Aqaba-Amman Water Desalination and Conveyance (AAWDC) Project
2025 Environmental and Social Impact Assessment
Non-Technical Summary

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1 Introduction

1.1 Project Overview

Jordan has one of the lowest levels of water availability per capita in the world with climate change impacts and population increase predicted to cause further decline in water availability. The Ministry of Water and Irrigation (MWI) launched the Aqaba-Amman Water Desalination and Conveyance (AAWDC) Project (the Project) as a major initiative to contribute to bridging the growing water-demand supply gap. The Project aligns with the objectives and targets of the Jordanian National Water Strategy 2016-2025 (MWI, 2016) and National Water Strategy 2023-2040 (MWI, 2023).

The AAWDC Project is designed to generate 300 million cubic meters (MCM) of desalinated water per year, supplying Amman (250 MCM per year) and Aqaba (50 MCM per year) from a new desalination plant located near Aqaba. The locations of the permanent Project facilities are shown Figure 1. An overview of the Project scope is shown in Figure 12 under Section 5.

Based on the current schedule, it is anticipated that the Project construction activities will commence in 2Q 2026. Commencement of operations is planned for 2030.

The Project comprises the following main components:

1. **Desalination Plant and Intake/Outfall Facilities:** new desalination facilities located within the Aqaba Special Economic Zone including:
    - Marine intake infrastructure, onshore intake pumping station (IPS) and transfer facilities to extract seawater from the Gulf of Aqaba and deliver the extracted seawater to a new desalination plant
    - New seawater reverse osmosis (SWRO) desalination plant located within the Aqaba Industrial Zone
    - Marine outfall infrastructure to discharge aqueous desalination process by-products (e.g. brine), to the Gulf of Aqaba
2. **Conveyance System:** a buried pipeline approximately 438km long to convey desalinated water from the desalination plant to the existing reservoirs of Abu Alanda and Al Muntazah near Amman. To support pumping of water and control the pressure within the pipeline, the conveyance system design includes:
    - Four pumping stations (booster stations BPS1, BPS2 and BPS3 and pumping station PS ADC)
    - Two regulating tank facilities (RGT1 and RGT3) and one break pressure tank (BPT)
3. **Renewable Energy Facility:** a new solar photovoltaic (PV) power plant and supporting electrical substation located approximately 5km to the east of Qweirah (shown as “RE2” within Figure 1). The AAWDC Project will use electricity from this solar power plant, as well as from the national electricity transmission and generation companies (National Electrical Power Company (NEPCO), Jordanian Electrical Power Company (JEPCO) and Electricity Distribution Company (EDCO)) through long-term power purchase agreements

Associated Facilities include:

- **New Electrical Transmission Lines and Substation:** To be built and operated by NEPCO and EDCO. New electrical transmission lines will include new overhead transmission lines (OHTL) to connect

the Renewable Energy Facility to the SWRO desalination plant and install grid connections including connections to a new substation to be located at Aqaba. New substations will also be constructed at the IPS and BPS2, BPS3 and PS ADC

- **Existing Abu Alanda and Al Muntazah Storage Reservoir Upgrades:** Upgrades of the water distribution systems in Aqaba and Amman are currently ongoing through different parallel projects, aiming among others at reducing water leaks. At the time of writing the design of required upgrades to the existing water storage reservoirs, if any, was not finalised. However, it is most probable that, at least, the Al Muntazah storage reservoir will require expansion

1.2 Jordans Water Context and the Need for the Project

Jordan is one of the most water-poor countries in the world, with only 61 cubic meters of renewable freshwater available per capita per year as of 2021, significantly below the internationally recognised absolute water scarcity line of 500 cubic metres per capita annually. The country's water demand is driven by rapid population growth, economic development, and the need to provide safe drinking water.

The population of Jordan is expected to grow from 11 million in 2021 to 16.8 million by 2040 (MWI, 2023), further exacerbating the water demand. The National Water Strategy 2023 – 2040 projects that the total water demand will increase from 1,486 million cubic metres (MCM) in 2021 to 2,013 MCM by 2040. Roughly half of the demand is for irrigation; the rest is mostly for drinking water, with a few percent for industrial uses.

Water supplies in Jordan derive from three main sources: 27 – 30% from surface water, 56-59% from groundwater and 14-15% from treated wastewater. In 2021, seawater desalination accounted for 0.06% of Jordan's water supply and was being produced and consumed primarily by industrial users in Aqaba.

There is a significant and growing gap between existing water resources and demand within Jordan. The reliance on groundwater resources has led to overextraction from key aquifers such as Disi and Azraq. This has led to declining water tables and deteriorating water quality and has been further compounded by climate-related factors which further reduce natural aquifer recharge rates.

Rapid urbanisation and economic growth have intensified domestic and industrial water demand, particularly in major cities and industrial zones. In addition, demand has increased for agriculture and crops, where there has been a sustained year-on-year increase in irrigated land under cultivation since the 1980s, increasing the stress on existing resources (MWI, 2023).

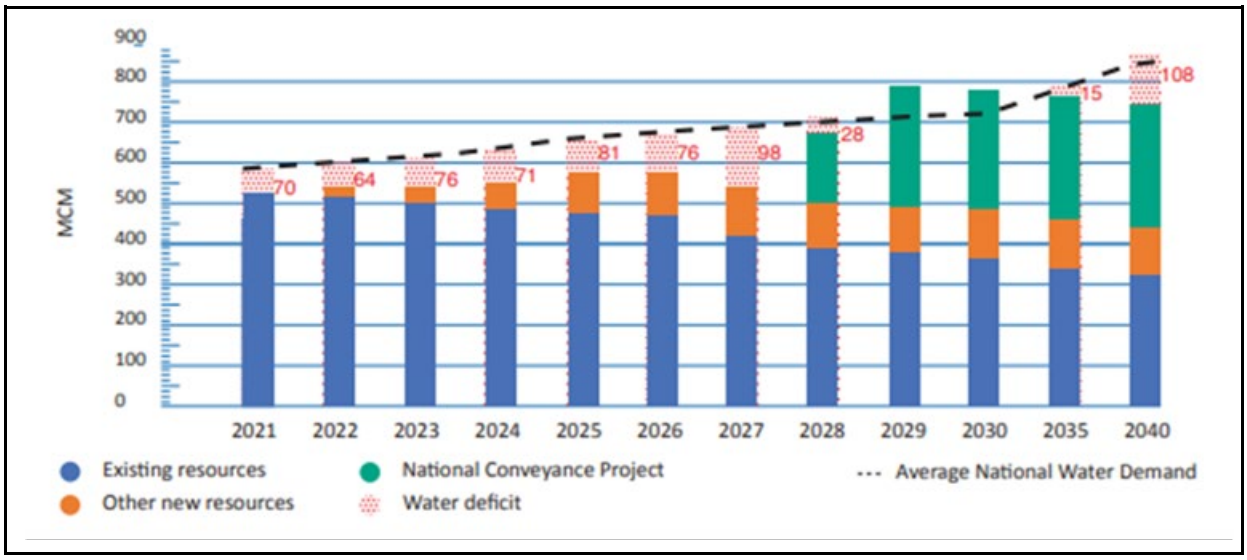
Transboundary initiatives such as the Red Sea–Dead Sea Conveyance (RSDSC) project have ultimately not succeeded to date. The concept of a desalination and conveyance scheme remains Jordan's only approach to addressing the growing demand for potable water.

The AAWDC Project (also known as the National Conveyance Project) will reduce reliance on other available water sources, modernise Jordans water network and provide long term water supply security. Figure 2 shows the forecast demand and supply estimates for municipal water as presented in the Jordan National Water Strategy 2023-2040, including the forecast supply from the National Conveyance Project[1].

[1] It should be noted that the National Water Strategy was prepared in 2023 and at the time the anticipated start of National Conveyance Project operations was 2028; this is now projected to be 2030.

Figure 1: Location of the AAWDC Project Facilities

Figure 2: Demand and Supply Projection for the Municipal Sector (Drinking Water) (National Water Strategy 2023-2040) (MWI, 2023)



1.3 Project Developer and Lenders

The Project will be implemented as a Public Private Partnership (PPP) with a Build Own Operate Transfer (BOT) Contractor responsible for the financing, construction and operation of the Project.

The consortium of Meridiam and Suez with their Contractors (Engineering, Procurement, and Construction (EPC) Contractors and Operation and Maintenance (O&M) Contractors) were appointed by the MWI in September 2024. The consortium established a Special Purpose Vehicle (SPV) for the local Project Company, named the National Carrier Project Company (NCPC). The Project Agreement (PA) was signed between the Government of Jordan, represented by the MWI, and the NCPC in January 2025.

The Project will be financed through a mix of debt, equity, and GoJ subsidies. Equity financing will be provided by Meridiam (90%) and Suez (10%). Debt financing will be provided by development finance institutions (DFIs) and joined by local, regional and international commercial lenders and export credit agencies. The Key Prospective DFIs (the "Lenders") comprise the International Finance Corporation (IFC, part of World Bank group), the European Bank for Reconstruction and Development (EBRD), the US Development Finance Corporation (DFC), the European Investment Bank (EIB) and PROPARCO (a subsidiary of the French Development Agency (AFD)).

1.4 Objectives of the Environmental and Social Impact Assessment

The objectives of the ESIA are to:

- Ensure that environmental and social considerations are integrated into the project design, construction and operation
- Enable environmental and social impacts to be identified, quantified and assessed and appropriate avoidance and mitigation measures proposed
- Ensure that applicable national and international legal requirements, national and lender standards and expectations are addressed and embedded in the project design and execution

- Ensure relevant stakeholders are consulted throughout the project and their concerns are addressed

An initial ESIA (Tetra Tech, 2022) was prepared in 2022 to assess the environmental and social impacts of the original concept design with funding and advisory support provided by the European Investment Bank (EIB). The 2022 ESIA report was prepared by Tetra Tech International Development and Engicon in accordance with national legislation and EIB requirements and subsequently approved by the Jordanian Ministry of Environment (MOEnv), and the Aqaba Special Economic Zone Authority (ASEZA). An update was subsequently produced in 2025 to reflect the change in location of the PS ADC pumping station, and separate interim updates prepared covering the change of SWRO desalination plant location and assessment of the Project Renewable Energy Facilities and associated overhead transmission line impacts. The updated 2022 ESIA report and its Annexes[2] were disclosed on EIB website (https://www.eib.org/en/Projects/pipelines/all/20190712).

In 2025 NCPC appointed environmental contractors (Energies Group and ECO Consult) to prepare the final update to the ESIA, in order to assess the updated Project design resulting from the optimisations and refinements introduced since 2022 by the new consortiumand to address and embed the environmental, social and governance requirements of newLenders (refer to Section 1.3 above).

The full 2025 AAWDC Project ESIA disclosure package, developed to meet lender requirements and standards, comprises the following:

- 2025 AAWDC Project ESIA Non-Technical Summary (NTS) (this document)
- 2025 AAWDC Project ESIA Report
- Project Stakeholder Engagement Plan (SEP)
- Resettlement Policy Framework (RFP)
- Environmental and Social Mitigation and Monitoring Plan (ESMMP) and supporting Frameworks.

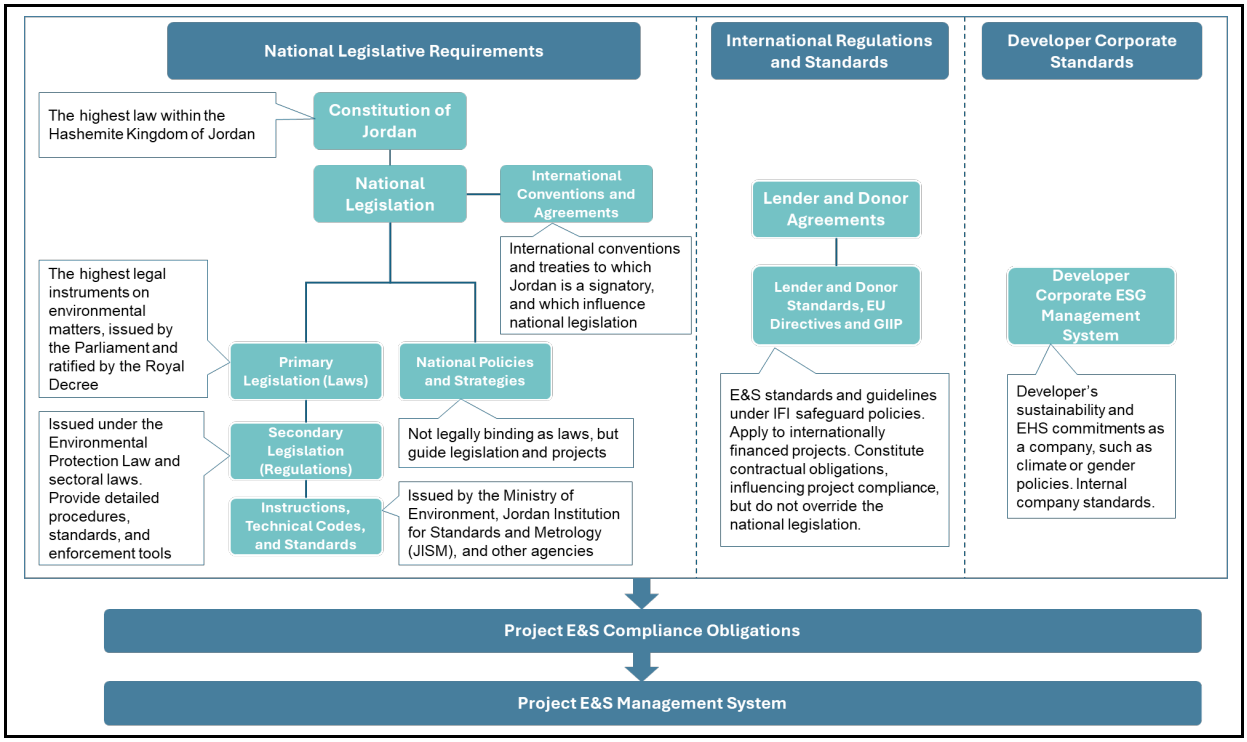
[2] Note: The 2022 ESIA Annexes include AAWDC Project Stakeholder Engagement Plan (SEP) (2022), AAWDC Project Land Acquisition and Resettlement Policy Framework (2022) and AAWDC Project Environmental and Social Management Plan (2022)

2 Policy, Legislation and Standards

The Project is committed to compliance with the applicable policies, legislation, and standards, including relevant international, European, and Jordanian requirements, as well as international agreements to which Jordan is a party.

The regulatory hierarchy applicable to the Project is outlined in Figure 3.

