	High	Minor to Moderate	<p>directions and speed limits placed all along the roads.</p> <ul style="list-style-type: none"> Internal roads inside the project site will be compacted as it reduces vehicular power consumption Unnecessary usage of vehicles, plant and equipment will be minimised – No unnecessary idling. Deliveries of equipment/plant to the site will be efficiently managed to reduce the number of trips. Exhaust fumes and particulates emitted from trucks and vehicles will be minimised by ensuring the use of good condition vehicles (e.g. compliant to vehicle emission requirements). There should be pre-requisite requirements of site vehicles to ensure no black smoke before entering site and that any identified machinery or vehicles with black smoke will require maintenance and re-assessment before it is returned. Lorries and truck engines will be turned off while waiting on site to minimize gaseous emissions. Air-conditioned or heated shelters should be provided for drivers in designated waiting, loading and unloading areas to prevent drivers waiting in vehicles. Emissions from machinery and equipment should be free from significant black smoke. 	Minor
	Minor Negative	Ibri IPP	Low	Negligible to Minor		Negligible

POTENTIAL IMPACTS	MAGNITUDE OF IMPACT	RECEPTOR	SENSITIVITY	P \ OTENTIAL IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACT
Emission of VOCs and other hazardous volatiles	Negligible Negative	Camel Race Track	Medium	Negligible to Minor	<ul style="list-style-type: none"> Hazardous materials stored and used on site with potential gas emissions (e.g. Volatile Organic Compounds) will be located in well-ventilated, but secure low-risk areas, away from major transport routes and away from the site boundary. Volatile fuels and chemicals will be stored in sealed containers. On site storage of large quantities of volatile fuels will be avoided, equally prolonged exposure to direct sun and heat will be avoided. Fires and material burning will not be allowed on the Project site. Chemical storage areas will be purpose built and well maintained. A data log of all chemicals with MSDSs will be provided at the storage facility within easy access. 	Negligible

5.4.2 Operational Phase

The proposed project is associated with the generation of renewable energy, hence there are no permanent fuel combustion requirements or any other associated air emissions directly from the PV Plant. An emergency diesel generator will be supplied to provide power in case of malfunctioning or disconnection from the grid, however this will not be used except for in emergency situations only (which feasibly may not occur). As such, no specific air pollution emissions sources other than those from the operation of vehicles are anticipated during the operational phase of the Project. Emergency diesel generator(s) shall be provided to maintain safe auxiliary power supply in case of blackout conditions (including the required control and monitoring facilities and the Central Control Room).

Operational Vehicle Emissions

The facility is likely to result in the small additional number of commuter vehicles and delivery/removal vehicles along access roads. Emissions from these vehicles will unlikely result in a noticeable impact above the existing industrial emissions from the local facilities and vehicular emissions in the area, as such detailed assessment has not been conducted.

Table 5-9 Air Quality – Impact Significance, Mitigation & Management Measures and Residual Impacts – Operation

POTENTIAL IMPACTS	MAGNITUDE OF IMPACT	RECEPTOR	SENSITIVITY	POTENTIAL IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACT
Gaseous Emissions from Vehicles and emergency diesel generator	Negligible Negative	Ibri IPP Worker Accommodation Area	High	Minor	<ul style="list-style-type: none"> • Appropriate quality of fuel used – Fuel of an internationally compliant standard to be sourced through a licensed supplier. • Limit unnecessary usage of vehicles – No unnecessary idling. 	Negligible
	Negligible Negative	Ibri IPP	Low	Negligible to Minor	<ul style="list-style-type: none"> • Planned inspection and maintenance of project vehicles and mobile equipment will be undertaken annually to ensure worthiness. • Emissions from vehicles should be free from significant black smoke - remedial measures shall be taken if this is observed. • Implement regular maintenance program of vehicles, and keep documentary evidence. 	Negligible

5.5 Monitoring

The EPC Contractor and the O&M Company will undertake air quality monitoring during both the construction and operational phases of the project respectively and these are outlined in the table below. The final monitoring methodology with specific monitoring details (i.e. locations, frequencies, durations, parameters etc.) will be developed in the specific 'Environmental Monitoring Plan'.

Table 5-10 Air Quality Monitoring Requirements

MONITORING	PARAMETER	FREQUENCY & DURATIONS	MONITORING LOCATION
Construction			
Dust Generation & Dispersion	Dust	Visual observation for dust emissions to be undertaken on a daily basis. To be monitored quantitatively if generation is considered to be excessive or complaints are received.	Access Road to the Project site, Construction site and laydown areas Dispersion to external receptors from point of generation.
Emissions from engines	Vehicle Emissions	Visual assessment of emissions to be undertaken on a daily basis while vehicles & equipment are in use and annual inspection of vehicles. This would include an inspection during the initial acceptance criteria of such vehicles to site.	All non-road vehicles and engines
Sanitary Facilities & Hazardous stores	Odour & VOCs	Daily olfactory observations – as part of maintenance and inspection checks	All sanitary facilities available within the laydown areas, sub-contractor camps and work fields. All hazardous material, chemical and fuel stores.
Operation			
Emissions from engines	Vehicle & emergency generator emissions	Regular maintenance & servicing of project vehicles and planned annual inspection.	All road and non-road vehicles and engines

6 NOISE AND VIBRATION

6.1 Standards and Regulatory Requirements

6.1.1 National Requirements

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

TYPE OF DISTRICT	LEQ, T, DB(A)		
	DAY TIME 7AM-6PM WORKDAYS	EVENING TIME 6PM- 11PM WORKDAYS	NIGHT TIME 11PM – 7AM WORKDAYS AND 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 7AM-6PM WORKDAYS	EVENING TIME 6PM- 11PM WORKDAYS	NIGHT TIME 11PM – 7AM WORKDAYS AND 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 Conditions

6.2.1 Noise

The notable anthropogenic noise sources observed from the Project site during the site visits in October 2018 and May-July 2019 were distant vehicle noises from Highway 21 located approximately 3km north east of the Project site and the commissioning/operational 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.

Noise Monitoring Survey Methodology

Following the scoping study, noise monitoring survey was conducted within and outside the Project site in order to quantify existing noise levels at the Project site and at receptor location due to the presence of existing noise influence.

Noise monitoring was undertaken at fence-line locations within the proposed Ibri II IPP site to ascertain the baseline environment. The monitoring survey was carried out during the day and evening and night on the 18th of June 2019.

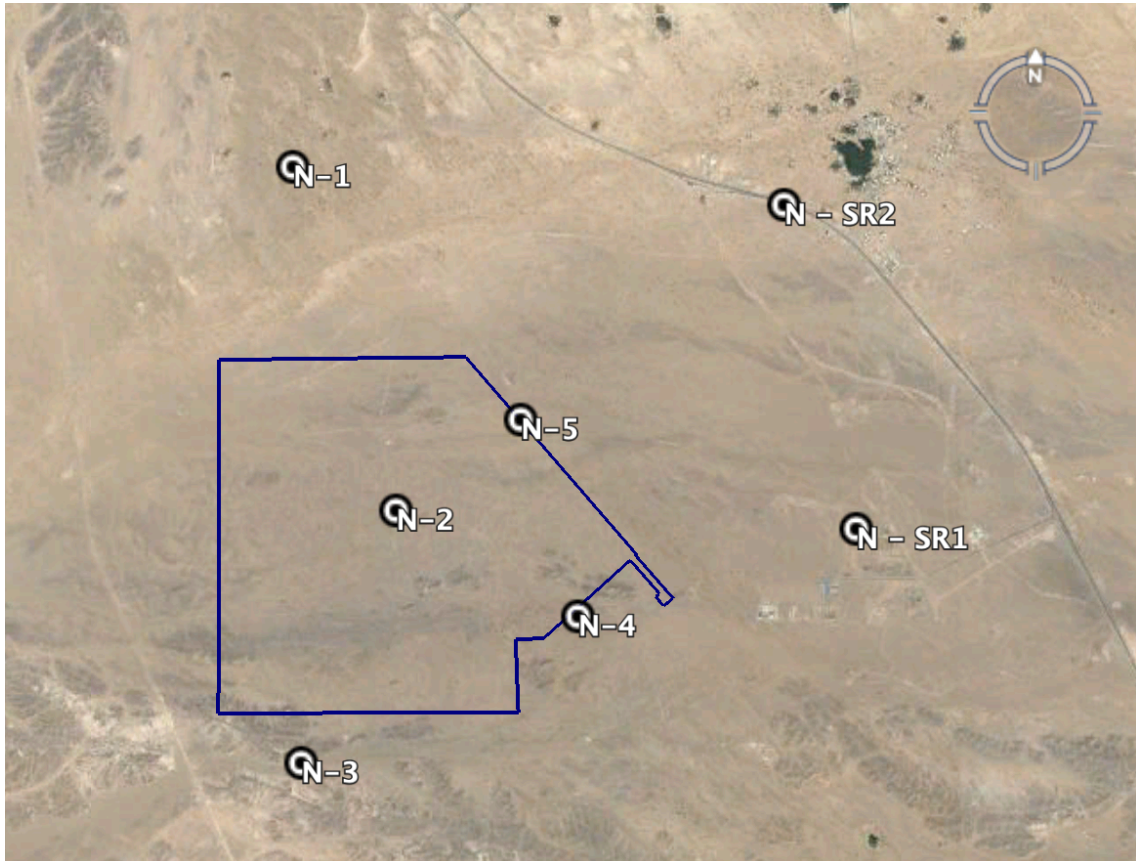
The noise survey was carried out with a Cirrus CR 171 B, Type 1 sound level meter (Calibration certificate provided in Appendix D). The A-weighted continuous equivalent sound level (LAeq) along with LAmax, LAmin, LA10, LA 50, LA90 and LA95 were logged for 1 Hour at each location.

The monitoring locations are provided in the following figure and the coordinates of the monitoring locations are presented in the table below.

Table 6-4 Coordinates of Noise Monitoring Locations

#	LOCATION	NORTHING	EASTING
1	Location 1	N: 23° 24' 04.2"	E: 56° 13' 32.7"
2	Location 2	N: 23° 22' 14.5"	E: 56° 14' 08.6"
3	Location 3	N: 23° 20' 53.9"	E: 56° 13' 35.6"
4	Location 4	N: 23° 21' 40.7"	E: 56° 15' 11.9"
5	Location 5	N: 23° 22' 43.5"	E: 56° 14' 52.0"
6	Sensitive receptor #1	N: 23° 22' 08.6"	E: 56° 16' 48.8"
7	Sensitive receptor #2	N: 23° 23' 52.1"	E: 56° 16' 23.7"

Figure 6-1 Noise Monitoring Locations



Noise Monitoring Survey Results

The noise levels obtained within and outside the project site (at receptor location) are presented in the table below.

Table 6-5: Noise Quality Results

ID	COORDINATES		DATE	TIME	MEASURED NOISE LEVEL DB(A)			OMAN STANDARD (MD 79/94)	WHO STANDARDS
	N	E			L-MIN	L-MAX	LEQ		
Morning									
L-1	23°24'04.2"	56°13'32.7"	19 June	8AM to 3PM	47.3	65.2	57.06	70dB(A)	55 dB(A)
L-2	23°22'14.5"	56°14'08.6"			32.3	67.1	52.88		
L-3	23°20'53.9"	56°13'35.6"			32.6	67.8	56.49		
L-4	23°21'40.7"	56°15'11.9"			32.5	67.7	61.51		
L-5	23°22'43.5"	56°14'52.0"			32.6	69.4	61.10		
SR-1	23°22'08.6"	56°16'48.8"			30.3	69.9	61.31		
SR-2	23°23'52.1"	56°16'23.7"			33.3	71	59.07		
Evening									
L-1	23°24'04.2"	56°13'32.7"	18 June	6.00 PM to 11PM	35.7	69.3	60.05	70dB(A)	55 dB(A)
L-2	23°22'14.5"	56°14'08.6"			28.6	46	39.60		
L-3	23°20'53.9"	56°13'35.6"			29.3	48.8	36.85		
L-4	23°21'40.7"	56°15'11.9"			31.7	51.7	40.46		
L-5	23°22'43.5"	56°14'52.0"			32.5	45.6	40.97		
SR-1	23°22'08.6"	56°16'48.8"			48.9	62.9	63.85		
SR-2	23°23'52.1"	56°16'23.7"			49.2	71.7	64.15		
Night									
L-1	23°24'04.2"	56°13'32.7"	18 June	11PM to 4AM	33.8	66.8	55.23	70dB(A)	55 dB(A)
L-2	23°22'14.5"	56°14'08.6"			35.5	58.1	50.36		
L-3	23°20'53.9"	56°13'35.6"			34.2	66.8	56.70		
L-4	23°21'40.7"	56°15'11.9"			46.4	70.2	65.52		
L-5	23°22'43.5"	56°14'52.0"			30.1	41	35.73		
SR-1	23°22'08.6"	56°16'48.8"			47.6	70.8	63.44		
SR-2	23°23'52.1"	56°16'23.7"			29.2	69.6	58.15		

6.2.2 Vibration

In terms of baseline, no noticeable vibrations were encountered at any time during the site visits or site survey undertaken to date. There are no current facilities in the vicinity of the proposed project site that are likely to result in significant vibrations at or around the area (including the nearby Ibrī IPP).

Localised vibration may be encountered from the Highway 21 (approximately 3km north east of the project site), however this will typically be dependent on vehicle flows, and vehicle classification (e.g. ratio of HGV's to LGV's and private vehicles). At present, it has been identified that this highway in the Project area is not close to capacity. The dissipation of any such vibrations are furthermore expected to occur over a short distance and would be limited to the areas immediately adjacent to the highway.

6.3 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 loses 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 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 respectively, the active camel farms 1 & 2 approximately 200m & 500m from the south eastern boundary & eastern boundary of the Project site respectively, the Ibri IPP Worker Accommodation Area approximately 800m south east of the project site and the Ibri Power Plant located approximately 1km south east of the project site.

Table 6-6 Noise & Vibration Sensitive Receptors

RECEPTOR	RECEPTOR TYPE	SENSITIVITY	JUSTIFICATION
Ibri IPP Worker Accommodation Area	Residential	High	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	High	The camel farm(s) includes a residential attachment and camel pens which are sensitive to changes in noise.
Camel Race Track	Recreational	Medium	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	Agricultural	Medium	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	Low	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.

6.4 Potential impacts

6.4.1 Construction Phase

Construction Site Noise

Construction activities will likely result in temporary and short duration increases in the noise and vibration levels emanating from the project site, access road and the laydown areas; dependent on the type of works being undertaken.

Noise will be generated by construction 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

- Site Preparation (e.g. earthworks, compaction);
- Civil Works (e.g. piling);
- Construction and Installation;
- Internal Road Paving/Compacting; and
- Vehicle movements.

The accumulation of noise from the above sources can 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.

The anticipated construction equipment/machinery to be used at the site for various construction activities together with noise data for this equipment are presented in the table below as obtained from 'British Standards: Code of practice for noise and vibration on construction and open sites'.

Table -6-7 Noise Level of Typical Construction Equipment

CONSTRUCTION ACTIVITIES	BS 5228-1:2009 REFERENCE	EQUIPMENT	SPL dB (A)
Site clearance	Table C.2, 4	Tracked Excavator (22t)	52
Earthworks	Table C.2, 13	Dozer (11t)	78
	Table C.2, 20	Tracked Excavator (25t)	68
	Table C.6, 28	Wheeled Loader	76
Material Handling	C.2, 30	Dump truck (29t)	79
	C.2, 38	Roller (18t)	79
	C.2, 40	Vibratory Roller (3t)	73
	C.2, 42	Hydraulic compactor	78
	C.4, 20	Concrete mixer truck	80
	C.4, 22	Concrete mixer (26t)	76
	C.4, 41	Mobile Crane (100t)	71
Stationary	C.4, 84	Diesel generator	74
Road construction	C.5, 1	Hydraulic breaker (67kw)	88
	C.5, 32	Asphalt paver (18t)	84

The accumulation of noise from the above activities can introduce potential impacts at receptor locations. Under worst-case circumstances where all equipment is operating at the same location for 50% of the working day, the combined cumulative noise level would be 85.0dB(A) as perceived at 10m distance from the source. This is considered to be a worst case for noise during construction, as it is not expected that this equipment will be located in the same area and operational concurrently.

As noise levels dissipate with distance, the potential for noise impacts at receptor locations will significantly decrease with increase in distance from the noise source. The nearest sensitive receptor for noise is the proposed worker accommodation area to the east of the Project site. This area is approximately 200m from the Project boundary. By using calculations set out in BS5228:2009 (Part 1), it is possible to predict expected noise levels at this location. This has been presented below.

Table 6-8 Summary of Construction Site Noise Assessment

RECEPTOR	BASELINE NOISE LEVEL (DBA) (MORNING)	DISTANCE FROM SOURCE	ANTICIPATED CONSTRUCTION NOISE AT RECEPTOR LOCATION DUE TO CONSTRUCTION WORKS (DBA)	CUMULATIVE NOISE LEVEL AT RECEPTOR LOCATION (DBA)
Worker Accommodation/lbri IPP	40	200	54.5	58

The worker accommodation camp/lbri IPP which is south east of the original project layout, will receive construction site noise which is lower than the WHO daytime noise standards.

The noise levels are however above the night-time standards for WHO, and the anticipated project works during night hours will be presumably limited.

Construction Vehicle Noise

The addition of temporary construction vehicles on access roads and within the site will likely result in temporary increases in traffic which will consequently result in an increase to noise levels at off-site receptors, particularly those immediately adjacent to the Project, with reduced impacts at receptors within 1km to the Project boundary, and close to the site access roads. Impacts due to vehicular noise will vary due to the phasing of works and the timing of vehicular movements, which affect both vehicle flows and the percentage of heavy vehicles.

The major transport routes to the site will be the Highway 21 and an unnamed paved route that links to the highway. This road runs through the lbri IPP Project area. The Highway 21 is a four (4) lane, two-way, dual carriageway, located approximately 3km north east of the Project site. The unnamed route that links to the Highway is south east of the Project site. Based on

observations during site visits, the Highway 21 has a large spare carrying capacity due to the low traffic flows of vehicles on this road.

The construction of the Ibri II Solar IPP might lead to a small increase of existing vehicle flows along the highway resulting in a noticeable traffic impact or secondary noise impacts to road users and any receptors in close proximity to the Highway. Flows of vehicles requiring access to the project site will however be brought closer to the proposed project along the unnamed route adjacent to the site. The Ibri IPP worker accommodation area will consequently be slightly closer to this site access traffic flow, as well as existing receptors such as the active camel farm 1 and the Ibri IPP. This may result in minor increases in noise at these receptor locations.

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 dissipate rapidly as they spread due to losses of energy radiating 360 degrees from the source.

As such, vibratory impacts as a result of the Project construction activities are only anticipated to be negligible at the project boundaries and at the adjacent camel race track. Impacts from vibration are not expected to be discernible at the camel race track, the active camel farms, the farmland 1, 2 & 3 and Ibri IPP due to attenuation of vibration over distance.