Figure 3: Policy, Legislation and Standards Applicable to the Project



The regulatory ESIA and environmental permitting process was followed for the previous Project approvals, including:

- 2022 AAWDC Project ESIA (updated in January 2025 to incorporate the change in the location of the PS ADC, policy updates and inclusion of marine baseline surveys results)
- 2025 Renewable Energy Component ESIA addendum covering the Renewable Energy Facility and Overhead Transmission Line (OHTL)

The signing of the Project Agreement for the AAWDC Project between MWI and NCPC in January 2025 was followed by meetings with each MoEnv and ASEZA to agree on the approach for the 2025 AWWDC Project ESIA. The following was agreed:

- A scoping phase and submission of a new Terms of Reference (TOR) will not be required given this is an update to previously approved ESIAs
- The 2025 AWWDC Project ESIA will be carried out in line with national legislation and Lender requirements and submitted to MoEnv and ASEZA for review and approval
- The ESIA Team will keep the regulatory entities updated on progress and approach and will inform them of the consultation plan and schedule

- On submission of the 2025 AWWDC Project ESIA in Arabic, MoEnv and ASEZA will review it and facilitate disclosure sessions in Amman and Aqaba
- The outcomes of the disclosure sessions will be incorporated into the final 2025 AWWDC Project ESIA

A detailed summary of the policies, legislation, and standards relevant to the Project is provided within Chapter 2 of the ESIA.

2.1 Relevant Institutions

Chapter 2 of the ESIA details the relevant institutions involved in the Project, highlighting their overall mandates and the specific roles they play in relation to the Project. These include, amongst others:

- Ministry of Water and Irrigation (MWI)
- Ministry of Environment (MoEnv)
- Aqaba Special Economic Zone Authority (ASEZA)
- Aqaba Marine Reserve (AMR), Wadi Rum Protected Area Authority (WRPA) and Marine Science Station (MSS)
- Ministry of Energy and Mineral Resources (MEMR)
- Ministry of Tourism and Antiquities (MoTA) and its Department of Antiquities (DoA)
- Ministry of Health (MoH) and Ministry of Public Works and Housing (MPWH)
- Ministry of Local Administration (MoLA) and Ministry of Labour (MoL)
- Jordan Maritime Authority (JMA), Royal Jordanian Naval Force and Vessel Traffic Service (VTS)

2.2 Constitution of Jordan and National Legislation

The Project is aligned with the Constitution of Jordan in terms of:

- Ensuring the right to water and public welfare
- Ensuring environmental protection through the preparation of the required environmental and social studies and assessments, and implementing the required measures to ensure compliance with national and international standards
- Encouraging economic growth and national development, especially as it is aligned with Jordan's modernisation vision, aligning with Jordan’s public-private partnership targets since the Project is developed as a Build-Operate-Transfer (BOT) transaction
- Protecting private property ownership and fair compensation by ensuring that land acquisition that may be needed is only for public benefit and will be fairly compensated, not only in line with national legislation, but also in accordance with international lender standards

The key national policies and strategies that support environmental sustainability, climate adaptation, resource efficiency (especially water and energy) and apply to the Project are:

- The Jordan Economic Modernisation Vision (2022)
- The National Water Strategy (2023-2040)

- Jordan's Climate Change Policy (2022 update)
- Jordan's Energy Strategy (2020-2030)

The key national legislation applicable to the Project is detailed in Chapter 2 of the ESIA and include primary laws and secondary regulations, instructions and standards on environmental protection and permitting, air, water and soil resources, biodiversity, waste and hazardous materials, occupational and public health and safety, employment and labour, cultural heritage, transport and maritime navigation and land acquisition.

2.3 International Conventions and Agreements

Jordan is a signatory to several key global environmental treaties, including those on climate change, biodiversity, desertification, wetlands, hazardous waste, chemicals, and ozone protection. Jordan is also a member of the International Labour Organisation (ILO) and has ratified seven of the eight Core Conventions in addition to 26 other conventions. Chapter 2 of the ESIA details the key international conventions and agreements to which Jordan is a signatory to that are relevant to the Project.

2.4 Lender and Donor Standards

The environmental and social standards of the key Lenders that are financing the Project and to which the Project will adhere include:

- EBRD Environmental and Social Policy and E&S Requirements (2024)
- IFC Performance Standards on Environmental and Social Sustainability (2012)
- EIB Group Environmental and Social Sustainability Framework (2022)
- DFC Environmental and Social Policy and Procedures (2024)
- Proparco Exclusion List (2022)
- Harmonised EDFI Exclusion List
- USAID Environmental Procedures (22 CFR 216)
- Green Climate Fund Environmental and Social Safeguards
- Equator Principles EP4 (2020)

The EBRD and EIB, within their policies, include a commitment to ensure that projects are structured in line with European Union (EU) environmental principles, practices, and substantive standards, where applicable, and no less stringent than the host country's environmental standards, noting that EBRD does not apply the EU Biodiversity Directives outside of the EU

Based on preliminary ESIA studies and supporting documents, EBRD and IFC carried out their own analysis of ethnic groups in the Project area against the four characteristics outlined in their respective Indigenous Peoples Policies to determine whether the Project triggered any standards related to Indigenous Peoples. The results of their analysis concluded that no ethnic groups possessed all four characteristics and that as a result the Project did not trigger the EBRD and IFC standards related to Indigenous Peoples.

The Green Climate Fund (GCF), however, employs a broader interpretation of the characteristics and has concluded that there are potentially affected people and communities in the proposed Project area that meet the characterising criteria in paragraph 14 of the GCF Indigenous People Policy, and that therefore

their Policy could be triggered if these people are impacted. If this is the case, the Project will address these impacts according to GCF requirements.

2.5 Good International Practice and Benchmark Standards

The following Good International Practice and Benchmark Standards are considered applicable to the Project:

- IFC / EBRD Guidance Note on Worker Accommodation: Processes and Standard (2009)
- IFC General Environment, Health and Safety Guidelines (2007) and sector specific guidelines:
  - EHS Guidelines for Electric Power Transmission and Distribution (2007)
  - EHS Guidelines for Water and Sanitation (2007)
  - EHS Guidelines for Ports, Harbours and Terminals (2017)
- IFC Handbook for Addressing Project-Induced In-Migration (2009)
- UNESCO Guidance and Toolkit for Impact Assessment in a World Heritage Context (2022)
- UNESCO / ICOMOS Intangible Cultural Heritage Guidelines
- MWI Guideline on EIA for Sea and Brackish Water Desalination Plants

2.6 Corporate Requirements

Corporate Policies of Meridiam applicable to the Project include Sustainable Development Charter and Sustainability Risk Policy (2025), Human Rights Policy (2024), Climate Policy (2024), Anti-Bribery and Corruption Policy (2024), Shareholder Engagement Policy (2024) and Responsible Lobbying Policy (2022).

3 Impact Identification and Assessment Methodology

Environmental and Social Impact Assessment (ESIA) is a systematic approach to identifying the potential impacts of a project, assessing significance of these impacts and agreeing the mitigation, management and monitoring measures to be implemented to address these impacts throughout the project lifecycle. A summary of the key stages of the ESIA process is provided in Figure 4 below.

Figure 4: The ESIA Process

3.1 Screening and Scoping

The key initial steps in the impact assessment process comprise screening and scoping. This stage enables the impact assessment to focus on the issues that are of greatest importance i.e. where there is potential for a significant impact to occur and transparently "scope out" those potential impacts where there is no potential for impacts to occur. For the AADWDC Project this stage was supported by formal scoping undertaken for the previous ESIA in 2022, engagement with the current Project team, engagement with

national scientists and scientific bodies involved in data collection, and consultations held under the 2025 ESIA stakeholder engagement programme (refer to Section 8 below).

3.2 Project Area of Influence

The definition of project AoI in the International Financial Corporation (IFC) Performance Standard (PS)1 (2012) states it *"...includes the primary project site(s) and related facilities that the client (including its contractors) develops or controls; associated facilities... and areas potentially impacted by cumulative impacts from other projects*...". This defines the geographical boundaries within which the Project's impacts are assessed.

The 2025 AADWC Project ESIA Study Area was initially defined based on the previous ESIAs Study Areas, with amendments to capture the change in Project scope and Lender requirements. The final ESIA Study Area was then refined following the completion of the impact assessment.

3.3 Baseline Conditions and Assessing Impact Significance

Following screening and scoping, those impacts "scoped in" to the full impact assessment are assessed using a systematic methodology which requires an understanding of the baseline conditions of the receptors potentially affected and the characteristics of the impact.

Baseline conditions were established through various methods involving both primary and secondary data collection including terrestrial and marine field surveys which were defined and executed in collaboration with relevant national experts including representatives from the Jordanian Marine Science Station and Jordan University of Science and Technology. In addition, social data and stakeholder concerns were collected through the stakeholder engagement and baseline collection program carried out in September and October 2025.

The systematic assessment of impacts was undertaken applying an impact assessment methodology which takes into consideration an impact's nature (adverse or beneficial, direct, secondary or cumulative), magnitude of the effect and the sensitivity of affected receptors, to predict the impact's overall 'significance'. This initial assessment considers any existing controls already embedded within the Project design. After the potential impacts are identified, evaluated and a preliminary assessment of significance conducted, the additional measures to further mitigate the impacts were identified, where required. The significance of the impact is then re-evaluated considering these mitigation measures and the resulting 'residual' impact evaluated. This represents the impact that will remain following the application of mitigation and management measures, and thus the ultimate level of impact associated with the Project.

3.3.1 Magnitude of Effect

Magnitude of effect is determined based on the following parameters:

- Duration of the impact - ranging from long term (e.g. years) to short term (e.g. hours)
- Spatial extent of the impact – for instance, within the site, boundary to regional, national, and international
- Reversibility - ranging from permanent requiring significant intervention to return to baseline to no discernible change

Impact magnitude is categorised as major, moderate, minor or negligible (adverse or beneficial) using these criteria, with justification provided for the ranking assigned.

3.3.2 Receptor Sensitivity

The sensitivity of a receptor is determined based on review of the available data and consideration of the following parameters, including:

- Vulnerability – extent to which a receptor is vulnerable to change and seasonal variability
- Value – extent to which a receptor is valued or protected with higher value receptors having a higher sensitivity
- Resilience - the extent to which a receptor can recover from an impact

Receptor sensitivity is categorised as high, medium, low or negligible using these criteria, with justification provided for the ranking assigned.

3.3.3 Assessment of Impact Significance

Impact significance, as a function of magnitude of effect and receptor sensitivity, is subsequently ranked as “Negligible”, “Minor”, “Moderate” or “Major” as shown in Table 1 below, where Major impacts are further classified as “Significant” and all other impacts classified as “Not Significant”. As discussed above ranking of impact significance is undertaken prior to mitigation and residual impacts ranked post mitigation.

In assessing significance, controls to ensure compliance with applicable legislation and standards are assumed to be adopted.

Table 1: Significance Ranking Matrix

		Sensitivity			
		Negligible	Low	Medium	High
Magnitude	Negligible	Negligible	Negligible	Negligible	Negligible
	Minor	Negligible	Minor	Minor	Medium
	Moderate	Negligible	Minor	Medium	Major
	Major	Minor	Medium	Major	Major

In the event an impact is ranked as “Significant” it is necessary to identify appropriate measures to avoid, minimise and mitigate the impact, consistent with the mitigation hierarchy. The mitigation hierarchy includes measures taken to avoid creating environmental or social impacts from the outset of development activities, and where this is not possible, to implement additional measures that would minimise, mitigate, and, as a last resort, offset and/or compensate any potential residual adverse impacts.

4 Project Alternatives

The development of the AAWDC Project concept design as described within Chapter 5 of the ESIA has focused on the identification and evaluation of alternatives associated with the following project components:

- Marine Intake and Outfall Infrastructure
- Desalination Plant
- Conveyance System
- Power Supply and Renewable Facility

Options considered have included location and routing options and design and technology alternatives. Evaluation of these options have taken into account the overarching Project objectives as discussed within Section 1.2.

The comparative assessment was carried out using technical and economic feasibility and environmental and social evaluation criteria.

4.1 Location of Marine Infrastructure and Desalination Plant

4.1.1 Location of Seawater Intake and Brine Outfall

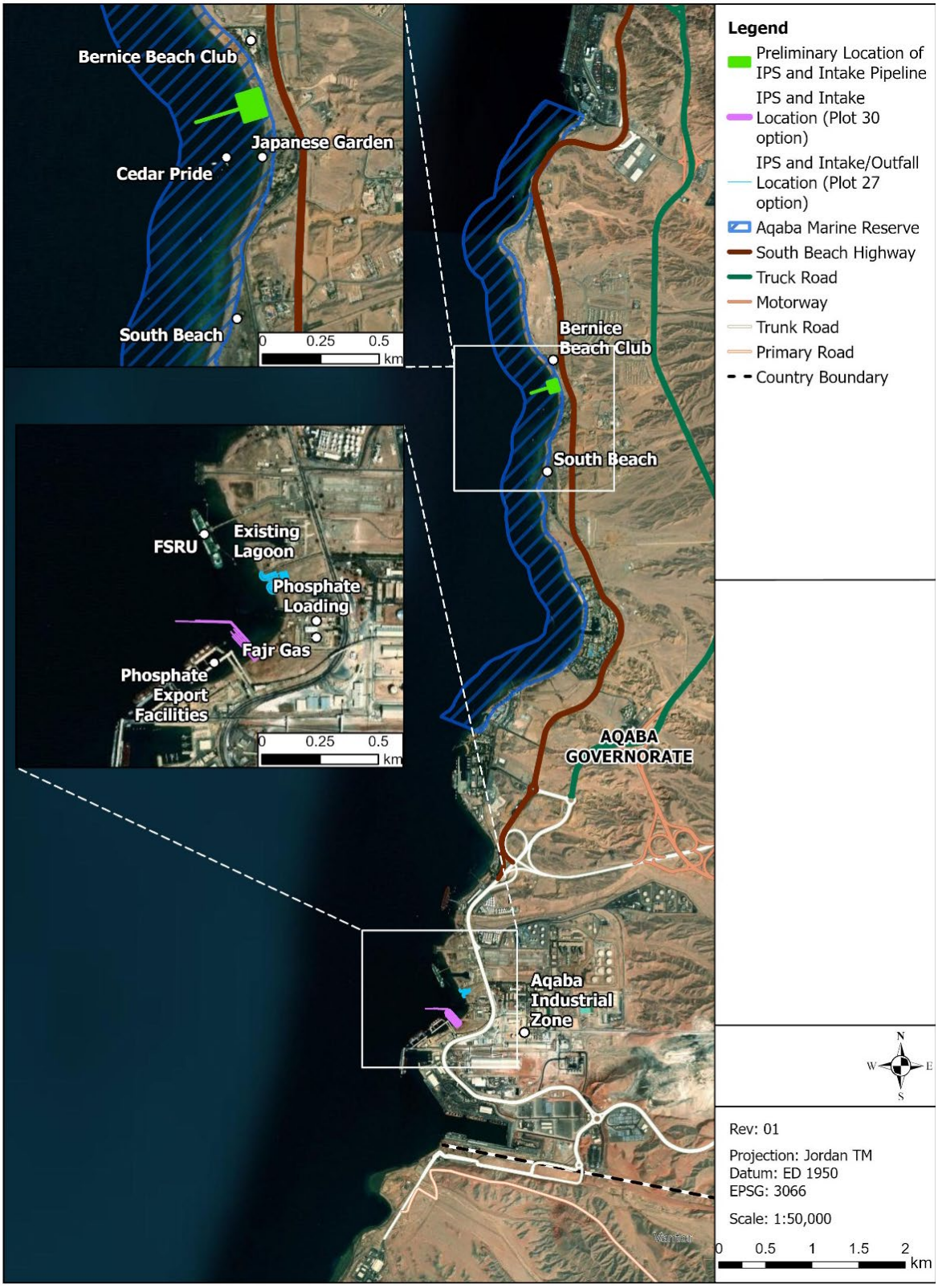
Two areas along the coastline were evaluated for siting the intake and outfall facilities during initial concept development. These locations are shown in Figure 5.

Feasibility studies undertaken in 2018 considered an initial location for the proposed intake and outfall facilities on an area of land located between the Bernice Beach Resort facilities to the north and the Japanese Garden snorkelling site to the south. The proposed intake and outfall pipelines were proposed to extend into the sea from this location. As shown within Figure 5, the pipeline location for this option is within the protected area of Aqaba Marine Park.

From an environmental and social perspective, the option was not deemed acceptable given the potential for significant interference with the Aqaba Marine Park users as well as impacts to the important ecosystem and habitats within the Park both during construction and operation.

A revised location for the IPS and the intake and outfall infrastructure was selected to the south of the Aqaba Marine Reserve between the Aqaba Gas Compression Station and the phosphate export facility (as shown in Figure 5). Technically, this location is constrained by the existing surrounding industrial infrastructure and numerous marine vessel movements. The environmental and social constraints associated with the Aqaba Marine Reserve location are avoided.

Figure 5: Alternative Intake and Outfall Infrastructure Locations



4.1.2 Location of Desalination Plant

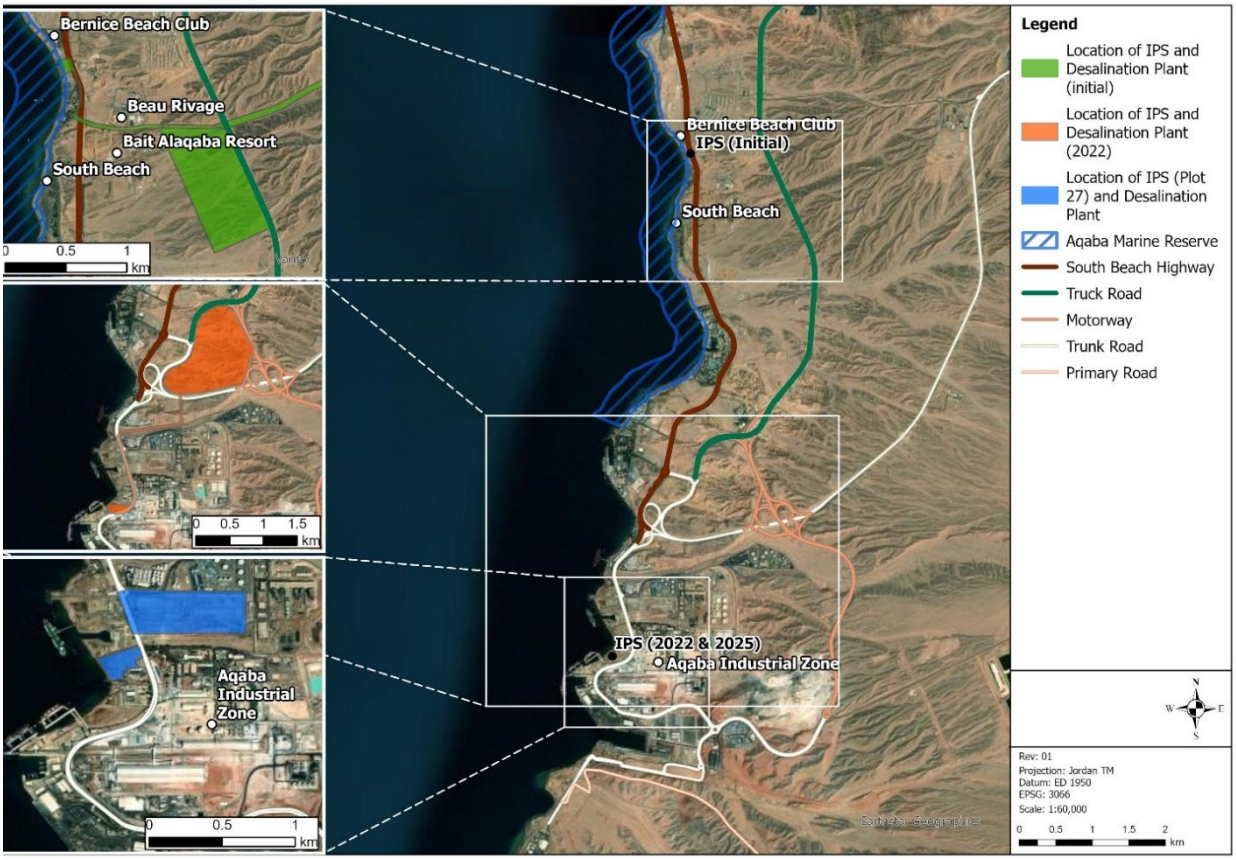
The three locations that have been evaluated to date for siting the desalination plant are shown in Figure 6 below.

The original site for the Desalination Plant (refer to Figure 6) was ultimately disregarded due to its location within the vicinity of the Aqaba Marine Park (refer to Section 4.1 above). Consequently, two further site locations were investigated within the Aqaba Industrial Zone, with the need for a new nearby NEPCO substation, to provide power to the Project facilities, factored into the site selection.

The location initially considered in 2022 was an undeveloped “greenfield” area which was deemed suitable from a technical perspective. However, the topography of the site meant that significant ground engineering and civil works were required, and the site was traversed by power lines and two seasonal wadis. The sites elevation of approximately 110m above sea level and distance from the intake pumping station also meant there was a greater pumping requirement as compared to a sea level location, resulting in greater power requirements (and associated emissions) as well as cost. The selection of a more suitable site closer the intake pumping station was highlighted as a key optimisation and resulted in the identification of a new brownfield site located in the centre of the Aqaba Industrial Zone (refer to “Location of IPS and Desalination Plant (2025) within Figure 6).

The brownfield site identified for the Desalination Plant is approximately 300m inland from the coast and was previously occupied by a timber processing and manufacturing facility, requiring significantly less ground engineering and civil works as compared to the previous “greenfield” alternative. Operational pumping requirements and hence power demand is significantly less given the shorter distance to the intake pumping station and lower elevation of the site**.** The disadvantage of the site is the smaller footprint available as compared to the previous site assessed and the added complexity of utilities and services in the vicinity (including a utilities pipeline corridor to the south of the site).

Figure 6: Alternative Desalination Plant Locations



4.2 Conveyance Pipeline Routing

Initial conveyance routing analysis was undertaken to determine a routing concept to convey the desalinated water from the intake and desalination facilities in Aqaba to the existing reservoirs of Abu Alanda and Al Muntazah near Amman. An early concept decision was made to take advantage of the existing Disi Conveyor Right of Way (RoW) and follow this route as far as practicable. Part of the routing concept also included a small part of the alignment on private land and sections on public roads including a section along the Desert Highway. Conceptual studies considering a route with a greater degree of alignment with the Desert Highway, however, identified a sharply inclined section of approximately 5km in length equating to an elevation change of approximately 500m. This section was deemed to contribute to a significantly increased overall power and pump head requirement and made the design hydraulically and economically very challenging. As such this option was rejected.

One of the key focus areas of recent pipeline route optimisation work is the identification of major sections of the route where various constraints make the initial proposed routing infeasible. Re-routes to date have focused on urban locations, specifically Diesah village (also known as Disi village) (including a section along the Wadi Rum Highway), Hasa and Qatraneh.

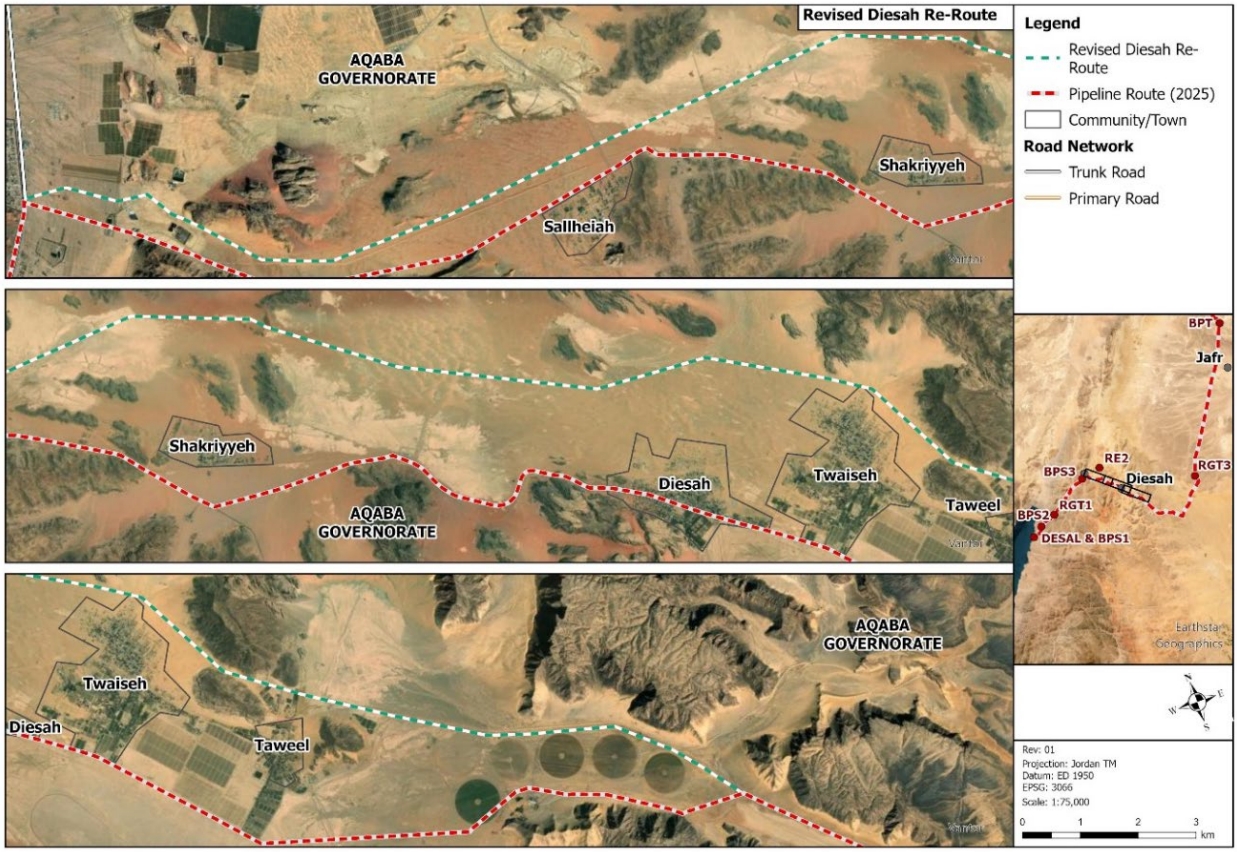
4.2.1 Routing Optimisation and Re-Routes

4.2.1.1 Diesah Village and Wadi Rum Highway

A section of 41km of pipeline route was identified as representing a challenge from a constructability perspective in the vicinity of Diesah village and along the Wadi Rum Highway. The constraints included various underground and above ground utilities that either extend into the pipeline construction zone, restrict the use of cranes and equipment needed to lower the pipelines into the ground or in some cases lie across the pipeline route itself. Within Diesah village there is very little working space available between the existing properties either side of the highway and hence a high potential for loss of structures.

As such an alternative "Northern Desert Route" was determined to improve pipeline constructability. The original and indicative alternative Northern Desert Route is shown in Figure 7. The benefits of this alternative also include the reduction in nuisance impacts to the Diesah residents and avoidance of potential physical impacts to businesses and residences which aligns with the outcome of the stakeholder engagement held in the village.