Table 6-9 Noise and Vibration- Impact Significance, Mitigation & Management Measures and Residual Impacts – Construction

POTENTIAL IMPACTS	MAGNITUDE OF IMPACT	RECEPTOR	SENSITIVITY	POTENTIAL IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACTS
Construction Site Noise – Noise generated from general construction activities	Negligible Negative	Ibri IPP Worker Accommodation Area Active Camel Farm 1 & 2	High	Neutral	<ul style="list-style-type: none"> Acoustic covers on machine engines to remain closed at all times. The Contractor will, at all times, carry out all work in such a manner as to keep any disturbance from noise to a minimum (by phasing noisy works). Vehicles/equipment will be operated within manufacturer recommended guidelines so as to avoid causing excessive noise. Where practical, electrically powered plant will be preferred to mechanically powered alternatives. All mechanically powered plant, diesel engine vehicles and compression equipment will be fitted with noise control equipment (exhaust silencers, mufflers) as available from the manufacturer. Consideration shall be given to hours of works during normal day time working hours (between Saturday and Thursday) and on Friday's or during official holidays. Where possible, the highest noise emitting activities should be undertaken in a central site area and away from boundaries. Where appropriate, noise barriers /attenuation to be employed (e.g. for generators) to ensure that the maximum noise level at 1 m distance from a single source will not exceed 85 dB(A). 	Neutral
	Negligible Negative	Ibri Power Plant	Low	Negligible to Minor		Negligible
	Negligible Negative	Commercial Receptors (Farmland 1, 2 & 3)	Medium	Negligible to Minor		Negligible

POTENTIAL IMPACTS	MAGNITUDE OF IMPACT	RECEPTOR	SENSITIVITY	POTENTIAL IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACTS
					<ul style="list-style-type: none"> Where noise levels exceeds 85 dB(A) noise protection devices shall be provided to personnel on-site and the area marked as a high-noise zone where ear protection is mandatory. 	
Vehicular Noise- Noise from the movement of construction vehicles	Moderate Negative	Ibri IPP	Low	Minor	<ul style="list-style-type: none"> Limit unnecessary usage of vehicles/equipment – No idling – Equipment to be shut or throttled down when in intermittent use. Delivery vehicles will be prohibited from waiting outside the site with their engines running (consideration of driver waiting room with air conditioning). Ensure any appropriate permits are in place for deliveries to the site and for any works performed outside normal working hours. Review vendor specifications and accept site plant & vehicles, in particular heavy vehicles, based on noise emissions (as far as practical). The movement of heavy vehicles during the night will be avoided wherever practical. 	Negligible
Construction vibration impacts (including vehicle vibration)	Negligible Negative	Ibri IPP	Low	Negligible to Minor	<ul style="list-style-type: none"> The Contractors will, at all times, carry out all work in such a manner as to keep any disturbance from vibration to a minimum. Operators of vibrating hand-held machinery (if any) will be provided with appropriate PPE (e.g. protective gloves) and be given suitable breaks from using such equipment to reduce the impacts of vibration. Where practical, all vibratory generating equipment and activities shall be sited away from the Project boundary. 	Negligible

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. As the magnitude of noise impacts are minimal, further assessment has not been undertaken.

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 Monitoring

The minimum expected requirements for the noise monitoring are outlined in the table below. The final monitoring methodology with specific monitoring details (i.e. locations, frequencies, durations, parameters etc.) will be developed in the specific 'Environmental Monitoring Plan' as part of the respective construction or operational phases ESMS.

Table 6-10 Noise Monitoring Requirements

MONITORING	PARAMETER	FREQUENCY & DURATIONS	MONITORING LOCATION
Construction			
Day time noise	Leq(A)	Weekly for 10-15 minutes periods at each location	At the project contactor camps and at the Project site boundaries, e.g. the nearest boundary of the contractor accommodation camp and the North, East, South & West boundary mid points respectively.
Night time noise			

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

AlIB's ESF includes a specific vision for the conservation of biodiversity (under paragraph 17).

The assessment of impacts upon terrestrial ecology is required to be performed 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 Conditions

7.2.1 General Observations

The baseline condition of this section has been informed by:

- Review of satellite imagery;
- Review of information available from online resources;

- Several site visits during the scoping and ESIA phases and;
- Project Ecological Survey.

7.2.2 National Ecological Context

The territory of the Sultanate is made up of desert rocky plains, sand and mountain areas as well as coastline plain which covers 3% of the Sultanate. Although Oman has a dry climate, the sultanate is in a place of unique biodiversity mainly in parts of the Sultanate of Oman popular with heavy rainfall. The total protected area (either by national legislation or based on International designation) is approximately 0.04% of the territory of the Sultanate. Considering the different types of protection, the area protected in Oman is about 4.27%.

According to the 5th Omani National Report to the Convention on Biological Diversity (2014), Oman is home to more than 1200 documented plant species (3 globally threatened), 509 marine flora species, 766 marine invertebrate species, 988 fishes (globally 13 threatened), 89 herptiles (6.7% endemic), 518 bird species (12 globally threatened) and 93 mammal species (20 globally threatened).

The flora species of the Sultanate reflects the influence of Iran in the north with an increasing influence of African species from the Eastern Hajar mountains southwards to Dhofar. With regards to the 1200 documented plant species in Oman, the conservation status of 261 plant species is assessed in the National Red List; 189 of those are range-restricted, 6.5% (78 species) of all species are endemic to Oman and cannot be found elsewhere in the world, 9.3% are near-endemic or regional endemic and a total of 9.1% of the flora is considered threatened. Endemism is at its highest in the southern region where 46% of the species are threatened. Of a total of endemic and regionally endemic species, 63 are present in Dhofar, 12 in central Oman and 25 in the northern mountains.

The mammal species or sub-species that are present in Oman offer a wide variety of wildlife including some endangered, endemic Arabian animals such as the Arabian Tahr (Wa'al al Arab), Arabian Oryx and the Arabian Leopard. Of the regionally endemic large mammals, the Arabian Tahr (*Arabitragus jayakari*) classified as an "Endangered species" under the IUCN Red List occurs only in the northern mountains. (Environment Society of Oman, 2013).

Amongst the large mammals, The Arabian Oryx, Arabian gazelle, sand gazelle Arabian wolf, White-tailed mongoose, Striped hyena and Gordon's wild cat are currently breeding in captivity.

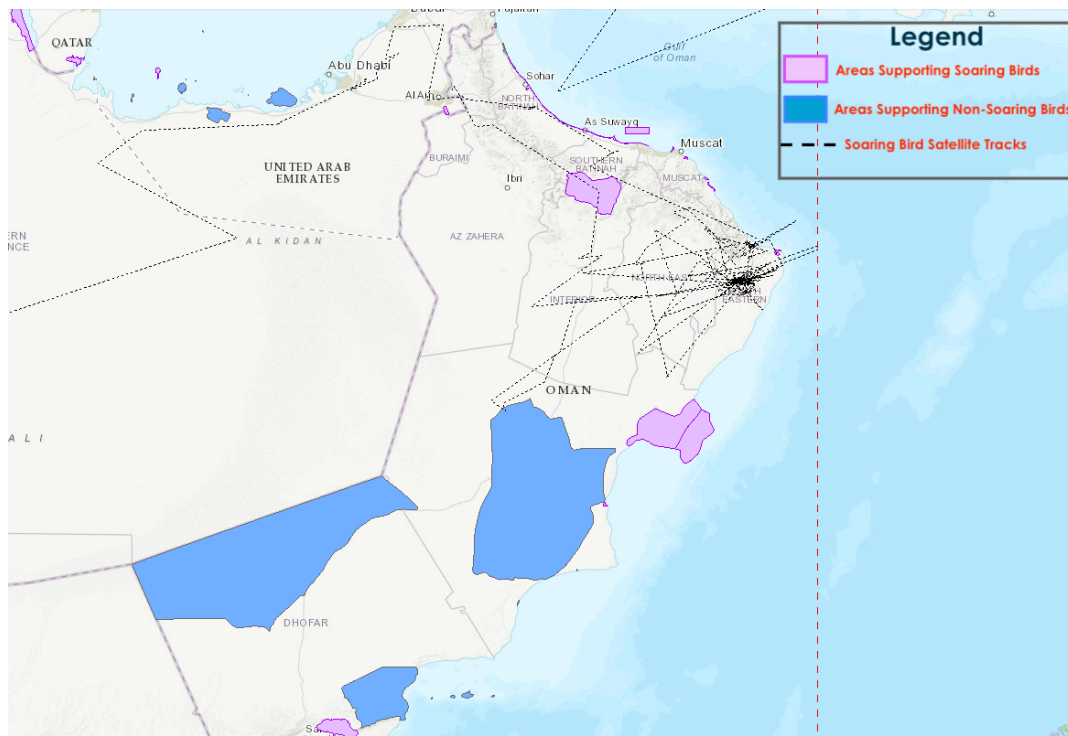
Majority of the bird species in Oman are migrating birds that travel seasonally between northern Asia and Africa. Out of the 518 bird species identified by the 5th Omani National Report to the Convention on Biological Diversity (2014) to be present in Oman, only about 100 species are breeding residents of Oman (Environment Society of Oman, 2013).

With regards to the total number of species identified in Oman for plants, marine species, avifauna and mammals, it is highly probable that this number is an underestimate and may increase following additional surveys.

7.2.3 Project Area Observations

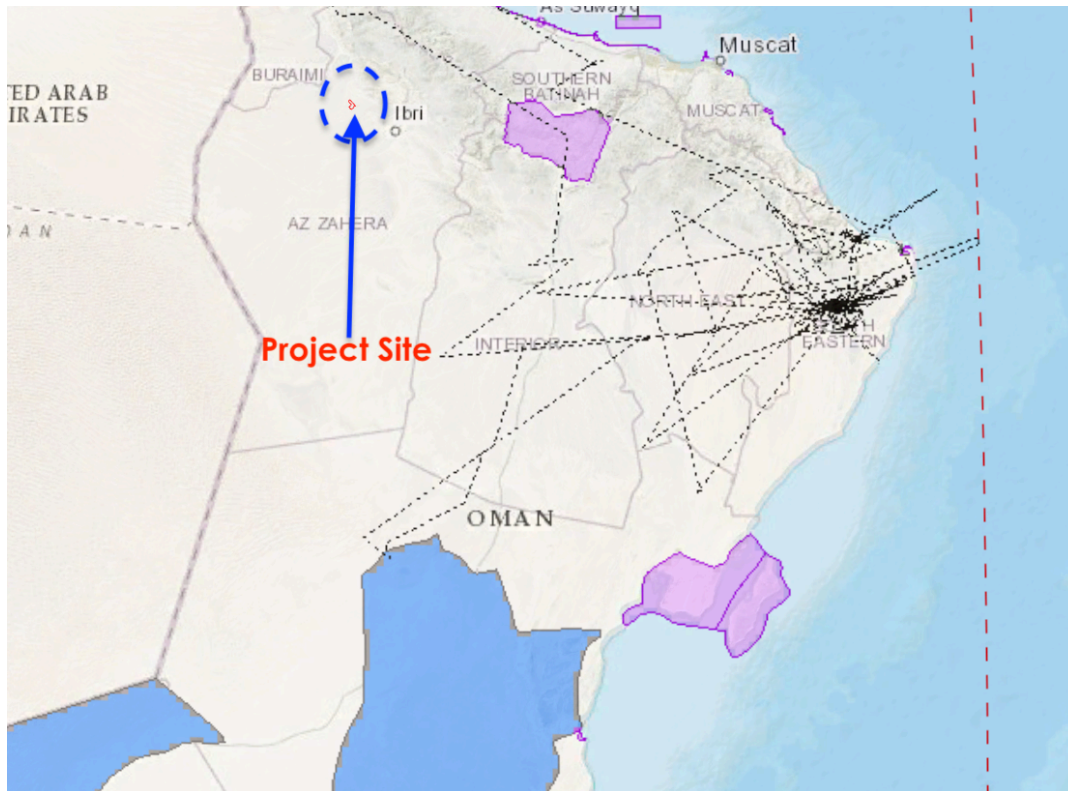
There are no designated ecological area or Nature Reserve located in close proximity to the Project site as all the Nature Reserve within the Sultanate are located over 50km from the Project boundary. In addition, no birds were identified within the Project site during the site ecological survey and according to the BirdLife International Bird Sensitivity Mapping Tool², 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).

Figure 7-1 Important Bird Areas in Oman



² Source: <https://maps.birdlife.org/MSBtool/> Accessed 15th April 2019

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.

7.2.4 Habitat Classification

The Project site consists of three (3) principal habitat types;

- Gravel plain habitat with no vegetation;
- Gravel plain with low lying vegetation, shrubs and trees; and
- Low-lying sand sheet habitat interspersed with low-lying vegetation, shrubs and trees (of similar species).

According to good practice guidelines such as IFC Performance Standard 6, habitats directly or potentially affected by a project can be classified as 'Natural', 'Modified' or 'Critical'. With respect to the habitat types, the habitat at the project site can be classified primarily as 'Natural' habitat, as it has not been significantly modified as a result of human activities. Further, and as detailed in the baseline below there has been no identification of endangered or critically endangered species in the projects area, which does not result in a classification of 'Critical'.

However, there are some areas within the Project site that can be considered as modified habitats as these areas have been evidently modified by human activities. These include the occupied camel farm (with accommodation hut) within the Project site, the old camel race

track and areas within the site with evidence of vehicular movement can be considered as 'Modified' habitat as this area has evidently been modified by human activities.

Plate 7-1 Gravel Plain Habitat With No Vegetation



Plate 7-2 Gravel Plain with Low Lying Vegetation, Shrubs and Trees



Plate 7-3 Low Lying Sand Sheet Habitat with Low Lying Vegetation, Shrubs and Trees (off site to the north near wadi)



Plate 7-4 Wadi Channels (Off-site)



Plate 7-5 Evidence of Modified Habitat with Vehicle Tracks within the Project Site

7.2.5 Project Site Ecological Survey

Methodology

The preparation of the ESIA has included several visits to the Project site over the past year, which has enabled the ESIA Team to have a non-targeted overview of the site area, its ecology and changes to biodiversity with seasons and the influence of rainfall. Observations and photographs from the site have been noted and taken throughout all of these visits.

In order to assess the potential impacts from construction and operational activities, a more specific survey of the ecological condition within the Project site as well as species composition was investigated on 12th of June 2019, through a targeted survey.

The ecological survey was executed via a drive through of the project site, with flora and fauna ecology photographed for further identification.

Flora

Despite the extensive area of the Project site, it was identified that there is a relatively low diversity of flora species in the footprint. This observation was common for areas also surrounding the Project site, and also appear to be similar for an extensive area towards the UAE border and towards the town of Ibri.





The flora at the site appears to remain relatively similar throughout the year at the Project site, although the site visit with AIB in May 2019, following rainfall did appear to identify some




additional grass species in areas, particularly in and around the wadi channels (of-site). This suggests that the site soils do contain seeds, and therefore may also be of ecological value.

There were several mature trees dotted across the site which were observed during the site surveys. These were Acacia species in the vast majority. Ghaff species were observed in and around the wadi areas (of the original site layout), but due to the changes in the site these will primarily be avoided.

Flora species identified within the Project site are presented in the figures below.

Plate 7-6 Flora Species Within the Project Site

	
<p>Unidentified Species</p>	<p>Acacia sp.</p>
	
<p>Unidentified Species</p>	<p>Unidentified Species (planted)</p>

	
<p><i>Prosopis cineraria</i> (Ghaf)</p>	<p><i>Tetraena</i></p>
	
<p>Unidentified Species</p>	

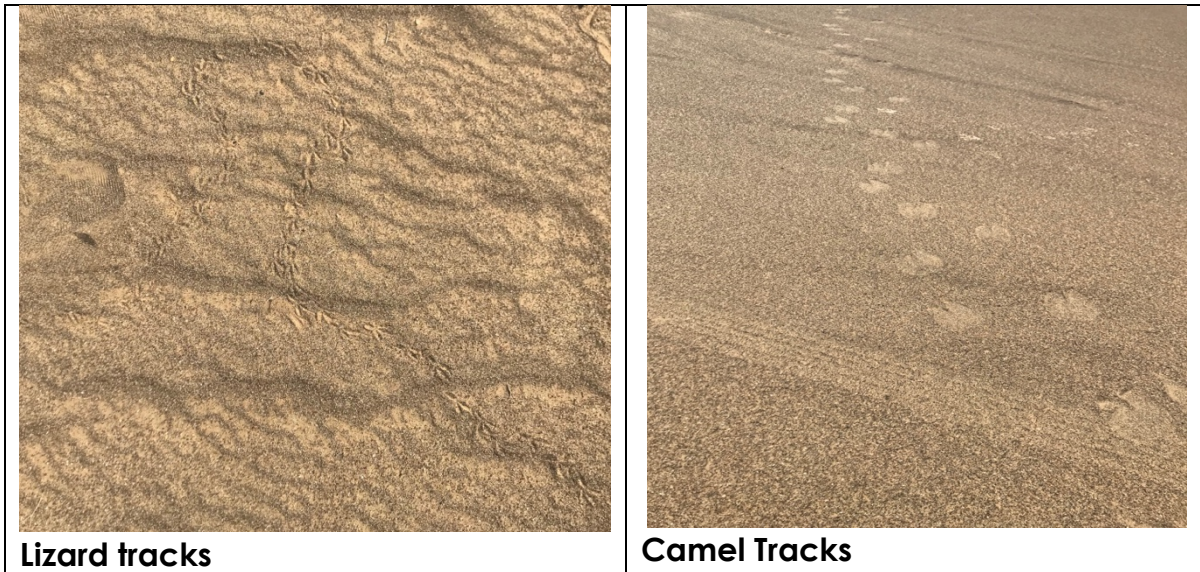
Fauna

The site visits undertaken have observed few faunal species in the Project area. The majority of fauna species relate to the rearing and herding of camels by the identified camel herders.

The only other direct observations of fauna at the site, related to lizards (although expected to be relatively low in abundance with respect to the site area) and bird species in and around trees. The majority of fauna sightings (primarily tracks and burrows of lizards) were observed in and around the wadi areas, which included softer sands and higher density vegetation providing increased shading. The lack of fauna species is largely expected to be linked to the commensurate slack of flora species in the Project area and limited availability of habitat. Based on the species observed, or from the review of animal tracks, none of these are expected to be of specific conservation value or protection, based on the Omani protected species list or the IUCN Red List database.

During the ecological survey, animal tracks & existential traces of fauna were encountered, examples as follows.

Plate 7-7 Fauna Species Identified Within the Project Site



7.3 Receptors

Table 7-2 Potential Terrestrial Ecology Receptors

RECEPTOR	SENSITIVITY	JUSTIFICATION
Flora	Low	The flora species identified within the Project site are common to the region and are of low ecological value or vulnerability.
Fauna	Low	The survey did not identify any specific habitat or any fauna species of IUCN Conservation Status within the Project site.

7.4 Potential impacts

7.4.1 Construction Phase

The presence of construction equipment, workers, temporary facilities and environmental externalities resulting from construction processes (i.e. noise, vibration, waste and wastewater) have the potential to impact upon ecology during the construction phase. Such impacts may include the partial or direct loss of habitat and flora species as well as disturbance to fauna.