Figure 7: Diesah Village – Original Route and Indicative Revised "Northern Desert Route"

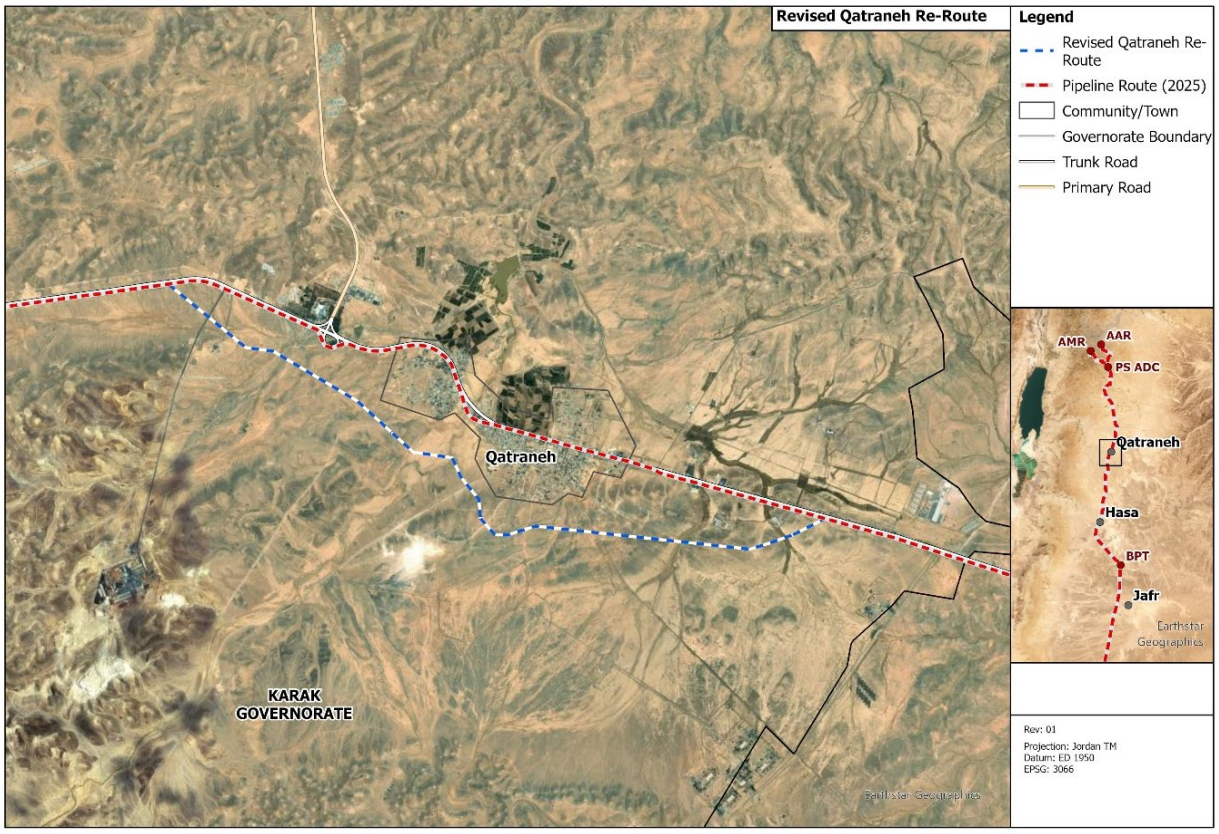


4.2.1.2 Qatraneh Village

A section of 13km of pipeline route was identified as representing a challenge from both constructability, safety and social impact perspectives, in the vicinity of Qatraneh.

The types of constraints included the presence of the existing so-called “Disi Conveyance” pipeline, a pipeline conveying water to Amman from a groundwater field located to the East of Diesah and the Wadi Rum area; other above ground and underground utilities, the existing highway, businesses and residences that either extend into the construction zone, restrict the use of cranes and equipment needed to lower the pipelines into the ground or in some cases lie across or immediately adjacent to the pipeline route itself, therefore an alternative route in an open corridor, utilizing open desert and away from the congested Disi Line utility corridor and associated constraints was identified. The original and indicative revised routes are shown in Figure 8. The benefits of the alternative route also include the reduction in nuisance impacts to the Qatraneh residents and avoidance of potential physical impacts to businesses and residences which aligns with the outcome of the stakeholder engagement held in the villages.

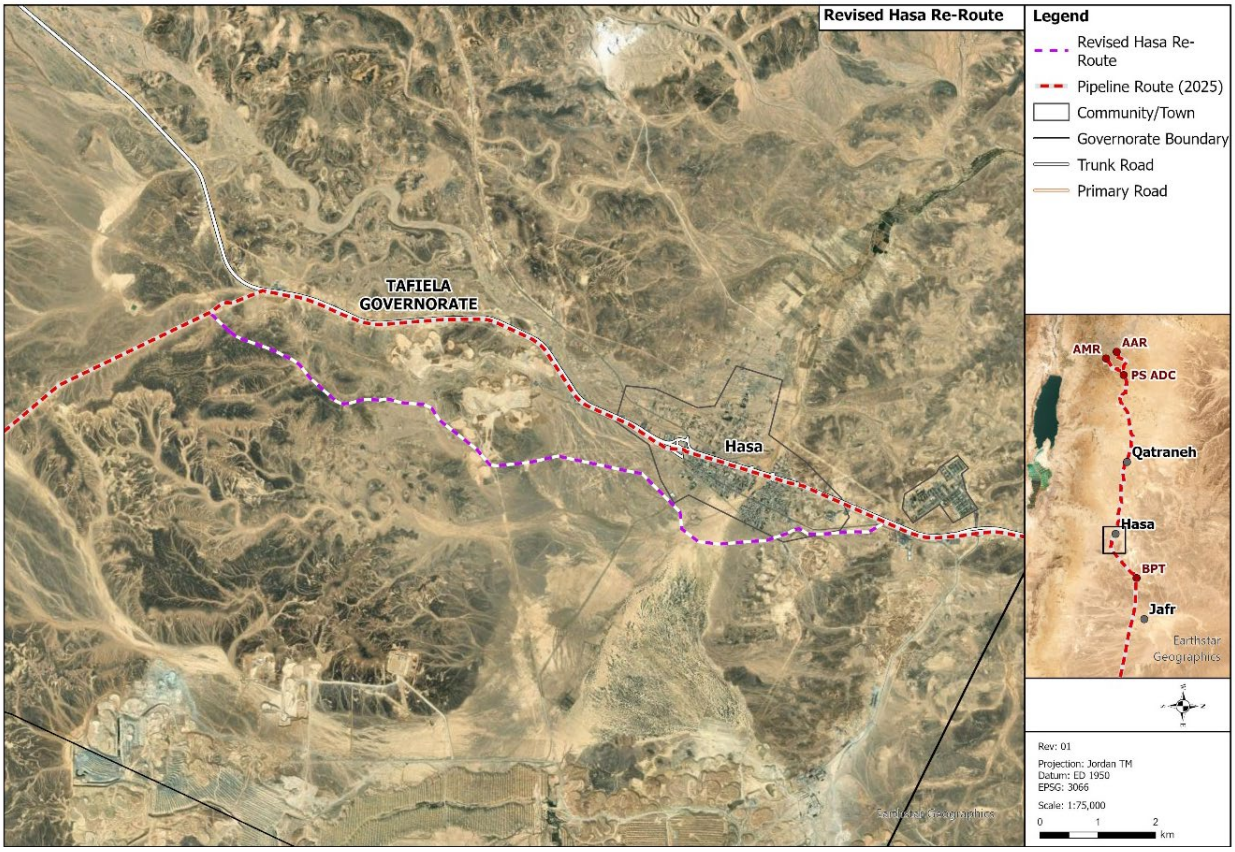
Figure 8: Original Route via Qatraneh and Revised Route via Open Desert



4.2.1.3 Hasa Village

Similar constraints have been identified for the section of the pipeline originally routed through Hasa village, resulting in the re-route of the section as shown in Figure 9 below. As in the case with the re-routing around Diesah and Qatraneh, the re-route around Hasa village resolves the constructability, safety, environmental and social constraints associated with the original alignment through the village and addresses the concerns that were raised by communities during the stakeholder engagement.

Figure 9: Original Route via Hasa and Revised Route via Open Desert

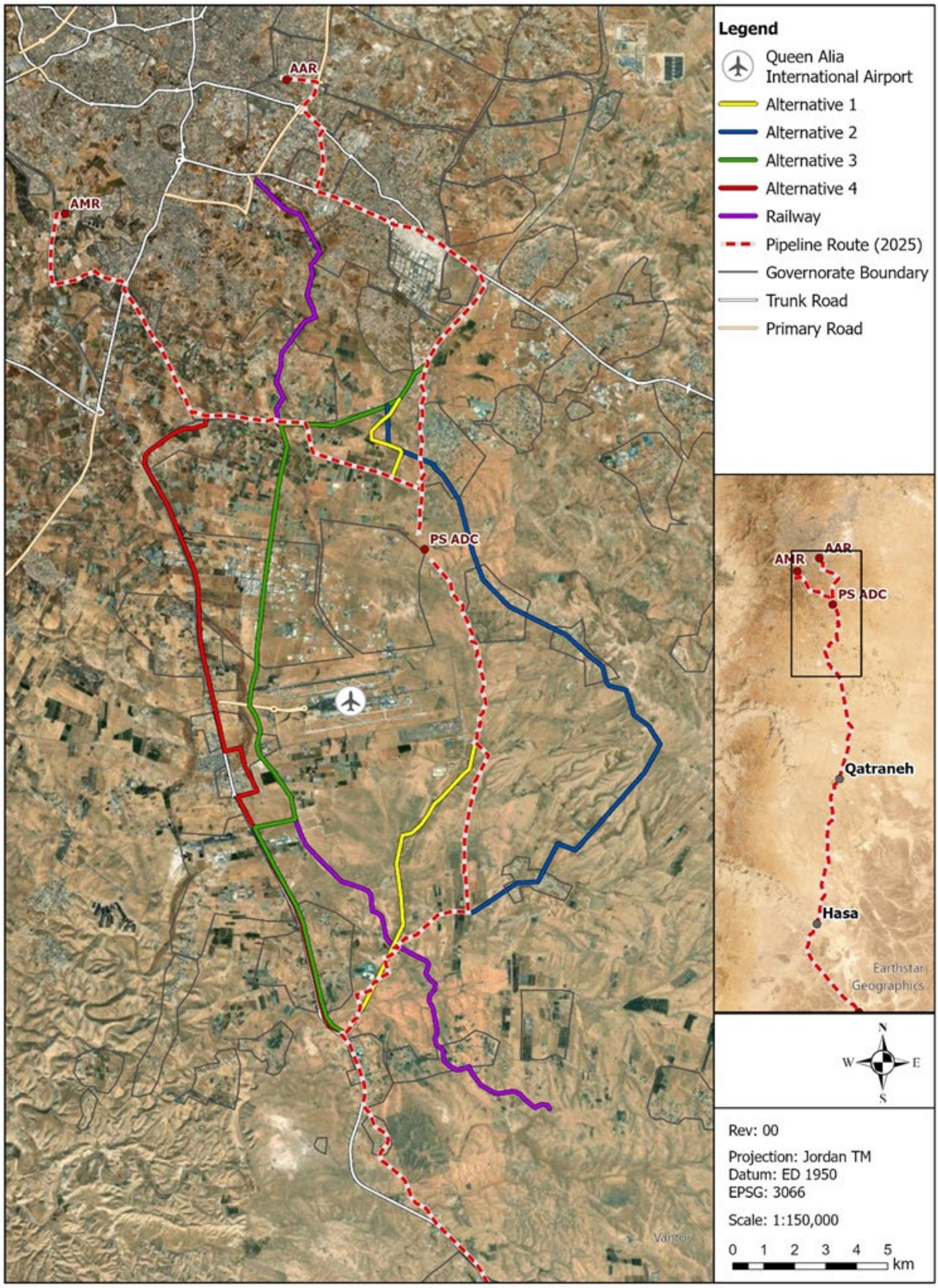


4.2.2 Routing Alternatives Around Queen Alia International Airport

Alternative alignments were initially considered in the South Amman area adjacent to Queen Alia International Airport (QAIA) and Al Jeza municipality to optimise costs, ease of construction, reduce interference with other existing services and reduce impact on commercial activities during construction. To achieve these objectives, four alternative alignments were considered (as shown in Figure 10). The alternatives were assessed considering the route length, the degree of land acquisition and expropriation required, the utilities, services and other constraints (including the Hijaz Railroad, local roads and highways and the building, structures and businesses) present along the proposed alignment.

Subsequently the decision was taken by MWI to relocate the ADC pumping station (PS ADC), which is to the north of the QAIA. A further revision to the routing alignment around the QAIA has been determined as shown in Figure 10 following part of the previous route alignment options taking into account the relocated PSA DC site.

Figure 10: Routing Alternatives Around Queen Alia International Airport



4.3 Power and Renewables

4.3.1 Power Supply and Renewable Concept

Desalination and conveyance require a significant continuous and stable power supply to meet the electrical consumer demand of high-pressure pumps and other process equipment. At the early concept stage of the Project the decision was taken to source the required power from the Jordanian national grid, rather than a standalone site-based power generation facility, as the most energy efficient and cost-effective option.

Subsequently MWI introduced a requirement for the AAWDCP is required to meet a greenhouse gas emissions cap of 3.2 kgCO2eq for every cubic metre of potable water delivered, therefore, the Project power supply includes a portion derived from a dedicated renewable energy source.

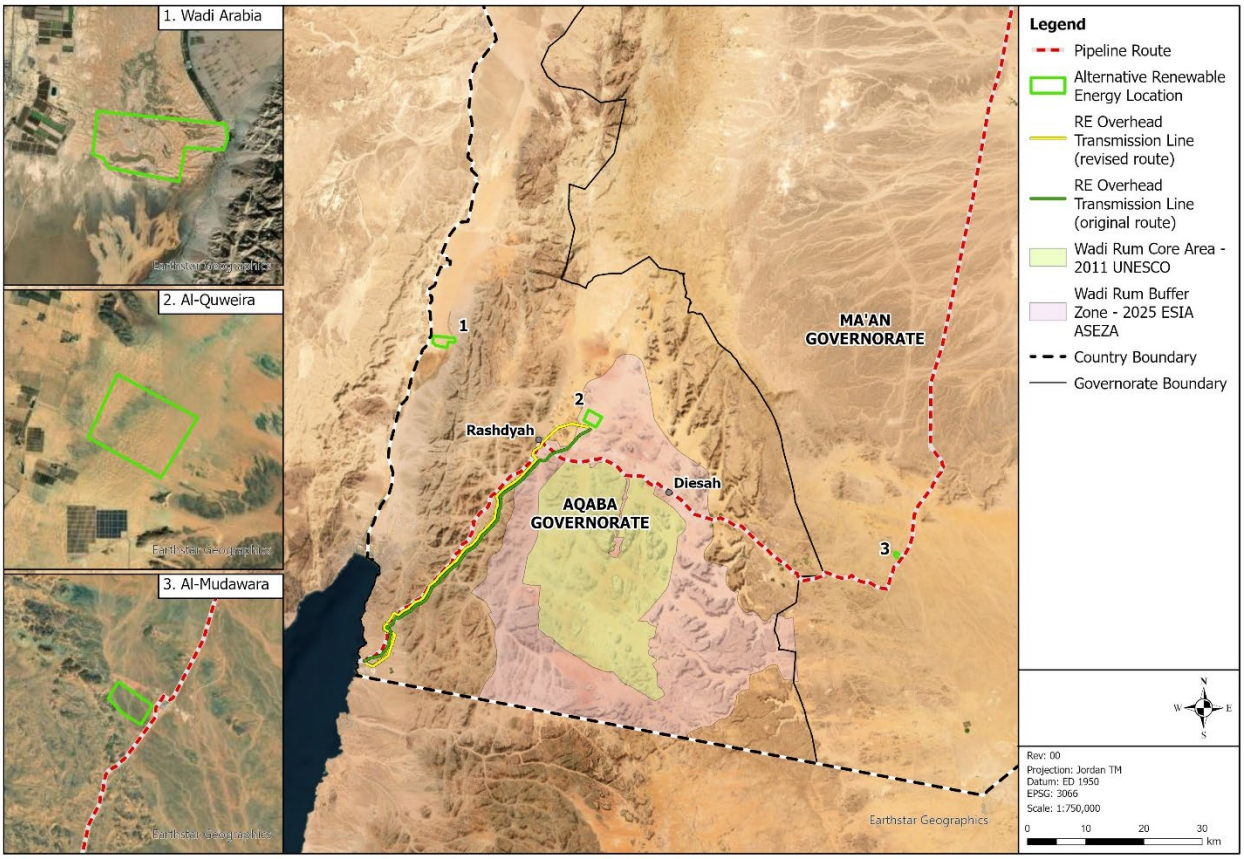
Existing renewable technologies within Jordan include solar, wind, geothermal, biomass and hydropower. At the early concept design stage, the decision was taken to adopt solar photovoltaic (PV) power as the preferred renewable energy concept. The high solar irradiation levels in southern Jordan and associated energy yield, the availability of suitable areas of undeveloped, non-arable land and the lower CAPEX required for a large-scale installation make this option the most attractive. The use of renewable energy power supply in combination with a Battery Energy Storage System (BESS) was not considered feasible from a land requirement, cost, and operational experience perspective.