Loss of Habitat

Site preparation works will result in removal of all vegetation in proposed PV areas, including Acacia species within the site. This will be as a result of grading for levelling, foundations, excavations for below ground infrastructures, trenching and backfilling for cables, etc. therefore complete loss of the existing low value habitat is anticipated within the site of proposed works and areas used for construction laydowns (i.e. material stores and temporary waste storage areas), as well as at any temporary administration building. Although a primarily natural habitat (with some modified areas) , the type of habitat is considered to be relatively low value and flora species observed on the site (including Acacia species) are particularly

common in the wider region and are quite resilient and grow naturally with ease (hence their abundance). The impacts are therefore expected to be relatively minor.

Disturbance to Fauna

Although large mammals were not identified onsite (besides for camel herding), the few fauna species present at the project site and local areas (mostly small reptiles) may be disturbed due to the loss of the habitat and temporary effects of noise and vibration during construction. Impacts to fauna are expected to be minimal due to the lack of direct observations of fauna on-site. Observed tracks, burrows and other potential signs of fauna were primarily in softer sand areas off site close to wadis where there is also a corresponding increase in vegetative cover.

Where fauna is disturbed, this may result in a flight response from the project area and such fauna species will be required to migrate away from the works to find suitable alternative habitat in the surrounding area. However, some species may also remain. Given the extensive adjacent areas of similar habitat composition to the south, west and areas to the north and east respectively, this is not expected to relate to impacts on habitat carrying capacity.

Movement of vehicles and heavy machinery within the project site as well as the site clearance and excavation could potentially cause a direct mortality of fauna species such as invertebrates, reptiles, or small mammals. This could particularly affect reptiles such as lizards that may not abandon their burrows during site clearance in which case, there is a potential for the use of construction equipment to injure or kill such species in the project area.

Table 7-3 Terrestrial Ecology Impact Significance, Mitigation and Management Measures and Residual Impacts – Construction

POTENTIAL IMPACTS	MAGNITUDE OF IMPACT	RECEPTOR	SENSITIVITY	POTENTIAL IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACTS
Habitat Loss	Minor Negative	Flora	Low	Negligible to Minor	<ul style="list-style-type: none"> All vehicles and equipment to be restricted to within the project boundaries. There will be no encroachment to land outside of the project footprint, or defined laydown areas, site access road, or designated construction access road. As per the current Project layout (ref. to Project Description), an area of land in the centre of the site will remain undeveloped from PV panels. Assuming such land will remain unused, it is proposed that this area is physically sectioned off from construction activity, in order for habitats (including trees) to be protected from all works and vehicle movements. This would result in a small reserve being left in place at the site. All trees and shrubs in this area shall be maintained. Any sightings of fauna during construction activities must be reported to the Environmental Manager. Any sightings of avifauna species during construction activities must be reported to the Environmental Manager; The Project area boundaries will be fenced to avoid fauna from entering the active construction site where they may be injured. To aid re-vegetation, topsoil from the vegetated sand sheets (containing the most nutrient rich soils) should be removed and stored safely and spread over any off-site laydown areas once construction has been completed. 	Negligible
	Minor Negative	Fauna	Low	Negligible to Minor		Negligible

POTENTIAL IMPACTS	MAGNITUDE OF IMPACT	RECEPTOR	SENSITIVITY	POTENTIAL IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACTS
Disturbance to Fauna	Minor Negative	Fauna	Low	Negligible to Minor	<ul style="list-style-type: none"> It is strictly prohibited to capture or remove any fauna from their natural habitat. Where lizard burrows are encountered on the project site the contractor will make efforts to ensure that they vacate their burrows prior to excavation works. It is not permitted to kill or eat any fauna on site. Any mortality must be formally reported and recorded on the same day of occurrence (This includes mortality or injury due to collision with construction vehicles). A 20km/h speed limit will be imposed across the construction site in order to minimise risk of direct mortality of fauna. 	Negligible

7.4.2 Operational Phase

Use of PVC or HDPE reflective material for reflective cover

The Project will use bi-facial solar PV technology to increase output efficiency and to increase albedo, a white PVC or HDPE material will be across the Project surface (approximately 80%) in and around the PV modules. Besides the geotextile, hard standing construction will be implemented in key areas in the administration complex and for entrance roads, as well as the external access road. Such surfaces used by the Project will restrict the re-establishment of flora and habitats. In any case the common practice observed on PV sites in the middle east is to undertake 'de-weeding', which effectively is the removal of vegetation that may grow (usually along the water drip line from panels). This is to ensure that there is no loss of efficiency due to shading of the panels. As such, the use of PVC or HDPE is not expected to result in any difference in the re-establishment of flora (compared to it not being installed).

It is however expected that some lizard species may return to the Project site during operations. Such lizards will likely be juvenile, or small species which can gain access through the external perimeter fence line. It is likely that the Project will provide ample protection and cover for such lizards due to the restriction on larger predator species from gaining access, and the potential for lizards to take cover from birds beneath PV Modules and potentially underneath the geotextile cover. This therefore may result in an indirect positive impact upon lizard species.

The remaining areas of the proposed site such as the internal access roads, will be compacted earth and may therefore pose difficulties for the re-establishment of flora.

The ground cover material PVC or HDPE, will be implemented in a sheet like manner which will not impact the flora on site in an irreversible manner.

As such, the only activities that could negatively impact the ecology of the site during operations would be through indirect measures, relating to poor management practices of any designated landscaped areas; or to the fauna species inhabiting/using these areas.

Exposure of habitats to chemical additives and hazardous materials

Inadequate storage and handling of hazardous materials/wastes, chemicals and fuels could directly affect habitats (e.g. landscaped areas). The use of any herbicides, pesticides and fertilisers may potentially impact on faunal species and local vegetation, thereby increasing the secondary poisoning of non-targeted species.

Pest Attraction

Pests and vermin such as rodents, cockroaches and flies may be attracted to site by the accumulation of wastes (particularly domestic food wastes) if these are not stored and disposed of appropriately. Pests have the potential to spread disease to fauna and humans, as well as driving away faunal species.

Bird Mortality

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.

However, as there are no recorded flyways within the Project site (the nearest flyway is over 60km from the site) and the Project site is largely devoid of any foraging or roosting opportunities, avian species are not expected to fly over or use the Project site as supporting habitat.

Table 7-4 Terrestrial Ecology Impact Significance, Mitigation and Management Measures and Residual Impacts - Operation

POTENTIAL IMPACTS	MAGNITUDE OF IMPACT	RECEPTOR	RECEPTOR SENSITIVITY	POTENTIAL IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACTS
Exposure of habitats to chemical additives and hazardous materials	Minor Negative	Flora	Low	Negligible to Minor	<ul style="list-style-type: none"> Landscaping on site should incorporate indigenous halophytic and xerophytic plant species to minimise irrigation requirements and the need for fertilisers/pesticides. Intentional replanting of vegetation would enhance the biodiversity of the site as well as improve the visual aesthetics of the site. Prevent introduction of any alien or invasive flora species that might spread beyond the boundary of the Project site. Hazardous materials and chemicals will be stored in designated areas in accordance with the requirements of MECA and good practices guidelines so as to prevent any spillages on the site. 	Negligible
	Minor Negative	Fauna	Low	Negligible to Minor		Negligible
Pest Attraction	Negligible Negative	Fauna	Low	Negligible to Minor	<ul style="list-style-type: none"> Implement an integrated pest management scheme to minimise the use of pesticides where practical. A plan to manage pests should be prepared to outline specific mitigation and management measures. 	Negligible
Bird Mortality	Negligible Negative	Fauna	Low	Negligible to Minor	<ul style="list-style-type: none"> Development of large areas of potential bird habitats (i.e. artificial water bodies, forest plantations, etc.) should be avoided in the immediate surrounding areas of the solar park. This will avoid attraction of significant bird population within the Project area. As per the current Project layout (ref. to Project Description), an area of land in the centre of the site will remain undeveloped from PV panels. Assuming such land will remain unused, it is proposed that this area is sectioned off from 	Negligible

POTENTIAL IMPACTS	MAGNITUDE OF IMPACT	RECEPTOR	RECEPTOR SENSITIVITY	POTENTIAL IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACTS
					operational activity, so that floral species in this area are protected from on-going operations.	
PVC/HDPE Ground cover Installation	Negligible Positive	Fauna	Low	Negligible to Minor Positive	<ul style="list-style-type: none"> PVC/HDPE ground cover may present coverage for lizards on-site. 	Negligible to Minor Positive

7.5 Monitoring

The EPC Contractor and O&M Company will undertake terrestrial ecology monitoring during the construction & operational phase of the project respectively. The minimum expected requirements for the monitoring are outlined in the table below. The final monitoring methodology with specific monitoring details (i.e. locations, frequencies, durations, parameters etc.) will be developed in the specific 'Environmental Monitoring Plan' Plan' as part of the construction phase ESMS.

Table 7-5 Terrestrial Ecology - Monitoring Requirements

MONITORING	PARAMETERS	FREQUENCY & DURATION	MONITORING LOCATION
Construction			
Fauna	Fauna species observed on the site	Daily visual observations of live fauna and burrow locations by workers at the commencement of working activities, and general observations throughout the day – to inform evacuation of specific burrows	In all working area requiring land grading or earthworks.
Operation			
Fauna	Faunal species	Visual observations for sightings of fauna within the Project site. Including for the re-establishment of lizard burrows.	The entire Project area.
Avifauna	Residential and Migratory Birds	Daily visual observations for bird mortality. Record keeping in regard to deceased bird species found.	The areas around the solar panels.

8 GEOLOGY, SOILS, HYDROLOGY AND GROUNDWATER

This chapter assesses the potential impacts that may occur to local geology, soil and groundwater as a result of the projects construction and operational activities and identifies the measures that will be undertaken and implemented in order to mitigate these impacts.

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

AIIB ESS 1 includes requirements to ensure pollution prevention where possible, by reducing use of hazardous materials and minimising generation of waste, as well as resource conservation in general.

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
Heavy Metals		
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) 4 (organic)
Molybdenum	3	190
Nickel	35	100
Zinc	140	720
Aromatic Compounds		
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
Chlorinated Hydrocarbons		
Volatile Hydrocarbons		
monochloroethene (vinyl chloride)	0.01	0.1

PARAMETERS	SOIL (MG/KG DRY MATTER)	
	TARGET VALUE	INTERVENTION VALUE
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
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
Chlorobenzenes		
Monochlorobenzene	-	15
Dichlorobenzenes (sum)	-	19
Trichlorobenzenes (sum)	-	11
Tetrachlorobenzenes (sum)	-	2.2
Pentachlorobenzene	-	6.7
Hexachlorobenzene	-	2.0
Chlorophenols		
Monochlorophenols (sum)	-	5.4
Dichlorophenols (sum)	-	22
Trichlorophenols (sum)	-	22
Tetrachlorophenols (sum)	-	21
Pentachlorophenol	-	12

8.2 Observations and Baseline Conditions

8.2.1 National Context

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 1,050Mm³. 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 119Mm³/year is lost to the sea.

8.2.3 Hydrogeology and Groundwater

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 1,300Mm³/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.

The local Project area (external to the footprint) has several boreholes and pumps for the collection of water by locals. These boreholes are licensed and operated by the Ministry of Regional Municipality & Water Resources (MRMWR).

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.

Figure 8-2 Gravel Plain areas with fine to medium sized gravels



Figure 8-3 Sand sheets with evidence of vegetation (to north of site near wadi area)



Soil

During the initial site visit in October 2018, it was observed that there are primarily 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 is 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 8-1 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

There are no permanent, or perennial surface water features or wadis within the adjusted Project layout. Wadis were identified to flow external to the north western and south western extents of the Project site. 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 8-4 Runoff/Wadi Area (Off site) – 23rd May 2019



Groundwater

The geotechnical investigation report provided with the project RFP reports that during the geotechnical investigation at the Project site between 15th & 22nd 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 wells 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.

8.2.5 Soil Quality Analysis

Following the scoping report prepared for the Project, a site survey for evidence of potential contamination on-site in the soils was carried out.

Methodology

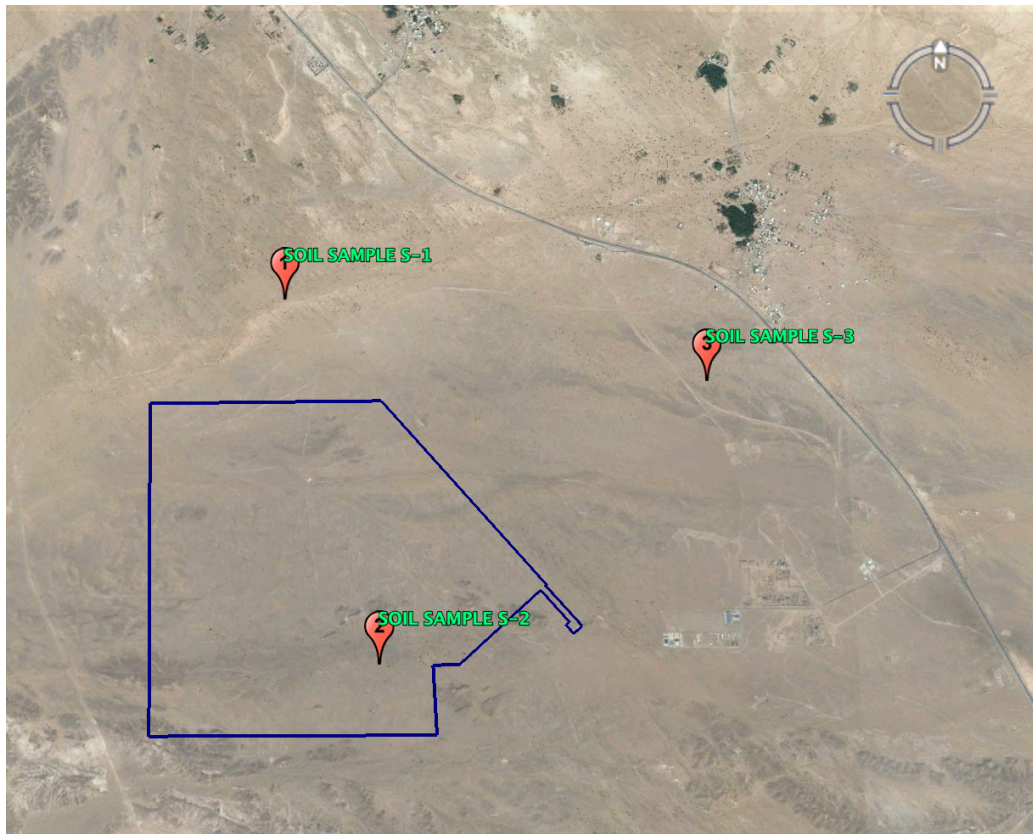
Soil investigation at the Project site was conducted to identify existing soil quality conditions and characteristics. During the survey, surface soil samples were collected from three (3) sampling locations within the proposed Project site.

Three (3) topsoil sample of approximately 1 kg was collected from each sampling location using a metal scoop (after scraping away the immediate surface layer). The purpose of sampling the topsoil is based on the likely influence of above ground features. The soil samples from three locations were representative samples, reflecting three different types of terrain; sandy, gravel and the wadi area.

Table 8-2 Soil Sampling Locations

ID	N	E
S-1	23°23'38.43"	56°13'56.68"
S-2	23°21'33.14"	56°14'29.88"
S-3	23°23'9.88"	56°16'33.26"

Figure 8-5 Soil Sampling Locations



All samples were analysed at the Alpha Lonestar Laboratory (accredited by the Ministry of Environment & Climate Affairs) in Muscat for concentrations of Oils & Greases, TPH and a suite of heavy metals. The primary purpose of this analysis was to ascertain the presence of potential soil subsurface contamination.

Results

The soil samples obtained were analysed for the presence of Oils & Greases, TPH and a suite of heavy metals. The results of the soil laboratory analysis are presented in the table below as compared with the Dutch Soil Standards (intervention/action values).

Table 8-3 Soil Analysis Results

PARAMETERS	MINIMUM DETECTION LIMIT	S-1	S-2	S-3	DUTCH STANDARDS	
					TARGET VALUE	INTERVENTION VALUE
Antimony, mg/kg	1	<1	<1	<1	3	15
Arsenic, mg/kg	0.3	<0.3	<0.3	<0.3	29	55
Barium, mg/kg	1	30.5	37.5	35.6	160	625
Cadmium, mg/kg	0.2	<0.2	<0.2	<0.2	0.8	12
Chromium, mg/kg	1	30.1	51.2	41.1	100	380
Cobalt, mg/kg	1	<1	<1	<1	9	240
Copper, mg/kg	1	30.4	33.1	55.5	36	190
Lead, mg/kg	1	<1	<1	<1	85	530
Magnesium, mg/kg	0.2	33870	42418	35045	Naturally occurring	
Manganese, mg/kg	1	109	109	110	Naturally occurring	
Mercury, mg/kg	0.1	<0.1	<0.1	<0.1	0.3	10
Molybdenum, mg/kg	0.1	<0.1	<0.1	<0.1	3	200
Nickel, mg/kg	1	68.9	68.2	65.6	35	210
Vanadium, mg/kg	1	<1	<1	<1	42	250
Zinc, mg/kg	2	53.1	56.7	46.3	140	720

All parameters were found to be within the prescribed limits from Dutch Standards. This is with the exception of Nickel concentrations in all the 3 samples, which were found to be higher than the referenced target values. This can be attributed to Nickel weathering of ultramafic of nickel laterites and is a characteristic of norther Oman soils.

The target (optimum) values indicate the level at which there is a sustainable soil quality, that is, it indicates the level that should be achieved to fully recover the functional properties of the soil for humans and plant and animal life. Besides this, the target values give an indication of the benchmark for environmental quality in the long term on the assumption of negligible risks to the ecosystem. If the value is exceeded, it does not result in the conclusion being drawn that the earth or sediment is contaminate but that there is a necessity for further investigation.

The full sets of the soil analysis results from the laboratory are presented in the Appendix E section of this ESIA report.

8.3 Receptors

Table 8-4 Geology, Soils & Groundwater - Receptor Sensitivity

RECEPTOR	RECEPTOR SENSITIVITY	JUSTIFICATION
Soil Quality	Low	The soil at the project site is common for the wider region.
Groundwater	Medium	Local groundwater is used by local herders as a potable resource and therefore provides utility service.
Low Lying Runoff Areas & Wadis	Medium	The project area has a few areas that may collect runoff at times of rainfall as, well as off-site main wadi channels.

8.4 Potential impacts

8.4.1 Construction Phase

Site preparation, infrastructure, civil works, electrical and mechanical works and other construction related activities will result in interactions with site geology, and may affect chemical and physical properties of the local soil and potentially groundwater quality.

Excavation or Removal of Soils

The Project will require excavation activities in order to establish a base at suitable level and design elevation for construction. Soil compaction using vibratory rollers to provide soil structural stability after the removal of soils will have direct impacts to surface soils thereby changing soil characteristics within the Project site.

Cross Contamination of Soil

The possibility of encountering some form of contamination due to accidental spills or leaks in areas within the Project site that have been used previously as vehicle tracks cannot be ruled out. In the event that such contamination is present within the Project site (or arises from construction works), there is a possibility for construction activities particularly those related to site clearance, excavation etc. to spread contaminated soils to other soils. The same impact may occur where contamination impacts caused by construction works are also cross-contaminated in the same respect within the Project site.

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. These risks will be managed through the implementation of the project CESMP and associated plans and procedures.

Inadequate Waste and Wastewater Management

Construction of the proposed project will involve activities that generate solid non-hazardous and hazardous waste, as well as potential liquid wastes resulting from sanitary waste streams. Waste 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. Although the hazardous fraction of construction waste such as used oil, machinery lubricants and paints, etc. will represent a very small proportion of the total amount of construction waste it will however require special attention for management and disposal.

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 potentially indirect effects to groundwater quality increases. Potential environmental impacts arising from the generation of hazardous wastes are covered in the 'Solid & Liquid Waste Management' Section of this report.

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 external to 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.

Table 8-5 Geology, Soils and Groundwater Impact Significance, Mitigation & Management Measures and Residual Impacts- Construction

POTENTIAL IMPACT	MAGNITUDE OF IMPACT	RECEPTORS	SENSITIVITY	POTENTIAL IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACTS
Cross-Contamination of soil during construction	Minor Negative	Soil Quality	Low	Negligible to Minor	<ul style="list-style-type: none"> The affected areas of contaminated soil at the project site should be removed, stored, transported and disposed of by a MECA/Be'ah licensed hazardous waste handling company. Imported soils brought to the site will be from accredited quarries with certificate of quality The re-use of materials from any dredging activities will be periodically tested for any contamination. 	Negligible to Minor
Pollution from Accidental Leaks & Spills	Minor Negative	Soil and Groundwater Quality & Low lying Runoff Areas & Wadis	Low	Negligible to Minor	<ul style="list-style-type: none"> Storage of all hazardous materials such as fuels and chemicals on an impermeable base with liners and/or secondary containment bund with enough capacity to hold 110 % of the maximum volume stored. Store all chemicals/materials according to manufacturer's instructions and MSDS. All machines using oils will have drip trays underneath to capture any oil leaks or drips. Washing equipment, machinery and vehicles will only be permitted in designated areas, with impermeable surfaces and dedicated drainage systems that lead to separate treatment facilities and/or lined evaporation ponds. EPC Contractor will develop and maintain an Emergency Response Plan (ERP) and Spill Response and Contingency. Maintain an inventory of all potentially hazardous materials and chemicals used and stored on-site. All spills and leaks will be reported promptly to the HSE Manager and Project Company to be investigated to 	Negligible to Minor

POTENTIAL IMPACT	MAGNITUDE OF IMPACT	RECEPTORS	SENSITIVITY	POTENTIAL IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACTS
					<p>confirm the cause and put in place appropriate corrective/preventative actions.</p> <ul style="list-style-type: none"> • Where approved by project company refuelling and limited maintenance of vehicles/equipment will be within a dedicated depot area at the camp, on an impermeable surface. • Availability of suitable containment and spill clean-up materials/equipment at specific locations within the project site (e.g. where refuelling is to take place). • Relevant personnel will be trained on emergency and spill response, containment, material handling and storage procedures. • Regular emergency drills to practice timely and effective spill response. • Fuel transport vehicles and equipment will be maintained and routinely inspected to ensure the tank, pumps, pipe work and vehicle itself are free from any leaks and fit for purpose-No equipment will be placed in service until deficiencies are corrected. • Implement regular maintenance program of vehicles and equipment to minimise leaks or mechanical failures and keep document evidence. • No storage of hazardous chemicals, materials, oils or fuels within 100 m of the shoreline or unprotected storm water drains/channels. 	
Waste and Wastewater	Minor Negative	Soil and Groundwater Quality	Low	Negligible to Minor	<ul style="list-style-type: none"> • The implementation of the project CESMP and associated Waste Management Plan and Procedures will ensure that spills are kept to a minimum and are cleaned up quickly using spill kits located in risk areas. 	Negligible to Minor

POTENTIAL IMPACT	MAGNITUDE OF IMPACT	RECEPTORS	SENSITIVITY	POTENTIAL IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACTS
					<ul style="list-style-type: none"> • Develop and maintain a hazardous waste inventory to document and track hazardous wastes generated, and their disposal route. • Implementation of good housekeeping practices during construction activities including procedures and requirements for proper handling, storage, and transport of hazardous materials and waste. • The EPC Contractor and sub-contractors will provide induction training and TBTs relating to the management, transportation and handling of hazardous materials and wastes • Concrete washout shall only be undertaken designated and signed areas, with adequate protection to soils, to prevent leaks of spread of wastewater. 	

8.4.2 Operational Phase

Specific project impacts to soil, and geology 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.

Accidental Leaks and Spillage Associated with Operation

During operations, there is expected to be limited potential for impacts to soil or groundwater as a result of accidental spills and leaks.

A relatively small volume of hazardous materials, such as cleaning fluids and solvents, chemicals, lubricants, transformer oils, emergency generator fuels may be present in dedicated storage areas. The management, handling, transportation and use of these materials can introduce risks associated with accidental spills and leaks to ground and impacts to soil quality, with potential indirect impacts to groundwater. However, such instances are considered unlikely as all such chemicals and lubricants will be stored inside structures and buildings with impermeable base and where appropriate with secondary containment. This will ensure that any leaks or spills will be fully contained, resulting in a negligible likelihood of impact to soil, as is the potential for impacts to groundwater which would rely on infiltration through exposed soils.

Inadequate temporary storage and handling of sanitary wastewater prior to being removed for disposal, could also pose a contamination risk, specifically where septic tanks overflow or are not adequately contained.

Contamination of Low-Lying Runoff Areas

Increased areas of hardstanding and impermeable surfacing within the Project site are likely to result in an increase in runoff rates, as 80% of the project site will be covered with geotextile (depending on the permeability of the geotextile); to enhance the reflection of sunlight onto the PV panels in order to increase the efficiency of the Project. Due to the potential for some minor spill/leaks (assessed above) there may be a resulting impact upon such runoff and wadi areas, where such pollutants are washed from surfaces and directed to these channels and depressions. In such instances, this may result in potential residual contamination to these soils ; however, this is expected to be extremely unlikely due to the nature of the Project operations and limited use of hazardous materials and chemicals.

Table 8-6 Geology, Soils and Groundwater Impact Significance, Mitigation & Management Measures and Residual Impacts - Operation

POTENTIAL IMPACTS	MAGNITUDE OF IMPACT	RECEPTOR	SENSITIVITY	IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACTS
Accidental Leaks & Spillage	Negligible	Soil Quality	Low	Minor to Negligible	<ul style="list-style-type: none"> • Appropriate training of staff in regard to the handling and response to spill/leak events. • Availability of complete spill kits in place. • Availability of MSDS on-site for any chemicals in use. • O&M Company to ensure that sanitation facilities have effective leak tight plumbing systems and temporary wastewater storages. 	Negligible
Contamination of Low-Lying Runoff Areas		Soil Quality	Low	Minor to Negligible		Negligible
		Groundwater Quality	Low	Minor to Negligible		

8.5 Monitoring

Table 8-7 Geology, Soils and Groundwater Monitoring Requirements

MONITORING	PARAMETER	FREQUENCY & DURATIONS	MONITORING LOCATION
Construction & Operation			
Soil Quality	Visible spills & leaks of hydrocarbons and other potentially hazardous or chemical pollution sources	Daily visual inspection	The entire Project area during construction and operation

9 SOLID AND LIQUID WASTE MANAGEMENT

This chapter assesses the projects expected generation of solid and liquid waste at the construction and operational phases. It does not consider the significance of impacts with respect to a specific receptor (i.e. soil or groundwater quality); as such impacts to soil or groundwater quality with respect to solid and liquid waste have been assessed in the respective section of this ESIA (Section 8 Geology, Soil, Hydrology and Groundwater).

The primary purpose of this chapter is to identify specific management measures in regard to solid waste and wastewater generation that can be adopted in the construction and operational phases ESMS' in order to ensure compliance with applicable regulations and standards.

9.1 Standards and Regulatory Requirements

9.1.1 Lender Requirements

International financial institutions providing project finance will likely require adherence with the WBG 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.

9.1.2 National Requirements

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

9.2 Observations and Baseline Conditions

Solid and liquid waste can exhibit certain characteristics according to its chemical, physical and biological features. Different types of waste require different management and disposal techniques according to the potential risk that the material poses to human health or the

environment. In order to categorise the different risks to these receptors, it is often useful to demarcate the streams into different categories that effectively equate to the level of the management and disposal which are required for each.

Industrial or domestic wastewater streams have the potential to contribute to a number of environmental problems if not properly handled, stored and/or managed, such as direct contamination to water bodies potentially leading to severe environmental and public health issues downstream.

9.2.1 Waste Management in Oman

The Oman Environmental Services Holding Company "Be'ah" is the entity responsible for solid waste management in the Sultanate. This waste management company was legally commissioned by the Royal Decree No. 46 of 2009 to be responsible for various kinds of solid waste management in the Sultanate including the following types of wastes:

- Green Waste (broken trees, grass & other garden/park wastes);
- Electronic Equipment Waste;
- Construction and Demolition Wastes;
- End of Life Vehicles;
- End of Life Tyres;

According to Be'ah solid waste in Oman is grouped into three (3):

- Municipal solid wastes;
- Industrial solid wastes;
- Healthcare waste and;
- Chemical and Hazardous waste.

According to a waste characterisation and quantification survey conducted by Be'ah in 2013, solid waste generated in the Sultanate is characterised by very high percentage of recyclables primarily paper & cardboard (15%), plastics (20.9%), metals (1.8%) and glass (4%). However, the Sultanate is yet to realize the recycling potential of its municipal waste stream as most of the solid waste generated in the country is sent to authorized & unauthorized dumpsites across the country. In 2009, it was estimated that there are about 317 dumpsites, 4 landfills, 9 transfer stations and 1 healthcare treatment facility within the Sultanate. Municipalities manage the landfills/dumpsites where municipal waste, industrial waste, e-wastes, etc. are deposited. Some of these landfills/dumpsites are located in the midst of residential areas or close to catchment areas or private & public drinking water bodies.

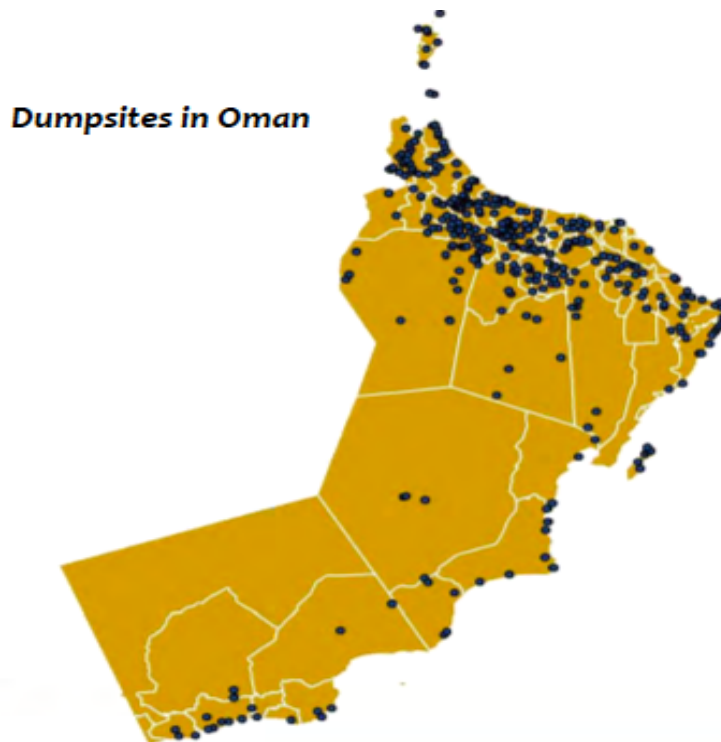
As at 2014, Be'ah reported that over 1.4 million tonnes of municipal solid waste, about 45,000 tonnes of electrical & electronic waste, 4,500 tonnes of healthcare waste, 35,000 tonnes of tyres, 14,000 tonnes of lead acid batteries, about 1.4 million tonnes of hazardous wastes and

over 700,000 tonnes of construction & demolition waste is generated in the Sultanate per annum

The Sultanate is striving to establish engineered landfills, waste transfer stations, recycling and waste to energy projects in different parts of the country. Modern solid waste management facilities are under planning in several Waliyat especially Muscat and Salalah. The plan is for these new landfills to replace the authorised/unauthorised landfills/dumpsites across the country.

The Oman Environmental Services Holding Company "Be'ah" is currently in the process of developing engineered landfills, metal recovery facilities, waste transfer stations and waste management services in the upcoming Special Economic Zone at Duqm (SEZAD), amongst others. A number of 'dumpsites' are maintained by Be'ah authorised contractors and are known to accept various waste streams. A dedicated hazardous waste facility has more recently been established in Sohar Port & Freezone area to the north of Ibri (approximately 150km away). There is one major Municipal Waste Management landfill per region in the Sultanate including Ibri town.

Figure 9-1 Location of Dumpsites Across the Sultanate of Oman



Source: Transformation of Waste Management in Oman, Be'ah 2016

9.3 Potential Impacts

9.3.1 Construction Phase

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.

Solid Waste

During construction, waste will be generated during earthworks, construction of the fences, paths, access roads and buildings.

Typical construction wastes include concrete, asphalt, scrap steel, glass, plastic, wood, packaging materials and domestic waste from construction workers (i.e. relating to food consumption). Concrete may be found in two forms on the construction site; structural elements containing reinforced concrete, while foundations (such as surface level concrete slabs) have mass non-reinforced concrete.

For a solar park, key waste stream will be the packaging of the PV modules. This includes loads of wooden pallets, cardboard, plastic ties and some metal frames.

Solid waste generated from construction activities at the Project site will include the following:

- Non-hazardous waste such as;
 - Waste related to construction processes, including earthworks (such as rubble, soils and potentially rock);
 - Paper/cardboard, plastics, packaging, plastic bottles, glass, scrap metal, excess fill materials, sand, gravel, excess construction materials, concrete, subsoil and rock (not contaminated)
 - Domestic waste generated by the construction workforce (e.g. food/organic waste, paper trash, cardboard, aluminium, plastic)
- Hazardous waste such as;
 - Batteries (unused), spend filtration cartridges, chemical drums, oil filters, aerosol cans, contaminated metals, empty containers, expired and unused chemicals, adhesives, machinery lubricants, clean-up materials such as rags, containers and tins with remains of hazardous substances, used spill kits and clean-up materials.
 - Replacement parts from vehicles, plant and equipment such as tyres.

Given the project footprint, the amount of solid waste generated will be of a considerable size. Inappropriate handling, storage, transport and/or disposal of these solid wastes during construction might pose the potential to pollute the surrounding environment (i.e. soil and groundwater resources), cause odour and visual nuisance, encourage pests or result in occupational health and safety issues.

Non-Hazardous Solid Waste

Non-hazardous construction waste is typically inert and does not pose a threat to human health or the environment. However, proper management is required in order to reduce associated secondary impacts such as unnecessary resource use, dust emissions, etc.

Hazardous Solid Waste

Due to the nature of the project and the construction works being undertaken, there will be a few hazardous materials used. Such materials may result in fuel containers waste, oily residues, paints, paint cans and wastes from chemical cleaning products.

Although the hazardous fraction of construction waste is expected to represent a relatively small portion of the total amount of construction waste likely to be generated, its management requires careful consideration as the impacts associated with hazardous waste can potentially result in contamination to soils and potentially groundwater, as assessed in the geology, soils, hydrology and groundwater sections of this ESIA.

Inappropriate management, storage, handling, transfer or transportation through lack of personnel training on site may lead to accidental spills or leaks to the soil or groundwater resulting in environmental impacts and potential health risk to workers. Contamination events may also arise as a result of transportation by unlicensed waste contractors or disposal to unlicensed/unauthorised landfills.

Waste management strategy and planning is therefore critical in order to minimise potential significant effects on sensitive receptors such as soil and groundwater. All waste management practices must be in line with the prescribed requirements of the CESMP and/or site waste management plan to be enforced and updated as necessary by the contractor.

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

Table 9-1 Anticipated Solid Waste Types Associated with the Construction Phase

TYPE	WASTE STREAM
Inert	Subsoil and Rock
	Glass
Non-Hazardous	Concrete and cement
	Asphalt
	Scrap metal
	Wood
	Plastic
	Packaging
	Municipal waste from construction workers
Hazardous	Contaminated soil/asphalt
	Resins and paints
	Waste oils

TYPE	WASTE STREAM
	Waste solvents and thinners
	Waste fuel and chemicals.
	Batteries
	Used spill kits and clean up materials.

The majority of the non-hazardous solid wastes generated onsite will be recycled and reused in order to reduce the quantity of waste to be disposed at landfill sites to as low as practicable. The cut fill waste shall be utilised on site as such as possible during the construction period. However, the packaging waste such as cardboard and plastic have the potential to be recycled around the project site area by local businesses.

Liquid Waste/Wastewater

Wastewater generated from construction activities at the project site will include the following:

- Sanitary and domestic wastewater generation;
- Wastewater from any vehicles or equipment washing/cleaning
- Liquid hazardous waste such as fuels, chemicals, paints, lubricants, solvents, waste oil, hydraulic fluid, resins, waste solvents and thinners, etc.; and
- Storm water runoff events on site and.
- Concrete washout.

For sanitary and domestic wastewater, it is anticipated that there will be a significant number of workers at the peak period of construction. The quantities of sanitary & domestic wastewater can be estimated as an average of 0.1m³/person/day (100 litres). Assuming the estimated number of construction workers during peak periods will be up to 1,500 personnel, sanitary wastewater is estimated to total 150m³ at peak periods of construction. Wastewater generated on-site will be stored within septic tanks for removal by a licensed wastewater contractor.

It should be noted that the figure of 100 litres/worker/day relates to overall water consumption including at accommodation areas (anticipated to be located at the Ibri IPP worker accommodation area and in other areas within the town of Ibri). Such wastewater will be stored within septic tanks on-site, prior to removal by a licensed contractor. Improper handling, storage and transportation of sanitary and domestic wastewater could potentially cause contamination to soil or groundwater resources; as assessed in the Geology, Soils, Hydrology and Groundwater section of this ESIA.

Storm water is not expected to occur on a regular basis due to the climatic condition of Oman. However, when rainfall occurs, storm water may runoff into areas containing hazardous materials and either leach these into the soil, flow to the runoff areas or carry these off the site, potentially contaminating soil, the runoff areas/wadi channels and reaching the groundwater.

9.3.2 Operational Phase

The operational phase of the Project will result in the production of few waste streams from the maintenance activities, with the vast majority of these streams being non-hazardous. Nevertheless, if these waste streams are not managed and disposed of effectively they could result in significant impacts upon the surrounding environment (i.e. soil and groundwater resources).