4.3.2 Renewable Energy Facility Location Alternatives

The feasibility of using land around the Desalination Plant for the RE Facility was discounted early in the Project due to lack of available sites. Three locations were subsequently considered for the siting of the Project RE facility as shown in Figure 11.

- Alternative 1 Wadi Araba: To the north of the King Hussein International Airport, approximately 60km from the proposed desalination facilities and owned by MWI/Jordan Valley Authority. The site was associated with various challenges including security concerns due to its proximity to the international border with Palestine. The site was also located within the Qatar Nature Reserve and therefore discounted
- Alternative 2 Al-Qweira: Approximately 60km from the proposed desalination facilities, located in the north of the Wadi Rum Protected Area buffer zone and to the north of the Hisma Basin–Rum Key Biodiversity Area (KBA). A number of other solar PV facilities are present within 2km of this location. The Al-Qweira site is located in a land use zone classified as “Medium Development: Limited to Non Consumptive Tourism”
- Alternative 3 Al-Mudawara: Located in the Maan Governate in a location immediately adjacent to the location of the initially planned Booster Pump Station 5 (BPS5) and approximately 90km from the proposed desalination facilities. Over the course of the design development the requirement for BPS5 was removed, and hence this location was eliminated from further consideration

Figure 11: Alternative Renewable Energy Locations and OHTL Route Options



4.4 Associated Facilities

The OHTL (to be built by NEPCO) provides a single power supply connection between the Project Renewable Energy Facility and the AAWDC Project Desalination Plant and Booster Pumping Stations. Transportation of the power load over the national grid is not feasible due to the extent of adaptation work required for the existing electricity network. The two OHTL routes evaluated to date are shown in Figure 11. Initially an OHTL route was proposed that passed through the buffer zone of the Wadi Rum Protected Area. However, following engagement with ASEZA and the Wadi Rum Protected Area management, the OHTL was re-routed to remain outside of the buffer zone.

4.5 Technology Alternatives and Optimisations

4.5.1 Marine Intake and Outfall System

The Project has considered alternative means of seawater intake, using either marine pipelines or a concrete shore intake channel.

Alternative 1 considered either two or four intake pipelines laid on the seabed within a trench, backfilled and provided with appropriate protection against scour and wave action, connected to intake tower structures offshore and a new Intake Pumping Station (IPS) located within “Plot 30” at the shoreline (refer to Figure 5).

Alternative 2 assumed construction of a new concrete intake lagoon provided with revetment structures for erosion protection within the intertidal area adjacent to a new IPS located within “Plot 27” (refer to Figure 5).

Alternative 2 was selected based on a reduction in predicted benthic habitat and water turbidity impacts during construction, and a decrease in the potential for coral larvae and other marine organisms to be entrained because of seawater abstraction, compared to Alternative 1.

Similarly, for the outfall system, Alternative 2 at Plot 27 reduced the overall trenching footprint and predicted lower water turbidity impacts during construction relative to Alternative 1 at Plot 30.

4.5.2 Desalination Plant

Chemical cleaning-in-place (CIP) of the RO membranes is a routine maintenance activity within the Desalination Plant which produces inorganic and organic waste streams. The Project has considered the options for the handling and disposal of the CIP organic waste stream. Initially the option of routing neutralised organic CIP waste streams from the RO system to onshore site-based evaporation ponds was considered. This option was not carried forward principally due to Desalination Plant plot size constraints.

The alternative option uses cartridge filtration to remove particulates from the CIP organic waste stream prior to neutralisation. The neutralised intermittent waste stream is then combined with RO brine and other effluents from the solids treatment system prior to discharge via the outfall facilities. This option represents a technically feasible alternative due to the lower footprint required at the Desalination Plant. Modelling of the discharge (Refer to Section 9) showed no significant difference in the quality of the discharge when the CIP waste stream is present and the option has since been adopted into the design basis.

4.5.3 Conveyance System

The Conveyance Pipeline material alternatives considered by the Project included Steel, Ductile Iron (DI), Glass Reinforced Plastic (GRP) and Pre-stressed Concrete Cylinder (PCCP). Steel pipe is the preferred choice for the high-pressure water conveyance systems due to its high strength, durability and leak-free welded joints. GRP pipes were not selected due to a lack of long-term field performance and the potential leak points from standard mechanical joints. Ductile Iron (DI) Pipe was considered uncompetitive for the main water conveyance pipeline system as DI pipe cannot meet the capacity requirement without the installation of 2 separate pipelines which would result in a larger, more disruptive construction footprint. Pre-stressed Concrete Cylinder (PCCP) Pipe was deemed unsuitable due to a high corrosion risk, and excessive weight that complicates handling and repair and the need for additional lining that would make PCCP pipe commercially unviable.

The overall hydraulic design of the Conveyance System has also been optimised, with the adoption of an open rather than pressurised closed system reducing the overall maximum operating pressure, enabling a reduction in pipeline diameters and steel requirements. The adoption of both fixed speed and variable speed pumps at BPS1, BPS2 and BPS3 and station outlet control valves also optimises the control of pumping stations, minimising the requirement for intermediate storage through the system, so that storage tanks previously located at BPS3 and PS ADC have been removed from the design.

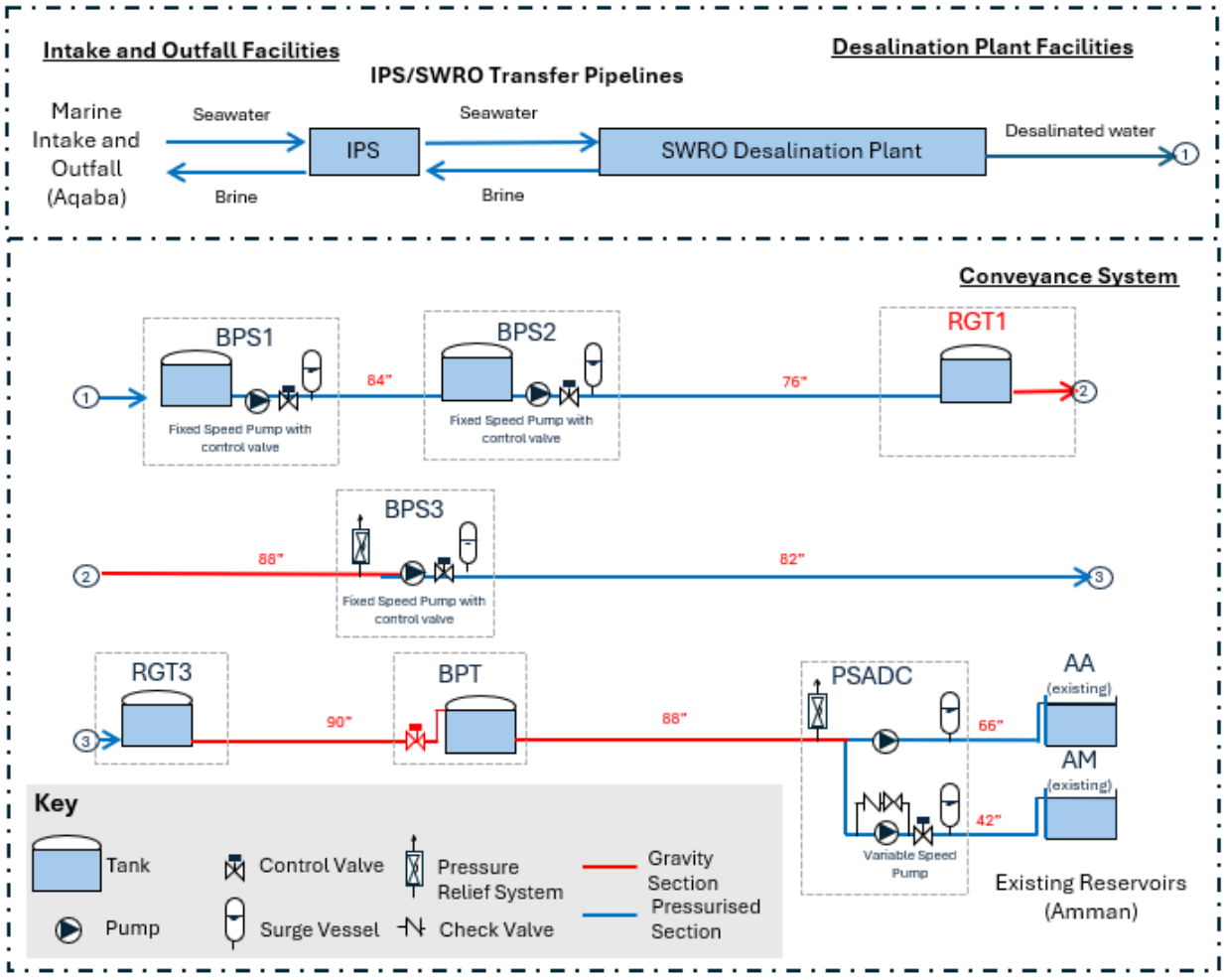
5 Project Description

The design of AAWDC Project (refer to Figure 12) includes:

- Seawater Reverse Osmosis (SWRO) Desalination Plant connected to Intake and Outfall Facilities comprising marine intake and outfall infrastructure, pumping and transfer facilities
- Conveyance system comprising a buried pipeline (approximately 438km long) and
- Four pumping stations (booster stations BPS1, BPS2 and BPS3 and pumping station PS ADC)
- Two regulating tank facilities (RGT1 and RGT3) and one break pressure tank (BPT)
- Renewable Energy (RE) facility comprising solar photovoltaic (PV) power plant and supporting electrical substation

The RE facility aims to meet the total power production demand of the SWRO Desalination Plant and the pump stations within Aqaba Governorate during daylight hours. Outside these hours, the plant and pump stations will rely on electricity provided by NEPCO.

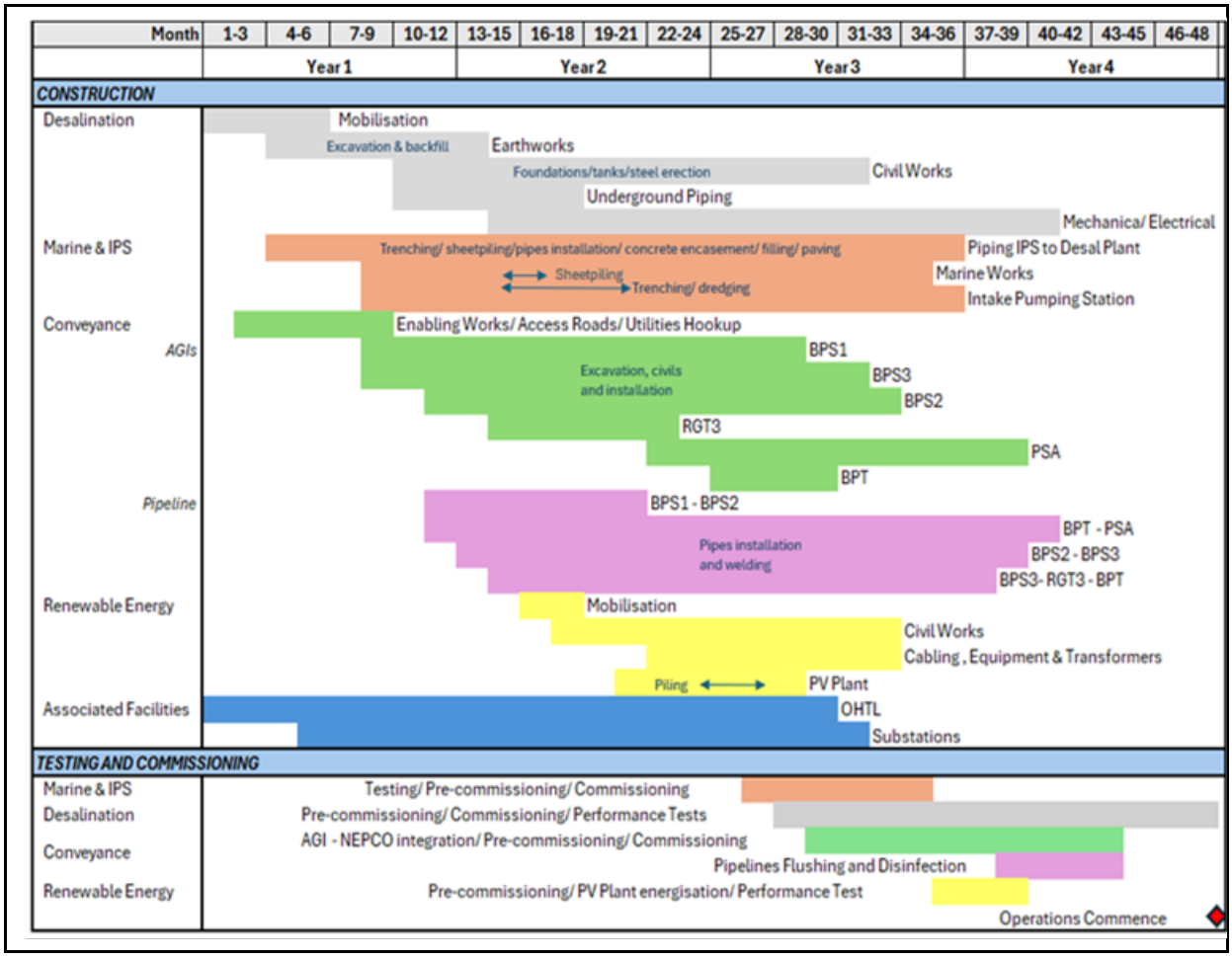
Figure 12: Overview of AAWDC Project



5.1 Project Schedule

The construction schedule is expected to extend over approximately 48 months with construction commencing in 2Q 2026 and final commissioning and start-up of the system planned for 2030. An Indicative Project schedule is presented in Figure 13.