Solid Waste

Solid waste is not expected to be generated in significant quantities during the operational phase of the PV Plant, besides maintenance for PV Panels, transformers, and general day-to-day maintenance activities of administration facilities.

Non-Hazardous Solid Waste

The operation of the proposed Project will generate small amounts of non-hazardous domestic waste from the operation of the administration facilities and from activities of the employees.

This waste can be classified as both recyclable and non-recyclable. Recyclable waste includes paper, tin cans, plastics, cartons, rubber, and glass, while non-recyclables will consist mainly of food residues and other organic wastes. The quantity of domestic waste will be small given the few anticipated personnel required to operate the PV plant. Other solid non-hazardous waste generated during operation will be landscaping waste and uncontaminated replacement parts and packaging.

Hazardous Solid Waste

This fraction of the waste streams can potentially cause significant adverse impacts on human health and the environment if inadequately managed.

Examples of likely hazardous waste streams that may arise during the operation of the Project include the following:

- Used chemical containers and drums;
- Soil contaminated by potential spills and leaks of hazardous materials/liquids and used spill kits and clean up materials;
- Miscellaneous wastes such as batteries, waste cables, oily rags, etc.;
- General clean-up materials and solvents from general maintenance of on-site plant and machinery.

Inappropriate handling of hazardous waste streams through lack of personnel training on site may lead to accidental release of hazardous waste contaminating soil or groundwater. Contamination may also arise as a result of poor-quality waste transporters and waste management facilities, or lacking capacity of these services locally. These risks may

consequently result in illicit waste disposals (e.g. fly-tipping, or waste disposal at unlicensed locations), or the engagement of unlicensed contractors/facilities.

Liquid Waste/ Wastewater

Liquid waste generated from operational activities at the Project site will include the following:

- Sanitary and domestic wastewater generation from operation and maintenance staff working in the PV plant;
- Oily Water (to collect spills/leaks from transformer areas) if any will be in very small quantities;
- Liquid hazardous waste (if any) such as fuels, chemicals, paints, lubricants, solvents, waste oil, hydraulic fluid, resins, waste solvents and thinners, etc.; and
- Storm water runoff events on site.

Sanitary and domestic wastewater will be generated directly from site toilets and kitchen facilities. All sanitary streams will be directed to the septic tank for collection and disposal by a licensed contractor.

Any oily wastes from the transformer area, or other floor drains in oily areas, will collect oily water in a sump and will be treated in an oil separator for settlement of solids. The residual oil and solids will be collected for recycling and/or disposal by a licensed contractor.

The improper handling, transport and disposal of hazardous wastes could lead to potential localised contamination of soil and groundwater resources, which have been assessed for significance in the 'Geology, Soil, Hydrology and Groundwater' section of this report.

Storm water has the potential to run off into areas containing hazardous materials and either leach these into the soil, flow into wadi channels or carry these off the site, potentially contaminating soil and possibly reaching groundwater resources. However, heavy rainfall is rare and only a small number of rainy days per year occur in the Oman; particularly in the northern region.

9.4 Mitigation and Management Measures

9.4.1 Waste Characterization

Waste can exhibit certain characteristics according to the process stream from which it is generated and any pre-treatment processes that are undertaken. Different types of waste require different management and disposal techniques according to the potential risk that the material poses to human health or the environment. For the purpose of this Project, waste has been classified into three (3) main categories below.

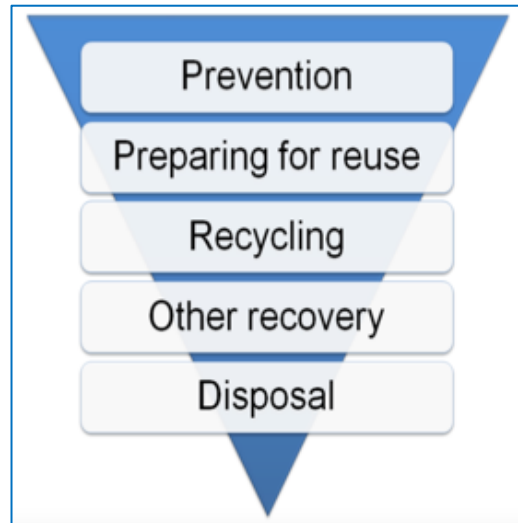
Table 9-2 Waste Characterization

WASTE CLASSIFICATION	DESCRIPTION
Domestic Waste	Household, commercial, agricultural, governmental, industrial and institutional wastes, which have chemical and physical characteristics similar to those of household such as garbage, paper, cardboard, plastic, cans, etc. Disposal of such waste can generally be routed to municipal recycling or disposal facilities.
Industrial Waste	Non-hazardous wastes that have physical and chemical characteristics that are different from domestic wastes such as construction waste, glass, scrap metal, wood, used containers, tyres etc. This waste generally poses little risk to the environment and can be disposed to normal municipal facilities after waste minimisation options are exhausted and prior obtaining approval
Hazardous Waste	<p>Waste is classified as being hazardous because of its concentration; physical, chemical or infectious characteristics, which may pose a present or potential threat to human health or the environment and/or may cause an increase in serious irreversible or incapacitating reversible illness or contribute to an increase in mortality. In accordance with the Basel Convention, hazardous waste is any waste (i.e. solid, liquid or gaseous) having the following properties:</p> <ul style="list-style-type: none"> • Explosive; • Radioactive (which includes NORM (LSA) scale); • Ignitable or flammable substances; • Poisons with acute and chronic (delayed) toxicity; or • Substances that by interaction with water might become spontaneously flammable or give off flammable gases. • Hazardous waste must be segregated, stored, transported and ultimately treated and disposed by approved waste services provider.

9.4.2 Waste Management Hierarchy

The waste management hierarchy illustrates best practice for waste management considerations by ensuring consideration of the most sustainable available application for waste management in preference of disposal and eventual contribution to adverse environmental and economic impacts associated with landfill. The hierarchy as illustrated below should form a key element of any waste management strategy and if implemented effectively will achieve maximum reductions on waste quantities combined with the limited use of resources and fill space. The waste management hierarchy also has the potential to reduce costs that may be incurred by the main contractor or the proponent for handling, transportation and the disposal of waste.

Figure 9-2 Waste Hierarchy



Initially, options to prevent or reduce waste should be considered. Where waste generation cannot be avoided or further reduced at source, opportunities for reuse of materials should be explored, either for use for the same or a different purpose. Disposal to landfill is the least favored option in the waste hierarchy and is the last resort after all other options have been considered.

9.4.3 Construction Phase Mitigation and Management Measures

Table 9-3 Solid & Liquid Waste Mitigation and Management Measures - Construction

IMPACT/SOURCE	MITIGATION AND MANAGEMENT MEASURES
<p>Inappropriate handling, storage, transport and disposal of solid non-hazardous waste</p>	<ul style="list-style-type: none"> • The project will develop and implement a Project specific Construction Waste Management Plan (CWMP) in line with committed mitigation measures in this ESIA report and the provisions of the CESMP. • Domestic solid wastes to be segregated and identified from the other waste streams into separate waste containers/skips clearly to facilitate recycling and reuse. • Specifically recycling of packaging waste shall be promoted, which will require site based segregation of cardboard, wood/pallets, metals and plastics. • Waste HPDE or PVC ground cover material shall be segregated for recycling. • Waste containers/skips should be clearly labeled and placed in designated waste storage locations. Labels will be waterproof, securely attached, and written in English and other languages as required for the workforce. • For litter (food waste, domestic waste), an adequate number of covered bins should be strategically placed throughout the site at locations where construction workers and staff consume food. These will be regularly collected and taken to the main waste storage area. • Food waste must be stored within a sealed metal or plastic skip or bin, in order to prevent pests gaining access. • On-going housekeeping training should be provided to all staff on the importance of the need to avoid littering.

IMPACT/SOURCE	MITIGATION AND MANAGEMENT MEASURES
	<ul style="list-style-type: none"> • Heavy waste may be contained within an open skip, provided that segregation occurs effectively enough to remove all lightweight material that could be blown away. • Waste generated during construction will be recycled and reused until reduced to as low as practicable prior to collection for disposal by an appropriately licensed waste contractor. • Only licensed waste transporters and waste management facilities will be engaged. • Develop and maintain a waste inventory to document and track domestic solid wastes generated, segregated, reused and consignments • Completed waste manifests are required to show the chain of custody of the waste generated on site, its transportation and treatment/disposal. All records will be maintained on site. • Mandatory training program for employees to increase their awareness of waste management protocols including proper handling and storage of waste, recycling waste, reusing plastics, rebar, wood & other reusable non-hazardous materials.
<p>Inappropriate/un controlled handling, storage, transport and/or disposal of solid hazardous waste</p>	<ul style="list-style-type: none"> • Develop and maintain a hazardous waste inventory to document and track hazardous wastes generated, segregated, reused and consignments. • Segregate and identify hazardous waste from the other waste streams into separate waste containers/skips clearly signed and labeled. • Store hazardous waste in allocated impervious hard standing areas in sealed containers stored with impermeable bases, sufficient containment and separation capacity, sun/rain shelter, separate drainage system, good ventilation and equipped with spill kits & spill response procedures. This area must be placed away from any sources of ignition. • Hazardous waste storage area should be constructed away from drainage system and a rain shelter to avoid any potential instance of runoff, or leakage of runoff. • Waste containers should be clearly marked with appropriate warning labels to accurately describe their contents and detailed safety precautions. Labels will be waterproof, securely attached, and written in English and other languages as required for the workforce. Wherever possible, chemicals will be kept in their original container. • Hazardous waste storage areas will be located away from any ignition sources or fire hazards.
<p>Inappropriate/un controlled handling, storage, transport and/or disposal of sanitary wastewater</p>	<ul style="list-style-type: none"> • Contractor to develop and implement a Project Specific Construction Waste Management Plan (CWMP) in accordance with committed mitigations measures in this ESIA report and provisions of the CESMP. • Develop and maintain a hazardous waste inventory to document and track sanitary waste generated and segregated. • Sanitary wastewater tanks should be placed in allocated impervious hard standing areas with bonding capacity to hold 110% volume of the maximum volume stored. • Sanitary wastewater tanks to be properly maintained and inspected to ensure tanks do not overflow. • Site inspections will be carried out regularly by the EPC contractor to ensure that all wastewater generated is properly managed, and no leakages or spill occur. In the event of a spill or overflow, immediate action will be taken in accordance with spill containment procedures and clean up procedures (to be developed in line with the CESMS).

IMPACT/SOURCE	MITIGATION AND MANAGEMENT MEASURES
	<ul style="list-style-type: none"> Engage a licensed waste contractor for the periodic removal of septic tanks. In common with the IFC EHS Guidelines, effort will be made in training construction personnel to minimise water consumption for ablutions and to ensure an understanding of water resource and wastewater issues.
Inappropriate handling and disposal of contaminated soil from clearing and excavation works causing cross-contamination of soils	<ul style="list-style-type: none"> In-situ testing of soil to ensure it is not contaminated and can be re-used or disposed into land. Training –Contractor staff to be able to identify signs of potential contamination (smell of HC, staining). If contamination is found, develop and implement a Contaminated Soil Management Plan for appropriate handling, treatment and disposal of soil

9.4.4 Operational Phase Mitigation and Management Measures

Table 9-4 Solid & Liquid Waste Mitigation and Management Measures- Operation

SOURCE	MITIGATION AND MANAGEMENT MEASURES
Inappropriate handling, storage, transport and disposal of non-hazardous solid waste	<ul style="list-style-type: none"> Contractor to develop and implement a Project specific Construction Waste Management Plan (CWMP) in line with committed mitigation measures in this ESIA report and the provisions of the CESMP. Training will be provided to employees to ensure awareness of waste management including proper waste; training and orientation on waste minimisation, segregation and good housekeeping practices. Domestic solid wastes to be segregated and identified from the other waste streams into separate waste containers/skips clearly to facilitate recycling. Waste containers/skips should be clearly labeled and placed in designated waste storage locations. Labels will be waterproof, securely attached, and written in English and other languages as required for the workforce. For litter (food waste, domestic waste), an adequate number of covered bins should be strategically placed throughout the site at locations where construction workers and staff consume food. These will be regularly collected and taken to the main waste storage area. Food waste must be stored within a sealed metal or plastic skip or bin, in order to prevent pests gaining access. Heavy waste may be contained within an open skip, provided that segregation occurs effectively enough to remove all lightweight material that could be blown away. Paper cardboard, metal cans, plastic, glass to be collected for recycling by a licensed waste contractor. Only licensed waste transporters and waste management facilities will be engaged. The Contractor will maintain copies of the waste management licensed on site. Develop and maintain a waste inventory to document and track domestic solid wastes generated, segregated, reused and consignments

SOURCE	MITIGATION AND MANAGEMENT MEASURES
	<ul style="list-style-type: none"> Completed waste manifests are required to show the chain of custody of the waste generated on site, its transportation and treatment/disposal. All records will be maintained on site.
<p>Inappropriate/uncontrolled handling, storage, transport and/or disposal of sanitary wastewater</p>	<ul style="list-style-type: none"> Sanitary facilities should be provided with adequately designed underground storage tanks. Sanitary wastewater tanks to be properly maintained and inspected to ensure tanks do not overflow. Sanitary wastewater tanks in allocated impervious hard standing areas with bunding capacity of 110% volume of the maximum volume stored. Sanitary wastewater treated at the onsite sewage treatment plant must meet established discharge limits prior to discharge. Where there are no onsite sewage treatment plant, a licensed waste contractor will be engaged for the periodic removal of tank.
<p>Inappropriate/uncontrolled handling, storage, transport and/or disposal of solid hazardous waste</p>	<ul style="list-style-type: none"> Develop and maintain a hazardous waste inventory to document and track hazardous wastes generated, segregated, reused and consignments. Segregate and identify hazardous waste from the other waste streams into separate waste containers/skips clearly signed and labelled. Store hazardous waste in allocated impervious hard standing areas in sealed containers stored with impermeable bases, sufficient containment and separation capacity, sun/rain shelter, separate drainage system, good ventilation and equipped with spill kits & spill response procedures. This area must be placed away from any sources of ignition. Waste containers should be clearly marked with appropriate warning labels to accurately describe their contents and detailed safety precautions. Labels will be waterproof, securely attached, and written in English and other languages as required by the workforce. Wherever possible, chemicals will be kept in their original container.

10 ARCHAEOLOGY AND CULTURAL HERITAGE

10.1 Standards and Regulatory Requirements

10.1.1 National Requirements

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.

RD 6/80 states the requirement for the protection of areas of cultural importance. These include the following:

All types of monuments and antiquities; and Chattels of cultural properties including archaeological fossils and fragments of monuments / ancient ruins or sites and ancient building blocks.

10.1.2 Lenders Requirements

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

AIIB ESS 2 Item 37 of the Environmental and Social Framework is applicable in this section.

10.2 Observations and Baseline Conditions

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 Observation

Based upon the site visits undertaken in October 2018 & May-July 2019 there are known archaeological sites located approximately 500m to the south of the adjusted Project layout.

Tis includes 5 grave sites which are situated in a continuum. All the sites have been officially tagged as heritage sites as presented in the photograph below.

Figure 10-1 Archaeological Sites

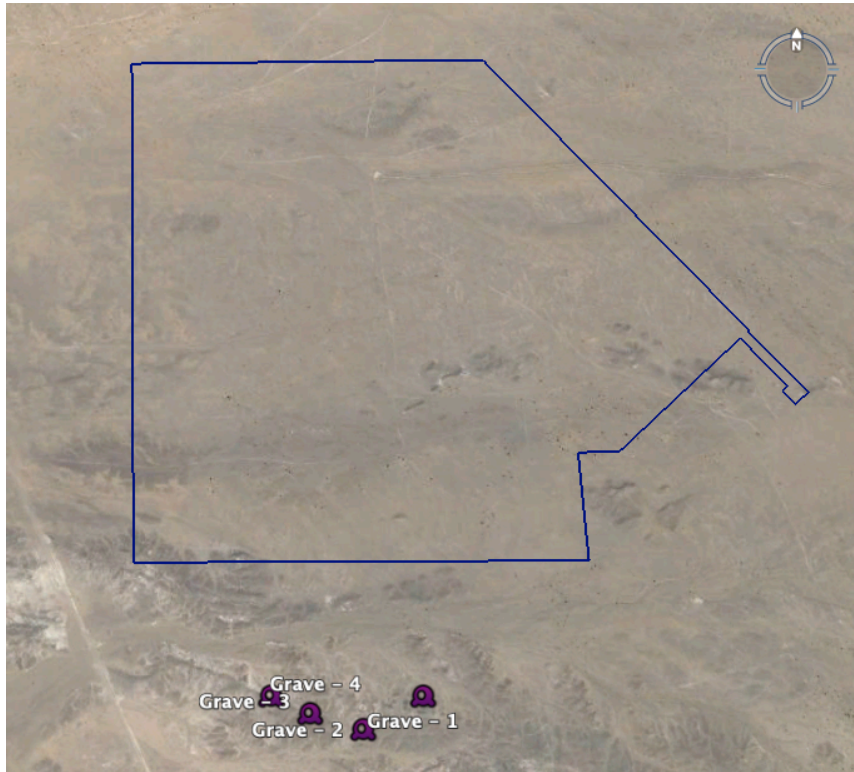


Figure 10-2 Ancient Grave Site



With regards to cultural heritage, the camels herders and racetrack 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 Omani Tax Tower design was identified along the highway and this could be an item of cultural value.

Figure 10-3 Water Tower Styled in Local Omani Tax Tower Design



10.3 Receptors

Table 10-1 Archaeology & Cultural Heritage – Sensitive Receptors

RECEPTOR	SENSITIVITY	JUSTIFICATION
Known Graves (off-site)	High	There are confirmed grave sites 500m south west of the project area.
Unknown Buried archaeological artefacts or remains	High	As the archaeological sites are next to the project boundary; during the construction works on the fence and adjacent to the fence-line there might be an interface between the archaeological site and project works.
Camel Farms	High	Camel farming and herding is recognised as an important aspect of Oman's heritage and is hence of conservation value. Hence 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

Known Grave Sites

It is unlikely that there will be any interaction of Project works with the known grave sites located 500m to the south-west of the project site. However, given the slightly elevated features and signed notices, these may potentially be of interest to the site workforce.

Unknown Buried Archaeology

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

There is always the potential of encountering unknown buried archaeological remains or artefacts during excavation and earthwork activities. This could lead to damage, destruction and loss of archaeological artefacts of conservation value.

Camel Herders and Racetrack

The Project will result in the displacement of the identified camel herders and part of the camel race track which overlaps with the Project footprint. It will be necessary for the Project to relocate these herders, the camels and the racetrack to an external area prior to construction works.

10.4.2 Operational Phase

Archaeology

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

Cultural Heritage

Due to the relocation of the camel racetrack, there might be a potential impacts on the local camel racing scene in the area which is part and parcel of the local cultural fabric. As the racetrack will be relocated to an area agreed by the local Wali and Sheikhs, the cultural racing will remain, although it may result in some local people having to travel slightly further to this location than the current racetrack.

Table 10-2 Cultural Heritage and Archaeology Impact Significance, Mitigation & Management Measures and Residual Impacts - Construction

IMPACTS	MAGNITUDE OF IMPACTS	RECEPTOR	SENSITIVITY	IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACTS
Accidental damage of known or unknown archaeological resources buried within the Project site.	Minor Negative	Known Archaeology (off-site)	High	Minor to Moderate	<ul style="list-style-type: none"> Creation of a clear fence between the project site and the archaeological site. Training to EPC staff to identify archaeological artefacts and to report artefacts to the correct focal point within the project organization. 	Negligible
		Unknown Buried archaeological artefacts or remains	High	Minor to Moderate	<ul style="list-style-type: none"> An archaeological 'Chance Find Procedure' will be developed prior to construction and the start of site earthworks, as part of the CESMP. This will include protocols and procedures to stop work and methods to preserve potential finds, as well as reporting requirements and co-ordination with the Oman Ministry of Heritage and Culture. Where artefacts or archaeological remains are encountered, the site will be clearly signed/delineated with high visibility flagging to impede access and prevent any damage or loss of the artefacts which have just been found. Contractor crew to be informed during morning toolbox meeting about any suspected archaeological finds to avoid disturbance. Removal of any archaeological artefacts from the site by site workers is strictly prohibited. 	Negligible
Relocation of Camel Farm & race track within the Project site	Minor Negative	Camel Farm	High	Minor to Moderate	<ul style="list-style-type: none"> Resettlement and provision of alternate land to camel herders – as already agreed with Wali and local Sheikh's (who own the camels). Relocation of the camel racetrack – as already agreed with Wali and local Sheikh's (who own the race track). 	Negligible to Minor

Known Archeological Artefacts	Minor Negative	Archeological remains	High	Minor to Moderate	<ul style="list-style-type: none"> Training to the EPC staff regarding the known archeological area near to the project site 	Negligible to Minor
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Table 10-3 Cultural Heritage and Archaeology - Monitoring Requirements

MONITORING	PARAMETER	FREQUENCY & DURATIONS	MONITORING LOCATION
Construction			
Archaeological Resources & Artefacts	Undiscovered archaeological remains within the Project site	Daily continued visual observations by site staff involved in excavations.	The Project area requiring excavations, earthworks or grading during construction and operation
	Known archaeology		Visual Inspections of these known graves to ensure that no damage is being caused by Project workers.

Note: Resettlement activities are mapped in the Resettlement Action Plan which is a separate document to this ESIA.

11 LANDSCAPE & VISUAL QUALITY

11.1 Standards and Regulatory Requirements

Specific legislation in regard to landscape and visual does not exist in Oman.

11.2 Observations and Baseline Conditions

11.2.1 Landscape

Landscape character could be defined as "a distinct, recognisable and consistent pattern of elements, be it natural (soil, landform) and/or human (for example settlement and development) in the landscape that makes one landscape different from another, rather than better or worse" (Natural England, 2014).

The proposed project will be constructed on a predominantly undeveloped, open landscape with the landscape typology 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, the Ibri Power Plant currently undergoing commissioning 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 power block 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 Quality

When establishing the value of views and visual amenity, the inter-relations between individuals or groups of people and landscape will be considered such as the change of views that people have of the landscape and the effects of change on their visual amenity. The visual baseline has therefore been established by:

- Identifying views, viewpoints and extent of possible visibility;
- Identifying receptors that may be affected.

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.

Other visual residential/commercial receptors are several kilometres away from the Project boundary and have no direct visibility of the Project site.

11.3 Receptors

The potential landscape and visual receptors are presented in the table below.

Table 11-1 Landscape and Visual Impacts – Sensitive Receptors

RECEPTOR	RECEPTOR TYPE	SENSITIVITY	JUSTIFICATION
Landscape Character	Open area- Across the entire Project site	Low	The landscape across the entire Project site is that of the typical desert landscape present across 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	High	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	High	Users of this recreational receptor have a direct visibility of the Project site and will be particularly vulnerable to changes in landscape character.
Active Camel Farm 1 & 2	Residential/ Commercial	Medium	Users of these camel farms will be particularly vulnerable to changes in landscape character as a result of installation of PV Panels across the Project site.
Farmland 1,2 & 3	Agricultural	Medium	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	Low	The Power Plant is of low vulnerability to changes in landscape character as it is an anthropogenic contribution to the landscape.

11.4 Potential impacts

11.4.1 Construction Phase

Change in Landscape Character

The construction of a new development, particularly those on a large scale have the potential to result in changes to the landscape character of a locality through land use and topographical changes or other factors. In situations where the visual horizon is disturbed by a development, such impacts may include the anthropogenic intrusion of the landscape by buildings/structures where no intrusion previously existed; or the change in the landscape character of an area, which could arise from new/out of place development or from changes in the land use.

One of the first stages of construction activities will result in the levelling, grading and preparation of the site prior to the commencement of construction. However, given the existing flat nature of the site, grading and levelling activities are not expected to be extensive. The proliferation of other activities such as the subsequent construction of small new buildings and installation of PV Panels which will take place steadily over the construction period and across the site will eventually transform the landscape resulting in major land use changes.

Reduction in Visual Quality

The movement of heavy construction vehicles such as trailers, cement trucks, graders, excavators, loaders, water trucks, waste removal truck, etc. to and from the project site and earthworks on sandy surfaces can potentially result in dust generation and a resulting temporary haze causing disturbance to the current visual envelope of receptors, by changing their visual amenity and/or blocking their views.

Impacts to the visual envelope of surrounding receptors will also occur at night where the addition of lighting during construction will illuminate the proposed project area. The use of lighting across the site will result in a night time light haze likely to be visible for several kilometres from the project area. However, it is not anticipated to have a significant impact on receptors due to the existing lighting at the Ibri Power Plant approximately 800m south east of the Project site.

Any impacts from lighting are anticipated to be minimised by the implementation of a CESMP on-site.

Table 11-2 Landscape and Visual Quality Impact Significance, Mitigation & Management Measures and Residual Impacts- Construction

POTENTIAL IMPACT	MAGNITUDE OF IMPACTS	RECEPTOR	SENSITIVITY	IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACTS
Changes in Landscape Character	Minor Negative	Landscape character of the entire Project site	Low	Negligible to Minor	<ul style="list-style-type: none"> Site clearance, levelling & grading to be limited within the boundaries of the Project site. Construction works to be limited within the boundaries of the Project site. 	Negligible
Changes in landscape character and Disturbance to Visual Envelope of Receptors	Minor Negative	Al, Ma'mur village, Al Mazim village and Masha'rub village	High	Minor to Moderate	<ul style="list-style-type: none"> Where appropriate, construction laydowns and working areas of the site will be screened to reduce the visual intrusion to existing off site receptors. When not in use, cranes and other construction plant will be lowered, so they are at their minimum height and do not protrude unnecessarily within the visual envelope of local receptors. Mitigation and management measures relating to the generation of dust (as detailed in the Section 5 Air Quality) will be implemented to minimise visual impacts during construction activities. Minimise construction works at night-time to those strictly required. Any flood lights required during night time construction activities will be directed onto the working areas, with a maximum position angle of 30° from vertical, and back spill shields, therefore minimising any unwanted light spill. 	Minor
		Camel Race Track	High	Minor to Moderate		Minor
		Active Camel Farm 1 & 2	Medium	Minor		Negligible
		Farmland 1,2 & 3	Medium	Minor		Negligible
		Ibri Power Plant	Low	Negligible to Minor		Negligible

11.4.2 Operational Phase

Landscape Character

The development of the Project will include the installation of thousands of PV panels, the construction of substations, administrative facilities, etc. which will 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 geotextile surfaces between the panels. The geographical extent of the area that will suffer the change of landscape character or be affected will be limited to the Project footprint) and will be within the boundary of the Project site.

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.

Visual Amenity

Following the impacts of construction and establishment of project features, the operational phase will not result in changes to the visual envelope of receptors overlooking the Project site. Although lighting impacts will occur, it is envisaged that only minimal lighting will be required at night-time for security purposes and this will be similar to the construction phase. As such significance has not been re-assessed. The mitigation and management measures with regards to light pollution will be the same as construction phase. This will include the deployment of lighting for safety and security that seeks to avoid light spill, skyglow and glare and will utilise efficient low energy systems where appropriate.

Table 11-3 Landscape and Visual Amenity Impact Significance, Mitigation & Management Measures and Residual Impacts- Operation

POTENTIAL IMPACT	MAGNITUDE OF IMPACTS	RECEPTOR	SENSITIVITY	IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACTS
Changes in Landscape Character	Minor Negative	Landscape character of the entire Project site	Low	Negligible to Minor	<ul style="list-style-type: none"> Project footprint to be limited within the boundaries of the Project site as per Project proposals Lighting provision shall not be excessive or unnecessary and not result in glare effect. Light fittings shall be directional as deemed appropriate for their use and intended areas of illumination. Lighting column and lighting head design should be chosen to limit back spill and any unwanted light spill to other site areas or, those areas off the site. 	Negligible to Minor
Disturbance to Visual Envelope of Receptors	Minor Negative	Al, Ma'mur village, Al Mazim village and Masha'rub village	High	Minor to Moderate		Minor
		Camel Race Track	High	Minor to Moderate		Minor
		Active Camel Farm 1 & 2	Medium	Minor		Minor
		Farmland 1,2 & 3	Medium	Minor		Minor
		Ibri Power Plant	Low	Negligible to Minor		Negligible to Minor

12 SOCIO-ECONOMICS

12.1 Standards and Regulatory Requirements

International Financial Institutions (IFI's) will 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 Conditions

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 Hajar 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.

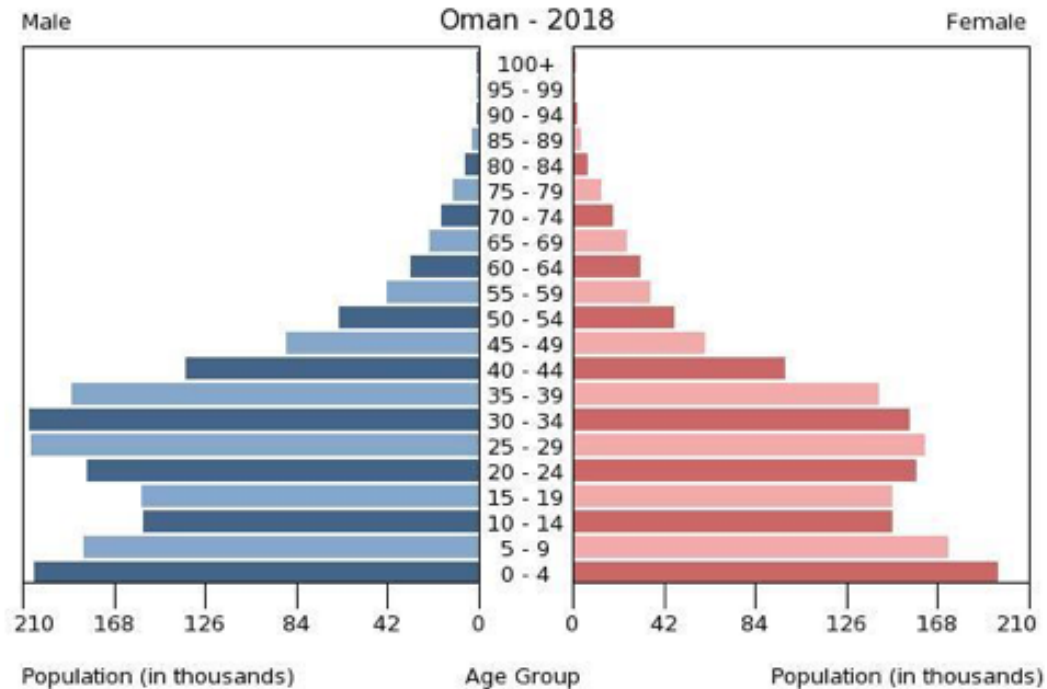
Table 12-1 Oman Population Data Summary

CRITERIA	DATA (2017 ESTIMATE UNLESS SPECIFIED)
Population	4,613,241 (2017 est.)
Age Structure	0-14 years: 30.1% 15-24 years: 18.26% 25-54 years: 44.15% 55-64 years: 3.94% 65 years and over: 3.55% (2018 est.)
Sex Ratio (Male/ Female)	At birth – 1.05 0-14years: 1.05 15-24 years: 1.1 25-54 years: 1.38 55-64 years: 1.14 65+years: 0.99 Total population 1.19 male/ female (2017 est.)
Life expectancy at birth	Total Population: 75.9 years Male: 73.9 years 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 16th April 2019

Figure 12-1 Oman 2018 Population Pyramid



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

Accessed 16th 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®ion=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®ion=1000020-muscat&nationality=1000010-omani>. Accessed 16th April 2019

12.2.2 Economy and 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)
GDP (Official Exchange)	US\$70.78 billion
GDP (Purchasing Power Parity)	US\$190.1 billion
GDP per Capita (Purchasing Power Parity)	US\$46,000
GDP Real Growth Rate	-0.9%
Industrial Production Growth Rate	-3%
Labour Force	2.255 million (2016 Est.) (About 60% are Non-Omani National)
Labour Force - by occupation	Agriculture: 4.7% Industry: 49.6% Services: 45% (2016 Est.)
Unemployment Rate	Unknown
Exports	US\$ 103.3 billion
Imports	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

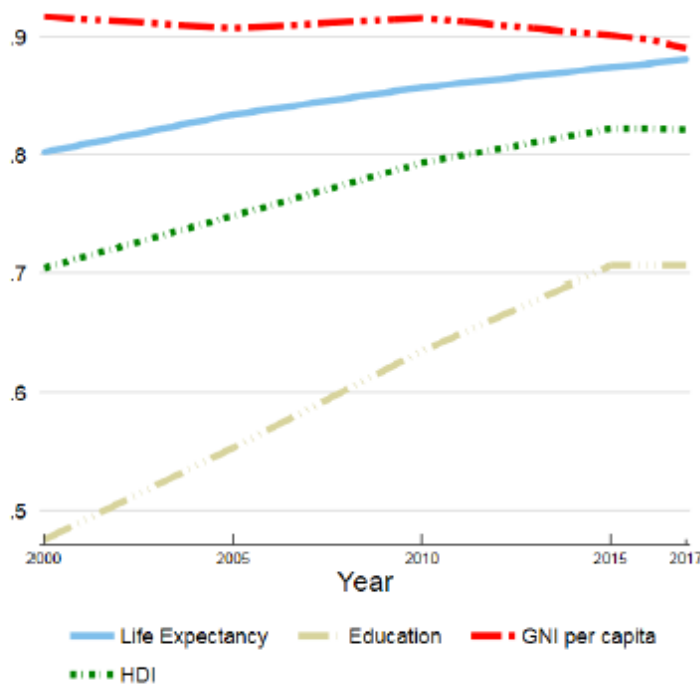
Using the United Nations Human Development Index as a guide, Oman is ranked 48, with an index score of 0.821 (2017) and falls under the Very High Human Development Category. Although Oman's HDI of 0.821 is below the average of 0.894 for countries in the very high human development group, it is above 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.

Table 12-5 Oman's HDI Trends Based on Consistent Time Series Data and New Goalposts

YEAR	LIFE EXPECTANCY BY BIRTH	EXPECTED YEARS OF SCHOOLING	MEAN YEARS OF SCHOOLING	GNI PER CAPITA (2011 PPP \$)	HDI VALUE
1990	67.2	7.9	-	35,411	-
1995	69.8	9.7	-	38,497	-
2000	72.1	10.7	5.3	43,276	0.704
2005	74.2	11.7	6.8	40,625	0.748
2010	75.7	13.4	7.9	42,954	0.793
2015	76.8	13.9	9.5	38,980	0.822
2016	77.0	13.9	9.5	38,129	0.822
2017	77.3	13.9	9.5	36,290	0.821

Figure 12-2 Trends in Omani HDI Component Indices 2000-2017



Source: United Nations Human Development Indices and Indicators: 2018 Statistical Update

12.2.4 Indigenous People and Physical Displacement

There are no ethnic minorities, indigenous groups, internally displaced people or any evidence of land use likely to be attributable to indigenous peoples within the project site area or immediate adjacent areas.

12.2.5 Commercial and Industrial

Other than the existing camel race track, camel farms and Ibri Power plant currently undergoing commissioning, 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.

12.2.7 Site Based Observations

Based on site observations and review of satellite imagery, there is one camel farm within the proposed project site. As such, the project will result in economic or physical displacement or resettlement of this camel farm.

Camel racing is a substantial sport for the region of Adh Dhahirah in Oman as it is a vital aspect of the local cultural fabric with the sport treated as cultural heritage. There is a camel racing track adjacent to the project site.

12.3 Receptors

Figure 12-3 Potential Socio-Economic Receptors

RECEPTOR	SENSITIVITY	JUSTIFICATION
Welfare of Local Population	High	Any change to infrastructure, population or regional inputs is likely to have knock on effects for the welfare of the local population.
Local / Regional Economy	Low	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.
Employment Market	Medium	The development of the Project will result in the creation of employment opportunities and will offer an opportunity for greater dissemination of skills.
Users of Highway 21	Low	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 limited project timeline centric employment creation during this phase. This project is expected to create employment opportunities during the construction phase for unskilled and applicably skilled workers. Although not confirmed at this stage, ACWA Power's typical process for employment considers the availability of local talent in the first instance as well as the use of relevant contracting companies (for applicable sub-contractor works). 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 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.

Notwithstanding the above, our experience of similar sites in the Middle East suggests that a lack of available construction workforce among the immediate local population makes it probable that a significant proportion of work on the site will be undertaken by expatriate workers. This could result in the repatriation of wages and a reduction in the benefit to the local economy of wage expenditure.

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.

Land Use

The project will mitigate impacts on the camel farm and racetrack identified within the site area.

The process for undertaking this has been agreed between ACWA Power, the local Wali and Sheikh's who own the camels and oversee the racecourse. It has been agreed to undertake

all relocation in parallel with construction, to agreed areas by the Wali and Sheikh's off-site. The Wali of Ibri has issued a formal letter stating the reconfiguration of the project layout keeping in context the expectations from the local community, which includes non-objection from the Sheikh's.

A Resettlement Action Plan has been prepared concerning the resettlement of PAPs off the site.

Traffic and Transportation

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, LGV'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 site visits in October 2018 and May 2019 as such, construction phase traffic may therefore result in significant variation from current condition.