Figure 13: Indicative Project Schedule

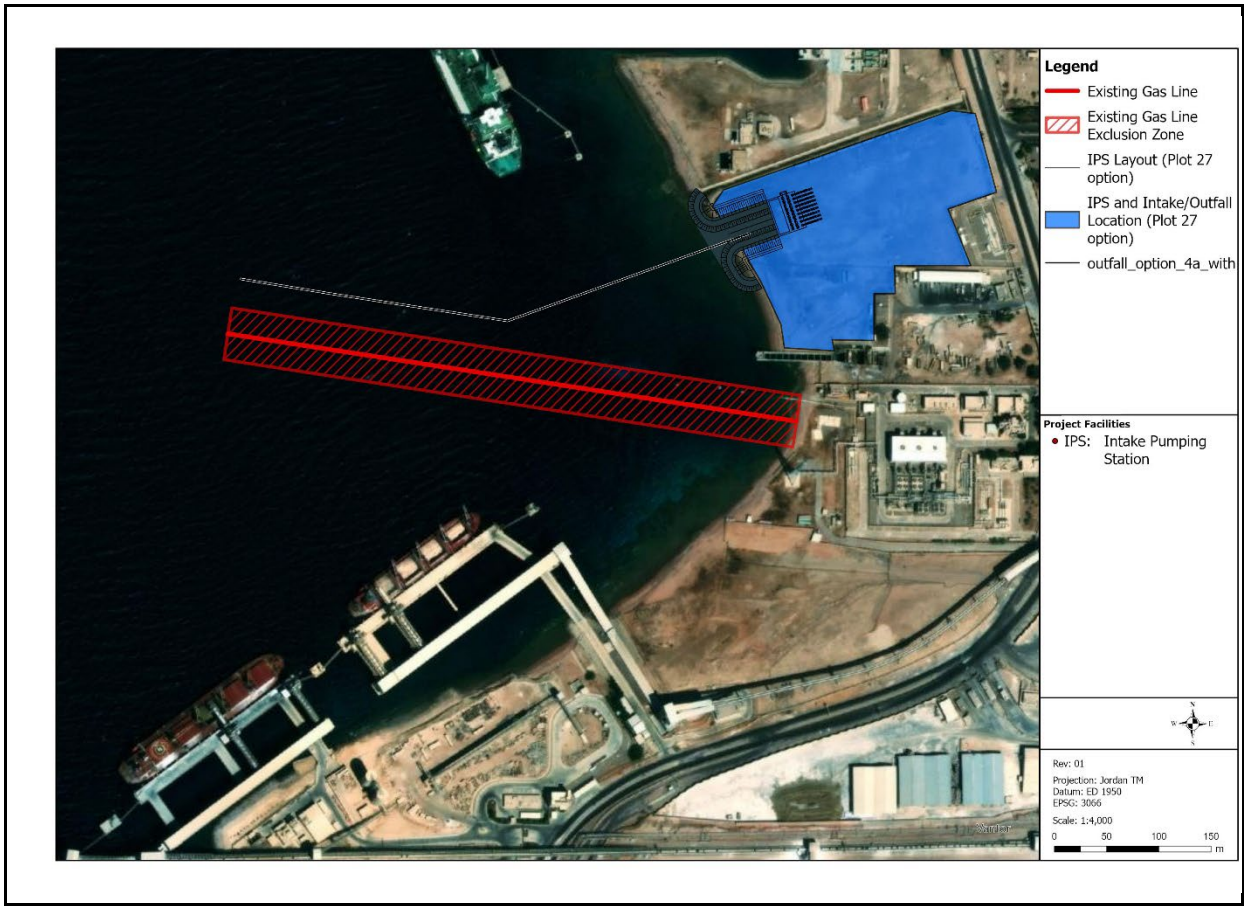


5.2 Permanent Facilities

5.2.1 Intake and Outfall Facilities

The Intake and Outfall facilities are designed to extract and transfer seawater from the Gulf of Aqaba to the Project Desalination Plant and discharge treated liquid effluents (predominantly comprising brine from the RO system) to the marine environment. The indicative layout of the Intake and Outfall facilities and IPS is shown in Figure 14 below.

Figure 14: Indicative Layout of Intake and Outfall Facilities and IPS



5.2.1.1 Marine Intake System

The marine intake system comprises an intake lagoon with a seawall extending 10 m from the current shoreline and an inlet to the adjacent Intake Pumping Station (IPS). The inlet is equipped with mesh screens to prevent the intake of debris and marine life, and a fish recovery device, that recovers fish and other marine life for release back into the sea.

The intake will be supplemented with a bubble curtain system at the mouth of the lagoon that reduces and prevents jellyfish, oil contaminants, algae concentrations, suspended sediments and planktonic larvae entrainment into the lagoon. The current design also incorporates a floating oil boom fence across the intake lagoon to prevent potential contamination in the event of 3rd party oil spills in the marine environment.

5.2.1.2 Marine Outfall System

The marine outfall system comprises a single outfall fitted with a diffuser initially laid within a trench and then along the seabed, stabilised by concrete ballast collars. The current design incorporates a single gravity-driven flow outfall, with an external diameter of approximately 3000 mm.

The purpose of the diffuser, fitted to the end of the outfall, is to optimise the dilution efficiency of the discharged effluent within the receiving body of seawater. The current preliminary design of the diffuser

comprises eight risers equipped with twin ports. The diffuser will be installed at water depths ranging from -50 MSL to -80 MSL.

5.2.1.3 Intake Pumping Station (IPS)

Seawater is received at the IPS and routed to nine separate intake channels, each linked to an upstream pump. Seawater is then pumped to the Desalination Plant via two 2.3m diameter seawater transfer lines.

The intake facilities are designed to incorporate chemical dosing systems at the pumping station outlet to control biofouling within the IPS and transfer lines. Dosing is planned for 4 hours, every 6 months per seawater intake transfer line.

Treated effluents from the Desalination Plant will be sent to the outfall energy dissipation chamber at the IPS via an outfall transfer line from the Desalination Plant and subsequently discharged to sea via the outfall diffuser.

A power supply of 11kV will be provided from a new substation (to be built and operated under NEPCO's responsibility) to be located within the IPS site boundary.

5.2.1.4 Intake and Outfall Transfer Pipelines

The two buried seawater intake transfer lines and one outfall transfer line will connect the IPS at plot 27 to the adjacent Desalination Plant site, crossing the highway immediately adjacent to the Desalination Plant site.

5.2.2 Desalination Plant

The Desalination Plant is designed to produce up to 300 million cubic metres (MCM) per year of treated potable water at overall plant recovery rates[3] of between 42% and 47%.

Seawater will be supplied to the Desalination Plant via the seawater transfer pipeline from the intake facilities.

The Desalination Plant is designed to produce potable water that meets the project water quality standards provided in Table 2.

Table 2: Project Potable Water Quality Design Standards

Parameter	Water Quality Requirement
Turbidity	<2 NTU 100% of the time, <1 NTU 90% of the time
pH	7.8 < pH < 8.5
Total Dissolved Solids (TDS)	< 500 mg/L
Total Hardness	< 300 mg/L
Chloride	< 300 mg/L
Residual Chlorine level at the Delivery Points and Turnouts	1.0 – 1.5 mg/L
Bromide	≤ 1.5 mg/L

[3] The recovery rate is defined as the proportion of potable water recovered from the total volume of seawater fed to the Desalination Plant

Parameter	Water Quality Requirement
Calcium	40 mg/L as CaCO3
Total Alkalinity	0-80 mg/L as CaCO3
Langelier Saturation Index (LSI)	< 0.5

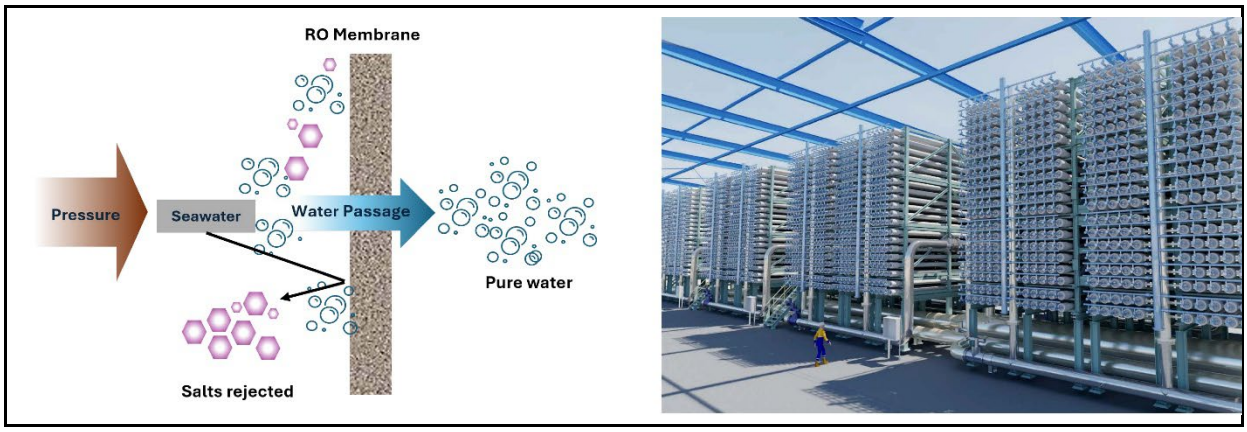
5.2.2.1 Pre-treatment

Pre-treatment reduces suspended solids and particulate loads to ensure that the raw seawater supplied to the RO system will not result in damage or excessive fouling or scaling to the RO membranes[4]. To achieve this, the pretreatment stage integrates several key processes such as coagulation, filtration, disinfection (for fouling mitigation), and chemical dosing to condition the feed water before it is fed to the RO system. Backwash effluents from cleaning the pre-treatment filters are sent for further treatment before being routed, with the RO brine, to the outfall facilities.

5.2.2.2 Reverse Osmosis (RO) System

The RO system comprises 24 independent racks, each accommodating 400 pressure vessels that contain the RO membranes. Feed water is supplied to the RO membranes using High-Pressure Pumps (HPPs). The RO system removes dissolved salts in seawater as its fed, by the HPPs, through the RO membrane, which retains most of the salts as a brine, whilst the fresh water (or permeate) is allowed to pass on to the other side of the membrane with a highly reduced salt content. Brine from the RO system is routed to the outfall facilities. The fresh water from the RO system is sent to the post treatment system.

Figure 15: Illustration of Reverse Osmosis Principle and the Desalination Plant RO Units



The RO system is maintained periodically by performing chemical cleaning of the RO membranes. Once the chemical cleaning has finished (typically lasting around 8-24 hours) the spent cleaning solution will be neutralised and sent for further treatment before being routed, with the RO brine, to the outfall facilities. The RO system also uses chemicals to reduce the build-up of scale on RO membranes and reduce any residual oxidants from the seawater feed which can damage the RO membranes.

[4] Fouling is the deposition of unwanted matter on membranes or other surfaces. Fouling can comprise colloidal matter, organic matter, minerals and/or the formation of a biofilm comprised of a mixture of microorganisms and organic matter. Scaling is a type of fouling caused by the precipitation of solid salts, oxides, and hydroxides, such as calcium carbonate.

5.2.2.3 Post-treatment

To meet the Project potable water standards, prevent corrosion within the Conveyance System and biological growth within the water distribution network, the post treatment system includes remineralisation, pH adjustment and disinfection of the fresh water from the RO system before it is sent to the Conveyance System.

5.2.3 Conveyance System

The Conveyance System will transport desalinated water from the Desalination Plant to the Abu Alanda and Al Muntazah reservoirs located in Amman with an offtake for local supply at Aqaba. The system comprises the buried conveyance pipeline and Above Ground Installations (AGIs) including pumping stations and tanks. The planned route of the conveyance pipeline passes through the governates of Aqaba, Ma'an, Tafiela, Karak and Amman with the AGIs located in Aqaba, Ma'an and Amman Governates (Refer to Figure 1).

The system is designed to pump desalinated water approximately 22km from BPS1, via BPS2, to the first regulating tank (RGT1) lifting the water over a vertical elevation of approximately 700m. From RGT1 the desalinated water flows under gravity for approximately 30km to BPS3 and is then pumped over approximately 102km to RGT3 which serves as a highpoint reservoir (HPR) at an elevation of approximately 1085m . From RGT3, the desalinated water flows under gravity for approximately 250km, via the BPT which also acts as a reservoir, to the final pumping station (PS ADC) from where the potable water is supplied to the two existing Amman water reservoirs (Refer to Figure 12). Routine power is provided to the conveyance system facilities through substations provided at BPS2, BPS3 and PS ADC, connecting to the grid and the new Overhead Transmission Lines (as described in Section 5.2.5 below).

5.2.3.1 Conveyance Pipeline

The pipeline will be constructed of steel in sections of varying diameter (max. 2.3m) and wall thickness (max. ~ 16mm), considering seismic design requirements such as minimising strain on the pipeline by crossing fault lines at the most favourable angle.

Internal and external pipeline corrosion protection will be provided in line with international best practice for the protection of structural steel. Additional corrosion protection is provided via a cathodic protection system.

The pipeline will be remotely monitored and controlled from a central control centre (CC) at the Desalination Plant. Leak detection will be provided for the entire Conveyance system pipeline using fibre optic sensing technology.

5.2.3.2 Above Ground Installations

The Conveyance System has four pumping stations to pressurise and maintain the flowrate within the pipeline using electric motor driven water pumps. Fixed speed pumps for the Booster Pumping Stations optimise control and minimise interruptions to pipeline operations. Variable Speed Driven (VSD) pumps at PS ADC accommodate variability in flow rates and operating pressures.