Table 12-6 Socio-Economics Impact Significance, Mitigation & Management Measures and Residual Impacts-Construction

POTENTIAL IMPACT	MAGNITUDE OF IMPACT	RECEPTOR	SENSITIVITY	IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACTS
Employment Opportunities	Minor Positive	Employment Market	Medium	Minor Positive	<ul style="list-style-type: none"> Contractor should seek to employ local workers where possible. The project company will fulfill the Omanization requirement of 15% for this project. The EPC and Sub-Contractors HR Policy will be prepared to ensure consistency in line with local labour laws and international ILO and UN conventions. The EPC Contractor is to ensure that this is applied as an overarching policy for all sub-contractor company HR policy as part of their contractual arrangements. 	Minor Positive
Training and dissemination of construction skills	Minor Positive	Welfare of Local Population	High	Minor to Moderate Positive	<ul style="list-style-type: none"> All project workers will receive induction training at the project, as well as vocational specific training for on-site construction works. All workers will receive training in regard to health and safety, as well as environmental awareness. Toolbox talks will be conducted before work on each day to ensure workers are reminded of key topics. Cultural awareness training for all foreign workers. 	Minor to Moderate Positive
Purchase of construction materials locally	Minor Positive	Local / Regional Economy	Low	Negligible to Minor Positive	<ul style="list-style-type: none"> Contractor to purchase goods and materials from the local/regional economy where possible 	Negligible to Minor Positive
Increase in traffic	Minor Negative	Users of Buraimi-Ibri Highway (Highway 21)	Low	Negligible to Minor Negative	<ul style="list-style-type: none"> Construction access roads to be clearly signalized. Minimise the number of construction road movements as much as practicable. E.g. maximize the capacity of vehicles - Buses should be used and carpooling should be encouraged. Staggering deliveries to the site will ensure that congestion on local and site roads is minimised, whilst reducing waiting times for drivers and over demand on receiving staff at the site. 	Negligible to Minor Negative

POTENTIAL IMPACT	MAGNITUDE OF IMPACT	RECEPTOR	SENSITIVITY	IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACTS
					<ul style="list-style-type: none"> Designated roads will be made clear to the drivers and signs for the directions and speed limit will be placed all along the roads. Drivers to be fully competent and authorised to drive heavy loads vehicles and to receive specific training 	
Relocation of Camel Farm	Negligible Negative	Camel farm located within Project area	High	Minor to Moderate	<ul style="list-style-type: none"> Relocation or resettlement of the camel farm in the vicinity of the Project site in parallel with construction activities. 	Minor

12.4.2 Operational Phase

At a strategic level the operation of 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 will reduce Oman's dependency on fossil fuel generated power and will reduce atmospheric pollution; in comparison to other power generation technologies in the current energy mix of Oman. It will also support the continued growth of the national economy through the provision of sufficient power supplies in Oman.

As with the construction phase, an economic impact during operation will result from any local employment created by the project. The operational phase will however require significantly less staff than during construction. Besides management and technical operator positions, the majority of staff will be security teams, panel cleaners and other office-based support staff. Such non-technical staff will likely be sourced locally based on ACWA Power's typical processes and observed track record of this in Oman and for other projects in the MENA region. Whilst the size of the required workforce is significantly smaller, the type of work and the increased time-scales involved offer an opportunity for greater dissemination of skills. A targeted system of local recruitment and investment in the human capital of the local workforce will enhance this process and consequently increase the benefit to the local economy.

Table 12-7 Socio-Economics Impact Significance, Mitigation & Management Measures and Residual Impacts-Operation

POTENTIAL IMPACT	MAGNITUDE OF IMPACT	RECEPTOR	SENSITIVITY	IMPACT SIGNIFICANCE	MITIGATION AND MANAGEMENT MEASURES	RESIDUAL IMPACTS
Sustainable supply of renewable energy	Moderate Positive	Oman Power and Water Procurement (OPWP)	High	Moderate to Major Positive	<ul style="list-style-type: none"> Ensure the appropriate operation and maintenance of the PV Plant to enable a secure supply of renewable energy 	Moderate to Major Positive
Employment Opportunities, facilitating development and dissemination of skills	Minor Positive	Employment Market	Medium	Negligible to Minor Positive	<ul style="list-style-type: none"> The projects recruitment policy will ensure a preference for employing workers from the local population where appropriately skilled workers are available locally (or if unskilled positions are available). The HR Policy will be prepared to ensure consistency with the ACWA Power corporate policy which will ensure compliance with local labour laws and international ILO and UN conventions. Workers will be encouraged to develop their careers and may be provided with opportunities to attend training courses and other career development processes. Training plans to be developed and implemented to facilitate career development and advancement within the local workforce. 	Negligible to Minor Positive

13 COMMUNITY HEALTH, SAFETY AND SECURITY

This chapter assesses the impacts relating to the health & safety of the local community who live and work in the surrounding area and may be subject to project related impacts.

The majority of secondary impacts relating to the local community in terms of air quality, noise, wastewater, waste etc., have been addressed in specific chapters elsewhere in this ESIA. 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, malicious intrusions and other misdemeanors.

The primary purpose of this chapter is therefore to identify specific management measures in regard to 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 and AIB ESS 2 Item 38. 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 Conditions

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.

The nearest residential receptor is the Ibri IPP Worker Accommodation Area approximately 800m south east of the Project site. The active camel far 1 & 2 and Farmlands 1,2, & 3 are also located within zone of 1km radius from the Project site.

Given the nature of the Project, associated construction and operational activities and distance from the Project site, the receptors over 1km from the Project site will not be directly affected by the Project and therefore are not considered 'Affected Communities'. Impacts relating to the local community in terms of air quality, noise, wastewater, waste etc., have been addressed in specific chapters elsewhere in this ESIA.

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

13.3 Potential impacts

13.3.1 Construction Phase

Public/Community Health

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 of the local area.

The construction phase of the project will require a large amount of workforce as well as suitable accommodation areas for this workforce. As outlined in the Project Description section of this ESIA, the EPC contractor plans to use the existing Ibri IPP Worker Accommodation Area approximately 800m south east of the Project site to accommodate its workers while subcontractors are expected to provide accommodation for their workers in the local Project area.

As such, there is a potential for both workers accommodated in the EPC Contractor camps and those in the local Project area to come into contact with local populations. Hence, the likelihood for spread of diseases to local communities.

Public/Community Safety

All construction projects have potential risks relating to public safety that could arise, particularly in regard to the use of high-powered equipment, heavy construction machinery, excavations, transportation amongst others, including fire and pollution releases.

Public risks during construction have the potential to result in isolated incidents, which could be of a devastating magnitude to a person or group of people in the wrong place at the wrong time.

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. Such risks will be suitably managed in the construction phase through the implementation of a robust CESMP and an Emergency Preparedness and Response Plan.

Public/ Community 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, the IFC's Good Practice Handbook on the Use of Security Forces: Assessing and Managing Risks and Impacts IFC's and the UN Basic Principles on the use of Force and Firearms by law enforcement officials (if staff are armed).

In addition to this, security personnel will receive internal training in regard to grievances, reporting such grievances and conduct for dialogue with any members of the local community. The workers on the project site will additionally receive cultural awareness training with regard to local customs as such guidance can provide a ready resource on the do's and don'ts of culture centered behavior.

Water Usage

It cannot be confirmed at this stage where construction phase water will be sourced from, however, given the scarcity of some water sources in Oman, there may be associated impacts upon aquifers (where water is not sourced from seawater desalination). Such impacts may include depletion of supply vs. recharge, impacts to groundwater quality and disruption to other aquifer users.

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, 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 via appropriate training of staff.

Public Security

The project constitutes a facility of high importance due to the generation of electricity. The project will also include site-based security at the project main entrance and on patrol around the site.

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 and UN basic principles on the use of Force and Firearms by law enforcement officials (if staff are armed).

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.

Water Usage

It cannot be confirmed at this stage where operational water will be sourced from, however, given the scarcity of some water sources in Oman, there may be associated impacts upon aquifers (where water is not sourced from seawater desalination). Such impacts may include depletion of supply vs. recharge, impacts to groundwater quality and disruption to other aquifer users.

13.4 Mitigation and Management Measures

Table 13-1 Community Health & Safety Mitigation & Management Measures - Construction

POTENTIAL IMPACT	MITIGATION AND MANAGEMENT MEASURES
Public/Community Health	<ul style="list-style-type: none"> The Health and Safety teams on site will provide advice during training/inductions on exposure to disease. During construction, staff will have access to medical professionals and suitable medical facilities, which will aim to prevent the spread of diseases internally and externally. Site personnel will only be cleared for work after with a medical fitness certificate from an authorized medical center. Any reportable disease will be diagnosed by the authorized occupation health center doctor. Diagnosis includes identifying any new symptoms, or any significant worsening of existing symptoms. Any external and internal spreading diseases will be diagnosed and taken the precautions as per the instructions from the national/ local medical authority. The potential for exposure to water-borne, water-based, vector-borne diseases and communicable diseases as a result from project activities will be avoided or minimised.
Public/Community Safety	<ul style="list-style-type: none"> Risks to public safety will be appropriately addressed and prepared for in the operational phase 'Emergency Preparedness and Response Plan' and training. The plan will include the appropriate procedure to respond to any such incidents, as well as site specific contact details and details of external agencies who may be required.

POTENTIAL IMPACT	MITIGATION AND MANAGEMENT MEASURES
	<ul style="list-style-type: none"> • A Traffic Management Plan will be prepared to map out accident and traffic hotspots for project access vehicles. • Project induction training will include a section on code of conduct when engaging with local community members. This will include an overview of culturally appropriate measures and etiquette to bear in mind. • All high-risk areas including fuel storage areas will be secured with internal fencing and will be patrolled by security throughout the day. • Appropriate mechanisms for emergency control (e.g. firefighting equipment) will be placed at suitable positions around the site.
Public/Community Security	<ul style="list-style-type: none"> • The project will employ its own security staff who will provide 24/7 security control across the Project site and dedicated security staff at gatehouses. • The project will be fenced during enabling works stage. • All vehicles entering the site will require pre-approved clearance and will need to be registered. Project security will record all instances of incoming vehicles. • CCTV will be installed at key locations around the site and at gatehouses. • Appropriate lighting will be provided at gatehouses for security personnel to prevent unauthorised access. • Project personnel will only be provided access to the construction site with valid ID cards and permits to work in line with HSE requirements.
Grievance Mechanism	<ul style="list-style-type: none"> • The project will implement an appropriate system to allow external parties to raise a grievance in regard to the project. • The Grievance Mechanism will be clearly defined, transparent and accessible to identified stakeholders.
Water Usage	<ul style="list-style-type: none"> • All contractors sourcing water for the Project shall ensure that water is drawn from a PAEW licensed well, and/or is sought from a licensed company drawing water from a PAEW supply. • Water from un-regulated boreholes or other un-regulated supply will not be allowed.

Table 13-2 Health & Safety Mitigation & Management Measures - Operation

POTENTIAL IMPACT	MITIGATION AND MANAGEMENT MEASURES
Public/Community Safety	<ul style="list-style-type: none"> • Risks to public safety will be appropriately addressed and prepared for in the operational phase 'Emergency Preparedness and Response Plan' and training. • The plan will include the appropriate procedure to respond to any such incidents, as well as site specific contact details and details of external agencies who may be required. • The employees during the construction phase shall undergo a Code of Conduct training to ensure smooth coordination with the neighboring community. • Appropriate mechanisms for emergency control (e.g. firefighting equipment) will be placed at suitable positions around the site. • Grievance Redressal Mechanism shall be made accessible to the community to ensure that community members wish to raise grievances to the Project leadership.

POTENTIAL IMPACT	MITIGATION AND MANAGEMENT MEASURES
Public/Community Security	<ul style="list-style-type: none"> The project will employ its own security staff who will provide 24/7 security control across the Project site and dedicated security staff at gatehouses. All vehicles entering the site will require pre-approved clearance and will need to be registered. Project security will record all instances of incoming vehicles. CCTV will be installed at key locations around the site and at gatehouses. Appropriate lighting will be provided at gatehouses for security personnel to prevent unauthorised access. Project personnel will only be provided access to the construction site with valid ID cards and permits to work in line with HSE requirements.
Water Usage	<ul style="list-style-type: none"> All contractors sourcing water for the Project shall ensure that water is drawn from a PAEW licensed well, and/or is sought from a licensed company drawing water from a PAEW supply. Water from un-regulated boreholes or other un-regulated supply will not be allowed.

13.5 Monitoring

Monitoring of Community Health and Safety will be undertaken as required via the management measures outlined above. For instance, monitoring of the security plan will form part of the wider Environmental and Social Management System internal audits to be undertaken monthly during construction and quarterly during operations.

Table 13-3 Key monitoring indicators

INDICATOR	SOURCE OF INFORMATION	FREQUENCY CONSTRUCTION & DECOMMISSIONING/OPERATION
Number of grievances closed out	Grievance Management System	Quarterly / bi-yearly
Average time for grievance processing and close out and trends	Grievance Management System	Quarterly / bi-yearly
Number of grievances still opened, method to submit the grievance and trends	Grievance Management System	Quarterly / bi-yearly
Topics raised in grievances and trends	Grievance Management System	Quarterly / bi-yearly
Water Consumption	Volume of water delivered to the site via water delivery notes from a licensed PAEW supply/supplier.	Monthly

14 LABOUR AND WORKING CONDITIONS

14.1 Standards and Regulatory Requirements

14.1.1 National Requirements

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 and AIB requirements 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;
- AIB ESS2 Item 38 and 39 are applicable references as well.

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 Conditions

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 and/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 dependent 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.

As occupational health and safety is a risk rather than a potentially defined impact, its significance has not been assessed further in this ESIA. Health and safety risks to the site force should be managed through effective risk assessment, development and implementation of an Occupational Health & Safety Plan.

Working Conditions

Labour exploitation on construction sites unfortunately has become a reality in some parts of the world. An inequality 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.

The EPC Contractor shall adhere to good practice measures regarding worker welfare on and off site particularly in terms of sanitation facilities on site, and having adequate checks and balances regarding timely payment of salaries and having necessary redressal access in case of forced retrenchment.

As with occupational health & safety risk, worker conditions are a defined aspect of site planning rather than a potentially environmental impact as such, its significance is not assessed further in this ESIA. Risks associated with worker welfare during construction will be managed through effective project planning, and the enforcement of fair and just treatment throughout the construction phase.

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. In spite of this, there will be specific risks related to electrical safety, hot areas (around panels) that will need to be managed; amongst others.

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.

Workers Conditions

No long-term accommodation requirements are anticipated for the project as staff during the operations phase are expected to find or be based in their own accommodation in Ibri Town. However, as with construction, operational activities will need to plan for and enforce enforce lender requirements and relevant sections of Omani Labor Law (MD 35/2003) just and fair treatment just and fair treatment of operation and maintenance staff (including any engaged sub-contractors). Allowance will also need to be made for site staff welfare facilities including sanitation, rest, recreational and medical facilities.

14.4 Mitigation and Management Measures

Table 14-1 Workers Condition & Occupational Health & Safety Mitigation & Management Measures - Construction

POTENTIAL IMPACT	MITIGATION AND MANAGEMENT MEASURES
Occupational Health and Safety	<ul style="list-style-type: none"> Workers will be provided with a safe and healthy work environment, taking into account inherent risks and specific classes of hazards associated with the project. Chemicals and Hazardous materials should only be handled by trained personnel and personal protection equipment (gloves, face mask, nose mask, etc.) will be provided. Workers will be informed of the chemicals that are hazardous to health or flammable and must be trained on handling such chemicals. The EPC Contractor will implement and maintain an OHS management system taking into account specific risks associated with the project, legal requirements and duty of care. The EPC Contractor will be responsible for ensuring that all affiliated sub-contractors comply with the Occupational Health and Safety (OHS) management system. The OHS management system will be in-line with

POTENTIAL IMPACT	MITIGATION AND MANAGEMENT MEASURES
	<p>recognised international best practice and as a minimum, this plan will include:</p> <ul style="list-style-type: none"> - Means of identifying and minimising, so far as reasonably practicable, the causes of potential H&S hazards to workers. - Provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances. - Provision of appropriate equipment to minimise risks, and requiring and enforcing its use. - Training of workers, and provision of appropriate incentives for them to use and comply with H&S procedures and protective equipment. - Documentation and reporting of occupational accidents, diseases and incidents. - Emergency prevention, preparedness and response arrangements - Communication of Health & Safety aspects to expatriate workers on the project site through signages in the language of the workforce (Chinese, Urdu) and Arabic for comprehensive understanding. -
<p>Workers Conditions- Terms of Employment, Non-discrimination and equal opportunities, Working Relationships</p>	<ul style="list-style-type: none"> • The EPC contractor will provide a plan detailing how working conditions and terms of employment are compliant with national labour, social security and occupational health and safety laws. • Employment relationship will be on the principle of equal opportunity and fair treatment, and will not discriminate with respect to any aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline. • The EPC contractor will not make employment decisions on the basis of personal characteristics, such as gender, race, nationality, ethnic origin, religion or belief, disability, age or sexual orientation, unrelated to inherent job requirements. • The Project Company and EPC Contractor will endeavour to promote the employment of women at the Project to allow (where possible) an equitable gender balance. It will be necessary for the Project teams to ensure that measures to promote the employment of women are included to the respective HR Policies and related processes. Provisions to ensure safety and comfort of women staff shall be considered and should include facilities including dedicated toilets and rest rooms. Other provisions may need to be considered such as separate transport to and from the site, canteen areas and office working space areas. • Specific assessments considering the context of the working environment shall be taken to ensure that potential harassment (or other abuse/conflict) to women is prevented and that women are encouraged to raise any such issues faced in the workplace via the defined grievance mechanism (refer to Section 7 of the Stakeholder Engagement Plan). • The EPC contractor will document and communicate to all workers their working conditions and terms of employment including their entitlement to wages, hours of work, overtime arrangements and overtime compensation, and any benefits (such as leave for illness, maternity/paternity, or holiday). • The EPC Contractor will base the employment relationship on the principle of equal opportunity and fair treatment, and will not discriminate with respect to all aspects of the employment relationship, including recruitment and hiring, compensation

POTENTIAL IMPACT	MITIGATION AND MANAGEMENT MEASURES
	<p>(including wages and benefits), working conditions and terms of employment, accommodation, access to training, promotion, termination of employment or retirement, and discipline.</p> <p><i>Special measures of protection or assistance to promote local employment opportunities or selection for a particular job based on the inherent requirements of the job which are in accordance with national law, will not be deemed discrimination.</i></p>
Workers Conditions- Forced Labour	<ul style="list-style-type: none"> The EPC contractor will not employ forced labour, which consists of any work or service not voluntarily performed that is exacted from an individual under threat of force or penalty. This covers any kind of involuntary or compulsory labour, such as indentured labour, bonded labour or similar labour-contracting arrangements. HR policies and procedures will be adapted appropriately to the size of the workforce required for the Project. Policies and procedures must be prepared to demonstrate consistency with the requirements of national legislation and IFC PS 2.
Workers Conditions- Child Labour	<ul style="list-style-type: none"> The EPC contractor will comply with all relevant national laws provisions related to the employment of minors. In any event, the client will not employ children in a manner that is economically exploitative, or is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development in line with IFC PS2 and ESS 1 Item 39. Young people below the age of 18 years will not be employed in hazardous work and all work of persons under the age of 18 will be subject to an appropriate risk assessment
Workers Conditions- Wages, benefits, conditions of work and retrenchment	<ul style="list-style-type: none"> Wages, benefits and conditions of work offered should, overall, be comparable to those offered by equivalent employers in the relevant region of that country/region and sector concerned. The HR Management System for the company employees, contractors and sub-contractors will be aligned with ESS1 Item 38 and IFC PS2. If the EPC contractor anticipates collective dismissals associated with the proposed project, the EPC contractor will develop a plan to mitigate the adverse impacts of retrenchment, in line with national law and good industry practice and based on the principles of nondiscrimination and consultation. Without prejudice to more stringent provisions in national law, such consultation will involve reasonable notice of employment changes to the workers' representatives and, where appropriate, relevant public authorities so that the retrenchment plan may be examined jointly in order to mitigate adverse effects of job losses on the workers concerned. The outcome of the consultations will be reflected in the final retrenchment plan.
Workers Conditions- Grievance Mechanism	<ul style="list-style-type: none"> The EPC contractor will provide a grievance mechanism for workers to raise reasonable workplace concerns. The client will inform the workers of the grievance mechanism at the time of hiring, and make it easily accessible to them. The mechanism should involve an appropriate level of management and address concerns promptly, using an understandable and transparent process that provides feedback to those concerned, without any retribution. The mechanism should not impede access to other judicial or administrative remedies that might be available under law or through existing arbitration procedures, or substitute for grievance mechanisms provided through collective agreements.