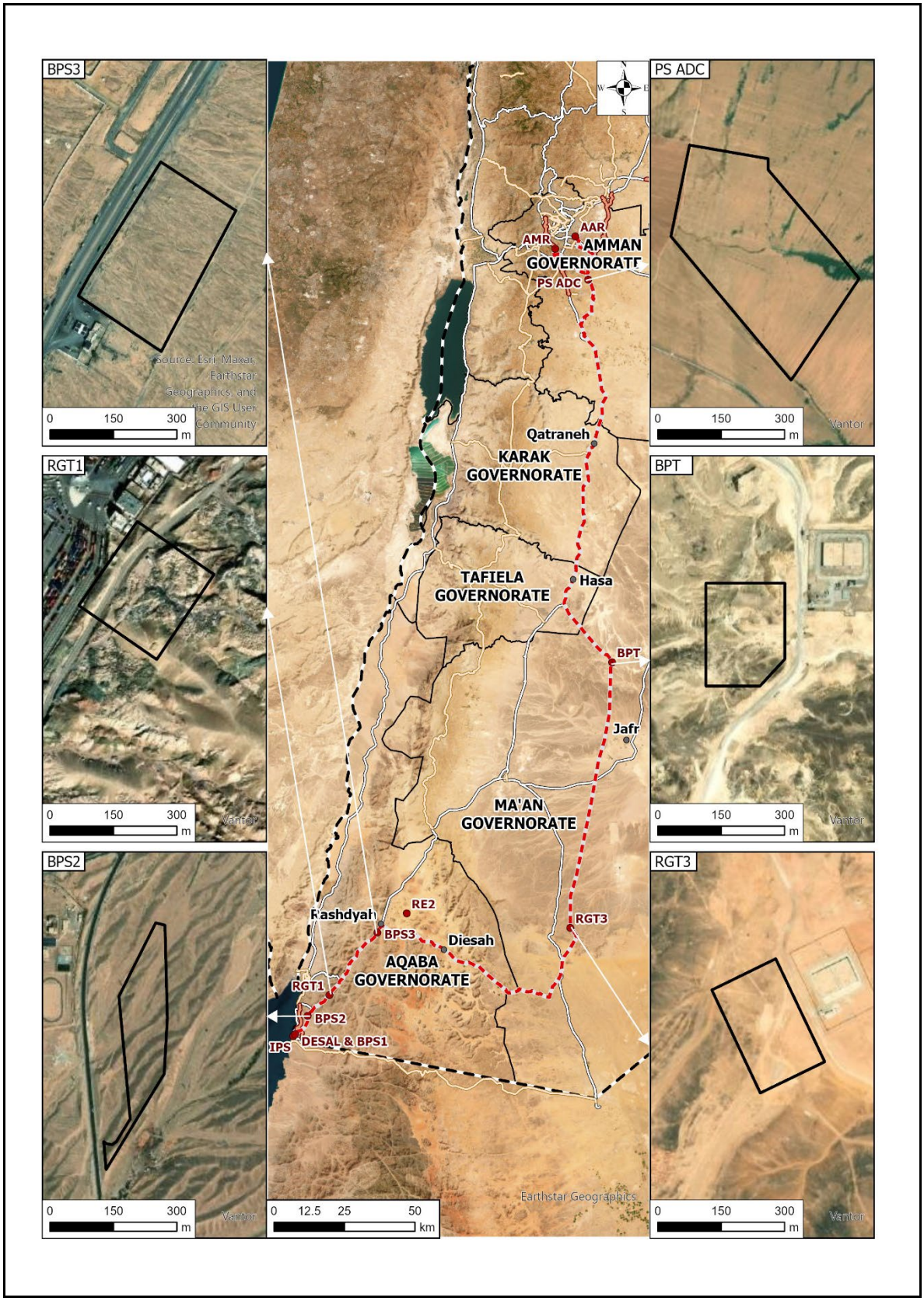
Each pumping station is fitted with surge vessels to protect against rapid changes in pressure caused by unplanned pump trips or sudden valve closures that could lead to damage to the pipeline. A pressure relief system (PRS) also limits the maximum pressures of water entering the pumping stations in case of an unscheduled or temporary event.

The function of the tanks is to provide operational storage (BPS1 at the Desalination Plant) and act as a reservoir for freshwater distribution to the Aqaba Governate (BPS2). Tanks RGT1, RGT3 and the Break Pressure Tank (BPT) regulate system flow and pressure to avoid unplanned pump starts and stops during normal operations.

Fixed automated chlorine disinfection stations are provided at the AGIs to ensure the quality of potable water throughout the Conveyance System.

The location of the BPS2, BPS3, PS ADC, BPT, RGT1 and RGT3 plots is shown within Figure 16.

Figure 16: Locations of BPS2, BPS3, PS ADC, BPT, RGT1 and RGT3 Plots



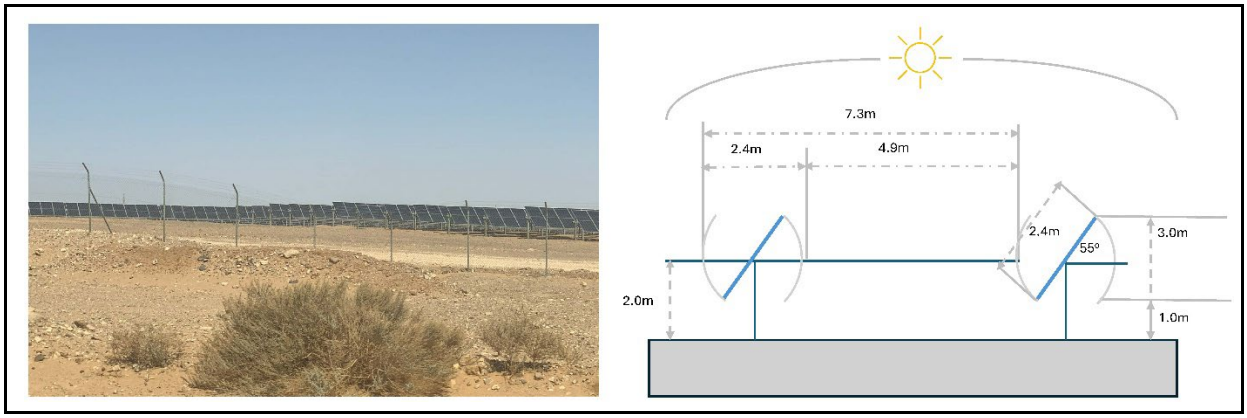
5.2.4 Renewable Energy Facility

The RE Facility will comprise a solar photovoltaic (PV) power plant on a 485-hectare (ha) site near Al-Qweira, about 65km northeast of the new SWRO Desalination Plant (refer to Figure 1).

The RE Facility is designed with sufficient capacity to meet the total power demand of the Desalination Plant and the pumping stations during daylight hours with supply provided via new Overhead Transmission Lines (refer to Section 5.2.5 below).

The RE Facility comprises approximately 440,000 solar PV modules, installed in 26 blocks. The solar PV modules within the RE Facility design will be mounted on single axis tracker supporting structures (see Figure 17), which enable the solar PV module to move and follow the sun's path across the sky, thereby allowing the PV panel to absorb more sunlight during the day.

Figure 17: Single Axis Tracking System Design Example and Cross Section



The electrical output from the solar PV modules will be converted for onward transmission using inverters distributed throughout the site and using three transformer stations across the PV solar plant to control voltage and safeguard equipment against any faults.

A new NEPCO substation will be located within the RE Facility site to enable the electricity generated by the solar PV plant to be efficiently transmitted and safely supplied via the OHTL to the Desalination Plant and AGI facilities.

5.2.5 Associated Facilities - Electrical and Transmission Works

Under supervision of MWI, the National Electric Power Company (NEPCO) will be responsible for the electrical and transmission works required to provide power to the AADWC Project facilities from the new RE Facility and from the national grid. This includes new substations within the IPS, Desalination Plant, BPS2, BPS3 and PS ADC sites and new Overhead Transmission Lines (OHTL) connecting the substations to a power supply.

Figure 18 shows the current planned routing of the new OHTL between the RE Facility, BPS2 and new substation at Aqaba. Figure 19 shows the new OHTLs south of Amman connecting PS ADC to the national grid. The OHTLs will consist of vertical steel lattice towers ranging between approximately 47m and 50m in height linked with suspended live conductor cables and insulators.

Figure 18: Current Routing of New OHTLs Between RE Facility, BPS2 and New Aqaba Substation

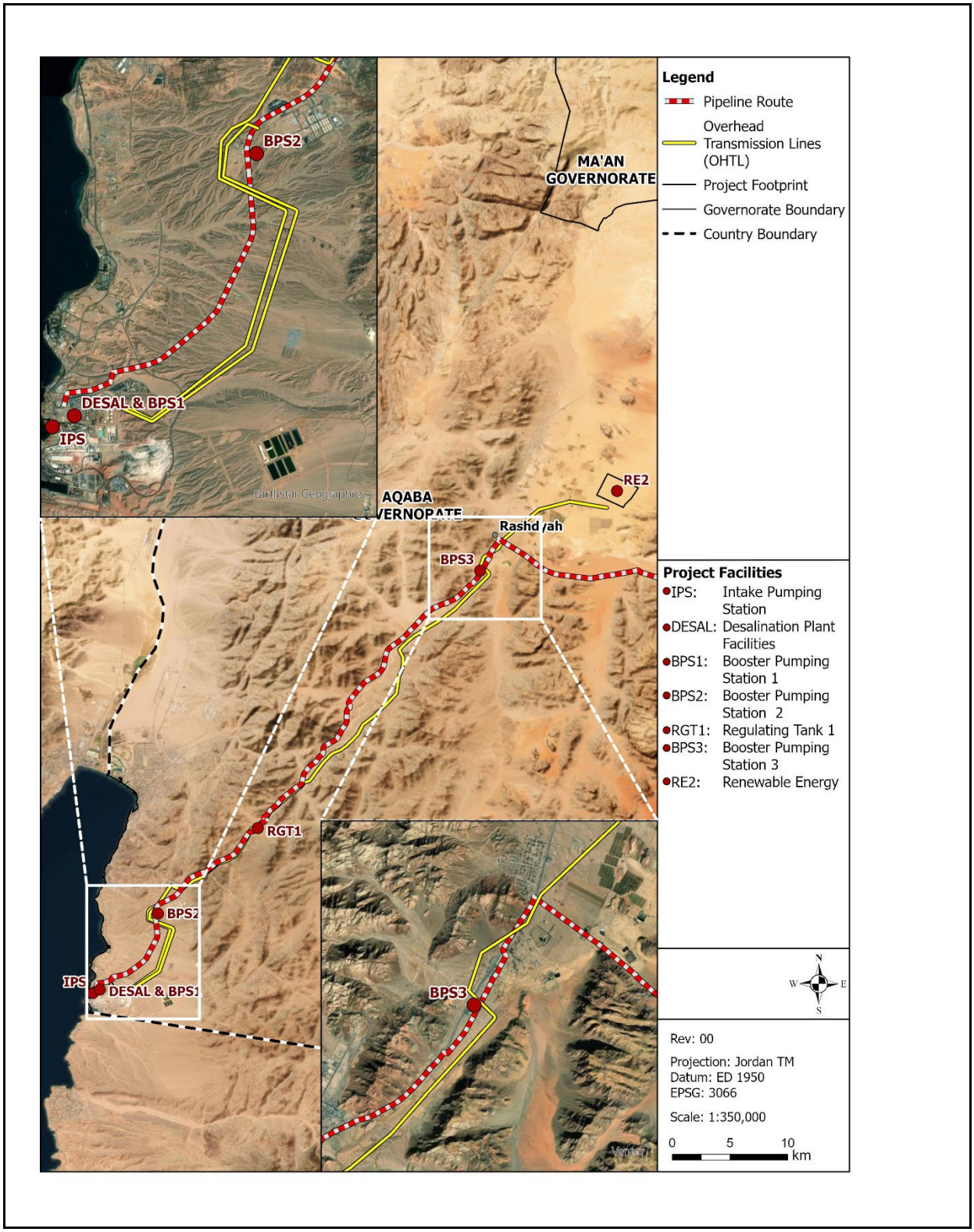
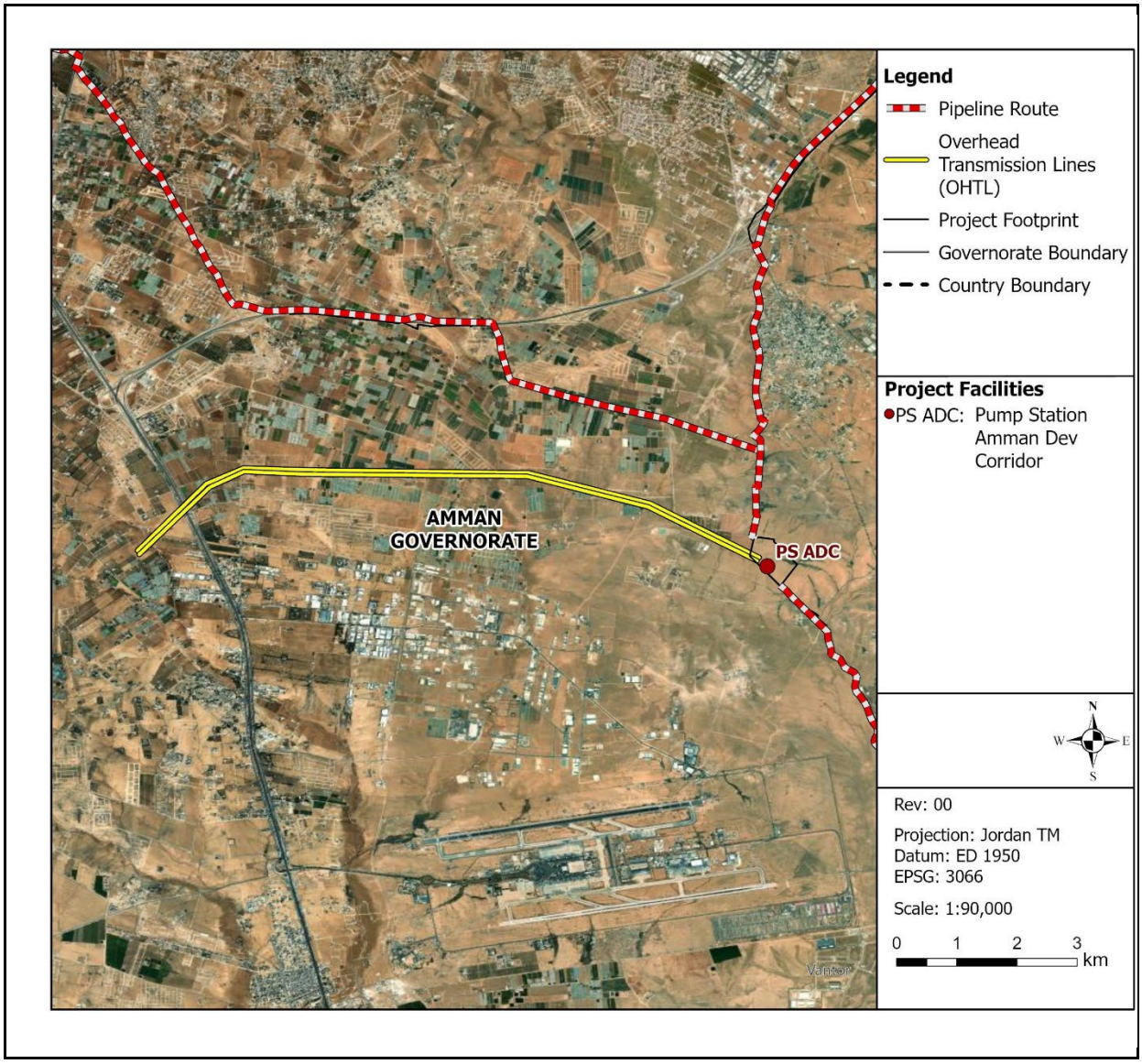


Figure 19: Current Routing of New OHTLs South Of Amman Connecting PS ADC to the National Grid



5.3 Construction

5.3.1 Intake and Outfall Facilities and Desalination Plant

5.3.1.1 Marine Construction Works

The intake lagoon will be excavated at the shoreline to a depth of - 4MSL. A temporary sheet-piled cofferdam may be required to prevent seawater ingress during excavation work, and a sediment curtain will be deployed around the perimeter of the lagoon construction work to prevent turbidity impacts on the adjacent nearshore waters. Revetment structures will be installed to stabilise the side walls of the lagoon and create a seawall defence on the seaward side of the lagoon.