POTENTIAL IMPACT	MITIGATION AND MANAGEMENT MEASURES
Workers Conditions- Supply Chain	<ul style="list-style-type: none"> The Contractor will devise a supply management system to ensure the measures above are implemented by any sub-contractors.

Table 14-2 Workers Condition & Occupational Health & Safety Mitigation & Management Measures - Operation

POTENTIAL IMPACT	MITIGATION AND MANAGEMENT MEASURES
Occupational Health and Safety	<ul style="list-style-type: none"> Workers will be provided with a safe and healthy work environment, taking into account inherent risks and specific classes of hazards associated with the project. Chemicals and Hazardous materials should only be handled by trained personnel and personal protection equipment (gloves, face mask, nose mask, etc.) will be provided. The Project's Operator will implement and maintain an OHS management system specific to the operational phase taking into account specific risks associated with the project, legal requirements and duty of care. The Project's Operator will be responsible for ensuring that all affiliated sub-contractors comply with the OHS management system. The OHS management system will be in-line with recognised international best practice and as a minimum, this plan will include: <ul style="list-style-type: none"> Means of identifying and minimising, so far as reasonably practicable, the causes of potential H&S hazards to workers. Provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances. Provision of appropriate equipment to minimise risks, and requiring and enforcing its use. Training of workers, and provision of appropriate incentives for them to use and comply with H&S procedures and protective equipment. Documentation and reporting of occupational accidents, diseases and incidents. Emergency prevention, preparedness and response measures
Workers Conditions- Terms of Employment, Non-discrimination and equal opportunities, Working Relationships	<ul style="list-style-type: none"> The O & M Company will provide a plan detailing how working conditions and terms of employment are compliant with national labour, social security and occupational health and safety laws. Employment relationship will be on the principle of equal opportunity and fair treatment, and will not discriminate with respect to any aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline. The O & M Company will not make employment decisions on the basis of personal characteristics, such as gender, race, nationality, ethnic origin, religion or belief, disability, age or sexual orientation, unrelated to inherent job requirements. The Project Company and O&M Company will endeavour to promote the employment of women at the Project to allow (where possible) an equitable gender balance. It will be necessary for the Project teams to ensure that measures to promote the employment of women are included to the respective HR Policies and related

POTENTIAL IMPACT	MITIGATION AND MANAGEMENT MEASURES
	<p>processes. Provisions to ensure safety and comfort of women staff shall be considered and should include facilities including dedicated toilets and rest rooms. Other provisions may need to be considered such as separate transport to and from the site, canteen areas and office working space areas.</p> <ul style="list-style-type: none"> • Specific assessments considering the context of the working environment shall be taken to ensure that potential harassment (or other abuse/conflict) to women is prevented and that women are encouraged to raise any such issues faced in the workplace via the defined grievance mechanism (refer to Section 7 of the Stakeholder Engagement Plan). • The O & M Company will document and communicate to all workers their working conditions and terms of employment including their entitlement to wages, hours of work, overtime arrangements and overtime compensation, and any benefits (such as leave for illness, maternity/paternity, or holiday). • The O & M Company will base the employment relationship on the principle of equal opportunity and fair treatment, and will not discriminate with respect to all aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, accommodation, access to training, promotion, termination of employment or retirement, and discipline. <p><i>Special measures of protection or assistance to promote local employment opportunities or selection for a particular job based on the inherent requirements of the job, which are in accordance with national law, will not be deemed discrimination.</i></p>
Workers Conditions- Forced Labour	<ul style="list-style-type: none"> • The O & M Company will not employ forced labour, which consists of any work or service not voluntarily performed that is exacted from an individual under threat of force or penalty. This covers any kind of involuntary or compulsory labour, such as indentured labour, bonded labour or similar labour-contracting arrangements. • HR policies and procedures will be adapted appropriately to the size of the workforce required for the Project. Policies and procedures must be prepared to demonstrate consistency with the requirements of national legislation and IFC PS 2.
Workers Conditions- Child Labour	<ul style="list-style-type: none"> • The O & M Company will comply with all relevant national laws provisions related to the employment of minors. • In any event, the client will not employ children in a manner that is economically exploitative, or is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development. • Young people below the age of 18 years will not be employed in hazardous work and all work of persons under the age of 18 will be subject to an appropriate risk assessment
Workers Conditions- Wages, benefits, conditions of work and retrenchment	<ul style="list-style-type: none"> • Wages, benefits and conditions of work offered should, overall, be comparable to those offered by equivalent employers in the relevant region of that country/region and sector concerned. • If the O & M Company anticipates collective dismissals associated with the proposed project, the O & M Company will develop a plan to mitigate the adverse impacts of retrenchment, in line with national law and good industry practice and based on the principles of nondiscrimination and consultation. Without prejudice to more stringent provisions in national law, such consultation will involve reasonable notice of employment changes to the workers'

POTENTIAL IMPACT	MITIGATION AND MANAGEMENT MEASURES
	<p>representatives and, where appropriate, relevant public authorities so that the retrenchment plan may be examined jointly in order to mitigate adverse effects of job losses on the workers concerned. The outcome of the consultations will be reflected in the final retrenchment plan.</p>
Workers Conditions- Grievance Mechanism	<ul style="list-style-type: none"> The O & M Company will provide a grievance mechanism for workers to raise reasonable workplace concerns. The client will inform the workers of the grievance mechanism at the time of hiring, and make it easily accessible to them. The mechanism should involve an appropriate level of management and address concerns promptly, using an understandable and transparent process that provides feedback to those concerned, without any retribution. The mechanism should not impede access to other judicial or administrative remedies that might be available under law or through existing arbitration procedures, or substitute for grievance mechanisms provided through collective agreements.
Workers Conditions- Supply Chain	<ul style="list-style-type: none"> The O & M Company will devise a supply management system to ensure the measures above are implemented by any sub-contractors. It is important that workers have adequate access to healthcare facilities provided by the EPC on site and the local hospital in Ibri in the circumstance of a serious injury. Accommodation to workers should follow international/regional good practices for worker welfare. Access to drinking water and toilets should be rendered on site.

15 RESETTLEMENT REQUIREMENTS

There are no statutory requirements in the Omani legal system for land acquisition and resettlement. However, IFC Performance Standard 5 and AIB ESS2 provides guidance on 'Government led Resettlement', which is applicable for resettling the camel herders, their camels and pens in the Project area. The camel racetrack, which partly overlaps with the Project site is also being relocated.

The process for undertaking this has been agreed between ACWA Power, the local Wali and Sheikh's who own the camels and oversee the racecourse. It has been agreed to undertake all relocation in parallel with construction, to agreed areas by the Wali and Sheikh's off-site. The Wali of Ibri has issued a formal letter stating the reconfiguration of the project layout keeping in context the expectations from the local community, which includes non-objection from the Sheikh's.

The requirements of the Resettlement have been mapped in a separate Resettlement Action Plan (RAP).

16 CLIMATE AFFAIRS

16.1 Overview

The impacts on climate due to the proposed project activities and associated facilities are discussed in this chapter. A forecast of the greenhouse gases (GHG) estimated using the Intergovernmental Panel on Climate Change (IPCC) emission factors, data from the design documents (where available) is also given in this chapter. The structure of this chapter is in line with recent guidelines provided by the Directorate General of Climate Affairs (DGCA) at MECA and its updates in CY 2013.

16.2 Contact Details

The contact details of the organization and the focal point at the organization for issues related to climate affairs are provided below:

ORGANIZATION	Shams Al Dhahira Project Company
ADDRESS	Dhofar Desalination Company, Muscat Grand Mall, Sultanate of Oman
NAME OF THE CONTACT PERSON	Mr. Yousef Al Zuhair
TELEPHONE NUMBER	+971 56 604 7820
EMAIL	YAlZuhair@acwapower.com
NAME OF CLIMATE AFFAIRS CONSULTANT	Yahya Engineering (MECA Consultant) P.O.Box 1537 Sultanate of Oman Postal Code 131, Al Hamriya
TELEPHONE NUMBER	+968 (0) 9 179 9170
FAX NUMBER	n/a
EMAIL	Hardik Ramaiya, Principal Consultant hardik@yahyaengineering.net

16.3 Ozone Depleting Substances (ODS)

16.3.1 Types of ODS

SF₆

It is expected that sulphur hexafluoride (SF₆) is to be used in high voltage electrical equipment as insulating gas, as part of the Gas Insulate Switchgear (GIS), an associated facility of the main PV project.

Refrigerants

HCFC is expected to be phased out in line with Montreal protocol and the project will comply with this requirement. Halons, CFCs and HCFCs will not be used in this project as per the environmental basis of design. Trace amounts of refrigerants will be used in chiller packages for potable water, and the Project Company will import chillers that use HFCs rather than HCFCs.

The EPC contractor will take into consideration the requirements of Montreal Protocol and ensure compliance to Montreal Protocol as well as requirements of MD 243/2005 & MD 281/2003. Procurement of air conditioning units both for the construction phase (including the camps) and the operation phase should also take the above into account.

16.3.2 Equipment Containing ODS

With the exception of the use of SF₆ in high voltage electrical equipment as insulating material, no ODS will be used in the project. The project will also not use PCBs including PCT and asbestos; carbon tetrachloride (CCl₄) in refrigerants; and any new equipment purchased shall not contain any asbestos under any circumstances.

Standard air-conditioners that are commercially available in the local market through authorized distributors will be procured. The exact number and make of these air-conditioners will be finalized during subsequent design stage of the project. The air-conditioners will be sourced, serviced and maintained by authorized suppliers and service centres in Oman, which are expected to comply with the requirements of MD 243/2005. Controlled substances listed in MD 243/2005, and equipment, appliances and products containing such substances will not be used during any stage of the project. Further, standard fire extinguishers will be sourced from approved local suppliers and such fire extinguishers are not expected to contain any ODS.

16.3.3 ODS Alternatives

The project does not envisage use of any ODS except as committed in the environmental basis of design.

16.3.4 Plans for Use of ODS Alternatives

As noted above, the project will identify suitable alternatives to SF₆ in the near future and phase that out. Plans for ODS alternatives are not applicable now as the project will not use any other ODS.

16.3.5 Adherence with MD 243/2005

Controlled substances listed in MD 243/2005 or equipment, appliances and products containing such substances will not be used during any stage of project activities. Where use of any controlled substances such as SF6 is noted, the project company will obtain a license from the Climate Affairs control department at MECA as per the procedures laid down in MD 243/2005 for its use. Further regular maintenance shall be carried out in order to control the release of controlled substances, and proper recovery system shall also be designed. Periodic record keeping of the name, type and quantity of controlled substance shall also be undertaken at the site. Project company also needs to obtain prior approval from the Ministry for destruction or disposal of controlled substance.

16.4 Greenhouse Gases (GHGs) Emissions from Energy Sources

16.4.1 Stationary Combustion Sources

Construction

The stationary combustion sources used during the construction phase of the Project will primarily relate to Diesel Generators, which will be located around the site in laydown areas, as well as at the EPC Contractors construction camp.

Operation

As a solar PV project, there will be no GHG emissions from typical day to day operational activities. It is noted that an emergency diesel generator will be located on-site, but is not expected to be used unless there are grid blackout conditions, which would enable the safe operation of the plant in such circumstances. Such situations of use are considered highly unlikely.

16.4.2 Mobile Combustion Sources

Construction

The construction phase of the Project will necessitate an amount of mobile equipment/plant and vehicles to facilitate works. Such equipment (such as excavators, rollers, cranes, pneumatic compressors, and other vehicles will be ample on the site, and are expected to be used in most construction processes. Such equipment will be fuelled by either diesel or unleaded petrol.

Operation

Mobile source GHG emissions during operations will only relate to the few vehicles being use on site for maintenance purposes and for the commuting of the small number of staff that will be required to operate the Project. The Project does not require key supply chains (i.e. regular

deliveries or removals) and is not expected to require significant maintenance. Therefore, emissions from associated vehicular movements or other transportation are expected to be minimal.

The weights of GHG emissions offset over the operational period has been calculated using the UNFCCC IFI Dataset of Default Grid Factors (2019) and is based on data provided by the EPC Contractor for predicted generation capacity against an Oman grid energy mix emissions factor:

YEAR	EPC CONTRACTOR (FM FIGURES) ANNUAL OUTPUT (kWh)	RELATIVE (NET) EMISSIONS (tCO ₂ e/YEAR)
1	1.624.374.000	803.221
2	1.621.157.000	801.630
3	1.617.800.000	799.970
4	1.614.315.000	798.247
5	1.610.695.000	796.457
6	1.606.929.000	794.595
7	1.603.055.000	792.679
8	1.599.053.000	790.700
9	1.594.939.000	788.666
10	1.590.720.000	786.580
11	1.586.382.000	784.434
12	1.581.942.000	782.239
13	1.577.395.000	779.991
14	1.572.746.000	777.692
15	1.568.001.000	775.345
TOTAL		11.852.444

Note: Methodology and Data, based on the following:

- *IFI Approach to GHG Accounting for Renewable Energy Projects (2015);*
- *IFI_Dataset_of_Default_Grid_Factors_11.05.19.*

16.5 Assessment of Climate Change Impacts and Vulnerabilities

16.5.1 Project Impacts upon Climate Change

Significant amounts of scientific research have identified a link between the concentration of greenhouse gases in the atmosphere and trends in global warming. A factor in the increases of GHGs would result from the combustion of fossil fuels and associated release of GHGs into

the atmosphere. Potential impacts of global warming have been modelled by various agencies and organisations and are now well documented. Besides a global average rise in temperature, such may potentially result in rising sea levels, more frequent extreme weather events, as well as associated impacts to biodiversity, amongst others.

Such impacts of current climate change are starting to be realised worldwide, and potentially may include impacts to Oman. Possible observations of the current global warming trends in Oman may be linked to the increasing frequency of rain events in certain areas. Additionally, the cyclones that originated in the Arabian Sea were earlier estimated to hit Oman's mainland at once in ten years. However, the cyclone hit has been experience at once three years since the 2007, when Cyclone Gonu hit the Oman mainland. In 2010, Cyclone Phet hit Oman.

As a renewable energy project, there is essentially a neutral operational impact on the current GHGs being emitted from power generation facilities in Oman. This will be due to a lack of further emissions. Although impacts on emissions are neutral, the installation of such a significant renewable power generating facility are positive in the long-term as it alleviates the need to construct and operate conventional fossil fuel fired power plants for commensurate power output. Thus, in essence reducing emissions and being a figure project for the long-term transition to a more renewable based energy mix in the Sultanate.

The only negative impact upon climate change as a result of the Project will be the construction phase combustion of diesel fuel and petrol linked to use of equipment and mobile sources (stated above). A minimal impact may also be realised due to the removal of vegetation as a minor carbon sink.

16.5.2 Vulnerability of Project from Climate Change

The Project will require few staff to work outdoors during long-term operations. Primary project staff will be security, control room operators, administration teams and some maintenance engineers, most of which will be based indoors. The number of these staff working outdoors will be limited and as such impacts to the workforce from possible rising temperatures due to climate change are expected to be limited.

The Project is located inland in an area of the country that experiences relatively stable weather patterns, with limited rainfall. By virtue of geography, the Project will be protected from the potential impact of seas level rise, however, it may result in increased storm water flows in the local wadis at times of future rainfall; on the basis of increase evaporation and rainfall rates due to future higher temperatures. In the event of warmer temperatures and any dry periods (i.e. during the summer), there may be a resulting increase in the severity or frequency of dusty days and dust storms.

As part of this ESIA, the Project layout has been re-established to ensure that no part of the footprint is included in the identified wadi channels, which are now external to the north and south-west of the site.

17 CUMULATIVE IMPACTS

Cumulative impacts are those that 'result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones'. CIA is therefore the process of:

- Analysing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and environmental and social external drivers on the chosen Valued Environmental and Social Components (VECs) over time; and
- Proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible.

The purpose of a cumulative impact assessment is to determine how the potential impacts of a proposed development might combine cumulatively, with the potential impacts of other projects or human activities as well as natural stressors such as droughts or extreme climatic events.

The objectives and expected outcomes of a Cumulative Impact Assessment process are as follows:

- Identification of Valued Environmental and Social Components (VECs) such as air, water, soil etc. that may be affected by the Project and the selected VECs the assessment will focus on;
- Identification of existing and reasonably anticipated and/or planned developments, as well as natural environmental and external social drivers, that could affect the selected VECs;
- Assessment and/or estimation of the future condition of selected VECs, as the result of the cumulative impacts that the development is expected to have, when combined with those of other reasonably predictable developments;
- Evaluation of the future condition of the VECs relative to established or estimated thresholds of VEC condition or to comparable benchmarks;
- Avoidance and minimization of cumulative impacts of the Project on the VECs and
- Monitoring and management measures to ensure the VEC viability over the life span of the development or its impacts.

17.1 Identification of Valued Environmental and Social Components (VECs)

This ESIA has assessed cumulative impacts of several environmental and social parameters in the main sections of this ESIA. For instance, construction air quality (particulates), construction noise impacts, etc. have considered the measured baseline conditions in combination with

the predicted process contributions. As a result, this has provided an assessment of cumulative impacts, as a result of the project itself.

17.2 Identification of other Activities and Environmental Drivers

Besides the Ibri IPP currently undergoing commissioning approximately 1km from the south eastern boundary of the Project site, it is unknown whether or not there are other future development plans within the Project area. As such, the CIA cannot establish whether there are barriers to unknown future development within the projects area of influence.

17.3 Assessment of Cumulative Impacts on VECs

Given that there is no known future development plan within the Project's area of influence, it is not possible in this ESIA to speculate on the potential cumulative impacts relating to future projects, as there is no available information regarding any future development plans in the local project area.

The assessment of cumulative impacts with reference to this Project will therefore go as far as those cumulative impacts upon specific receptors as a result of the proposed project and existing impacts from other local facilities. As described above, these cumulative impacts have already been assessed in the respective sections of this ESIA.

18 REFERENCES

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