Installation of the outfall will require trenching in the nearshore waters, to about 10m water depth. A five-metre-wide temporary jetty, constructed from imported aggregate, will be installed to allow

excavators access to the nearshore. Sediment curtains will be installed around the jetty and trenching area, until all turbidity generating activities are completed. All excavated material will be recovered to a temporary onshore storage location in compliance with AZEZA environmental and social requirements, before being used for backfilling. The temporary jetty will be removed once trenching and backfilling work is completed.

The outfall, along with the ballast weights, will be floated and towed before then sinking into final position within the pre-prepared trench or directly onto the seabed as appropriate. The diffuser will be assembled onshore and then towed via barge to its location and sunk into position.

The trench, in the nearshore area, will be backfilled to protect the outfall and overlaid with concrete mattresses on the seabed.

5.3.1.2 Intake Pumping Station and Transfer Pipelines Installation

Construction of the intake pumping station (IPS) will involve installation of retaining walls, foundations and a temporary cofferdam at the shoreline. Excavations to a depth of -10m will be followed by installing the concrete substructure and foundations for the pumping station pits which will eventually house the permanent intake pumps.

Groundworks, levelling and surfacing across the IPS plant areas will be undertaken followed by backfilling operations. The temporary cofferdam will be removed and the connections for the intake and outfall pipelines will be installed.

Construction works for the transfer pipelines between the IPS and Desalination Plant will comprise trenching of the pipeline routing using similar techniques and plant as used for the main conveyance pipeline, taking into account relevant operating constraints and space restrictions (see Section 5.3.2.1)

5.3.1.3 Desalination Plant Construction

For the Desalination Plant construction and installation activities it is envisaged that temporary service connections to municipal utilities will be made for the provision of power, water, sewage and telecommunications to the site. Pre-construction surveys will include geotechnical and topographic surveys. Mobilisation activities will include establishing access, safety and security arrangements.

Groundworks will commence with clearance and grading of the site, followed by excavations in areas intended to support structural loads. Trenching will be undertaken across the site for the installation of underground pipework and cabling as well as drainage ditches and channels.

Above surface construction will include the installation of permanent building structures for operational storage, maintenance, control and instrumentation, electrical plant, administration and welfare purposes. Desalination Plant equipment and system packages will be mechanically installed and connected followed by completion of electrical works on site and substation connections prior to testing and commissioning.

Road traffic associated with the desalination site construction will move to and from the site via the existing public highway and access roads. Access to the site is expected to be from the main Ports Highway to the west of the site.

5.3.2 Conveyance System

5.3.2.1 Conveyance Pipeline Construction Works

Pipeline construction will follow a sequential process and include a number of distinct operations. The works to construct the 438km pipeline will be broken down into manageable lengths called “spreads”. The spreads will consist of work teams carrying out different activities operating along a rolling work front.

Ahead of the main construction works, the exact pipeline route will be marked out and the working width of the route clearly signed and temporary fencing erected around active working sections. The working width for pipeline installation is determined by the space allocations required to access and safely install the pipeline, typically ranging between approximately 35m and 60m with wider working strips in the range of 50-100m in some unconstrainted areas to allow for access and materials storage and handling. In urban areas the minimum working width is limited to 18.5m, which is sufficient to safely accommodate a 100 ton crawler crane and the pipe trench.

Surfacing will be removed from the working strip. Consideration will be given to the value of vegetation for local grazing or other community use before clearance to assess whether any areas of high value can be left in-situ. The working strip will then be levelled using plant including graders and dozers.

The pipeline will be laid in a trench generally around 4m deep for standard pipelay conditions, excavated to the required depth using mechanical excavators or trenchers straddling or running alongside the pipeline trench. Trenching is forecast to progress at a rate of 300-500m per day in open/ rural areas and a slower rate of 100m per day in constrained and urban areas.

Pipe sections will be lowered into the trench, connected to form a string before being welded together using either manual welding equipment or automatic welding machines. Fibre optic cable conduits will also be installed alongside the pipeline. The pipeline trench will then be backfilled using screened material, as far as practicable, taken from the trench originally. Hydrostatic (pressure) testing will be carried out after backfilling of the pipes to check for any potential leaks (e.g. from faulty welds or cracked pipe) prior to commissioning.

The majority of the conveyance pipeline route (over 99%) will be constructed using the standard trenched pipeline installation methods described above. The pipeline route, however, crosses a number of roads, highways and highway intersections, wadis and railways.

Crossings of these features will either be carried out using trench “open cut” methods, where the pipeline trench would be excavated directly across the crossing feature, or as a trenchless crossing which minimises ground disturbance at the surface to cross beneath a feature. An estimated 2km of trenchless crossing using an auger bore at 53 separate locations is currently assumed.

5.3.2.2 Construction of Conveyance System Above Ground Installations (AGIs)

The construction of the Conveyance System AGIs at the locations for the four pumping stations, two regulating tanks and break pressure tank (BPT) will involve the same type of activities as described for the Desalination Plant construction, namely:

- Pre-construction surveys and mobilisation activities
- Groundworks, excavations and subsurface works
- Erection of permanent structures and mechanical and electrical works

5.3.3 Renewable Energy Facility

Prior to construction commencing, pre-survey activities, e.g. geotechnical surveys, will be carried out and the site will be securely fenced. Grading and levelling will be undertaken using excavators and bulldozers. Excavations will be carried out for concrete foundations including the transformer stations, whilst the foundations for the Solar PV modules and trackers will be installed as rammed piles using a pile driver or hydraulic hammer. Cabling works to connect the main electrical equipment across the site will require trench excavations. Once the cables have been laid, the trenches will be backfilled ahead of installation of the remaining electrical equipment and final cable connections.

Various site buildings will be constructed to support the day-to-day operations of the Solar PV plant with associated civil works to install building foundations (laying concrete slabs) and complete structural works and building fit out.

Site periphery and internal roads will be constructed to facilitate inspection and maintenance of the PV Solar Plant.

5.3.4 Associated Facilities

5.3.4.1 Overhead Transmission Lines Construction

Construction of the OHTLs including the OHTL between the RE Facility and the new NEPCO substation in Aqaba is NEPCO's responsibility and will commence with topographical and geotechnical surveys to establish a construction Right-of-Way (RoW) along the route. Clearance activities will provide construction access to the tower locations, equipment laydown and assembly areas and ensure permanent safe clearances for the future transmission lines.

At each tower site ground excavations and levelling will be undertaken for installation of the reinforced concrete foundations. The lattice-steel tower sections will be lifted into position using cranes or derricks and bolted onto the pre-installed foundations. Insulators will initially be attached to the tower arms, the conductors and the overhead earth wire then pulled into place and earthing system finally secured.

The completed line will undergo electrical testing before a final detailed inspection to verify that all clearances are met, and the RoW is fully clear. Upon certification by NEPCO, Overhead Transmission Lines will then be energised.

5.3.4.2 Substation Construction

Substations will be constructed at the IPS, BPS2, BPS3, PSADC and RE Facility locations and within a designated plot near to Desalination plant in Aqaba. In each location the area for the substation will be levelled and graded and foundations installed ahead of installation of buildings, structures and electrical equipment and cabling. Equipment will be tested and commissioned prior to commencement of operations.

5.4 Operations

The operational phase of the AAWDC Project will involve the production and delivery of potable water from the intake facilities at Aqaba to the Abu Alanda Reservoir 2 and Al Muntazah Reservoir in Amman.

The estimated operational power loads of the AADCWP facilities (in normal operation regime) are shown in Table 3 below. Annual power consumption of the Project Facilities (in kWh) is proportional to the loads

indicated below. The operations and maintenance of the AADWC Project facilities is expected to require approximately 100 staff.

Table 3: Operational Electrical Power Loads of the AADCWP Facilities

Project Facility	Electrical Power Load (MW)
Marine Works and Desalination Plant	126.4
BPS1	43.9
BPS2	51.5
BPS3	51.5
PSADC	26.8
Total	300.1

5.4.1 Intake and Outfall Facilities and Desalination Plant

5.4.1.1 Intake System

During operations, routine maintenance of the intake pumps and other mechanical equipment at the IPS will be undertaken. The seawater intake system is equipped with screens and a self-cleaning system that will generate waste during operation. The coarse 50mm mesh screen and associated fish-recovery device installed at the intake mouth will require cleaning to remove debris. Waste will be collected and disposed of at the approved waste management facilities, along with other waste generated during routine maintenance activities at the IPS.

5.4.1.2 Desalination Plant

Routine operations and maintenance will be supported by monitoring of plant performance on a regular basis to recognise when RO membrane elements are becoming fouled. The combination of the flushing, backwash and chemical cleaning-in-place (CIP) addresses potential fouling along with a maintenance programme to monitor the condition and effectiveness of the Desalination Plant filters and membranes.

Solid process wastes from water treatment will be transported via a typical containerised skip system to appropriate approved waste management facilities for disposal. Other wastes generated in the Desalination Plant will include spent cartridges from CIP cartridge filters, replaced RO membranes as well as miscellaneous office wastes and domestic wastewater.

Safeguards will be put in place to avoid overdosing of production chemicals and overfilling of process vessels and storage tanks. Any overflows will not be directed to the outfall.

5.4.2 Conveyance System

The Conveyance System operates by pumping and regulating freshwater flow rates to meet the daily or seasonal demand at the end user reservoirs. The entire system will be monitored and controlled from the main Control Centre (CC) located at the Desalination Plant.

A key operational requirement will be pressure management within the water network to maintain the integrity and lifespan of the steel conveyance pipelines and subsequently reduce the risk of leaks.

The chlorination system, required to maintain freshwater residual chlorine levels within specified limits, will be automatic based on measured existing residual chlorine levels and pumping station flow rates.

There are no specific routine process related waste streams anticipated from the Conveyance System AGIs. Staffing levels at Pumping Stations will be minimal and routine inspections along the pipeline RoW are expected to generate small quantities of domestic waste.

5.4.3 Renewable Energy Facilities

Routine operations at the Solar PV Plant will be highly automated via the Main Control Room (MCR). Maintenance activities will include periodic panel cleaning. The cleaning method is expected to be a water based (wet) washing system, whilst the Project is also considering a 'dry' cleaning system, using brushes or compressed air systems, to remove deposit build-ups on solar panels. There are no specific routine process-related waste streams anticipated from the RE Facilities. Staffing levels at the Solar PV farm will be minimal expected to generate only small quantities of domestic waste.

5.4.4 Summary of Waste, Discharges and GHG Emissions

Waste generated through the construction of AAWDC Project will comprise various non hazardous waste streams, bulk quantities of spoil that is either unsuitable for re-use or surplus and hazardous waste such as oils, paint, solvent and resin residues. A waste management plan will be prepared before the start of construction works to include a detailed inventory of wastes, estimation of quantities, and identification of management solutions in alignment with national regulations and Good Industry Practice (GIP).

In addition to the operational discharge from the desalination plant, effluents and discharges will primarily arise from drainage and runoff from Project areas (during both construction and operation), water used for hydrotesting and treated wastewater from construction camps.

During operations, waste will be primarily associated with maintenance activities and generated by the SWRO treatment processes. Waste management plans will be developed and implemented for operational waste streams which will include identification and quantification of anticipated wastes and approach to management.

Greenhouse gas emissions will be generated during both construction and operation phases. During construction sources include construction plant and equipment, vessels to support marine works, vehicles and temporary generators. Over the 4-year construction programme an estimated 111k tonnes CO_{2e} of GHG emissions is estimated.

During operations, direct emissions from the Project facilities will be minimal and limited to occasional use of diesel generators during emergencies and upsets, and the use of maintenance vehicles. Power will be routinely provided to the Project Facilities from the Project RE Facility and from Jordan's electricity grid. Total GHG emissions associated with the Project Operations phase, calculated using the International Finance Institutions (IFI) default grid emissions factor for Jordan and IFI harmonized GHG accounting methodologies, for the period of 2030 to 2055 are estimated as 19,640 ktonnes CO_{2e}. Taking into account the estimated power supplied from the RE facility to the grid, the contribution of the RE Facility enables the project to avoid, on average, 259.3 kt CO_2 per annum over the project lifetime.

6 Environmental Description

The baseline environmental conditions within the ESIA Study Area have been characterised following the completion of desktop studies, Rapid Field Assessment and stakeholder engagement and baseline terrestrial and marine biodiversity surveys. Terrestrial and marine critical habitat assessments have also been undertaken to identify biodiversity values which qualify as Critical Habitat (CH) or Priority Biodiversity Features (PBFs), as defined in the respective Lender Performance Standards (PSs) and Performance Requirements (PRs), in relation to the Project

6.1 Terrestrial Environment

There are five Protected, Designated or Proposed Protected Areas in Jordan that are within 10km of the Project. The Aqaba Proposed Reserve, the Qatar Nature Reserve, the Wadi Rum Protected Area and the Aqaba Coast and Mountains Key Biodiversity Area (KBA) are all located in the south of Jordan (refer to Figure 23), while the Madaba Hisban KBA is located in the north of Jordan.

The Gulf of Aqaba (GoA) is considered one of the most seismically active regions in the Middle East . The Conveyance Pipeline crosses various geological structures, including the south-eastern extension of the Ras en Naqab Fault, the Al-Hisa Fault, the Siwaqa Fault, and the Zarqa Ma'in Fault.

The topography from Aqaba to Amman transitions from low-lying coastal and rift valley terrain to rugged escarpments, high plateaus, hills and mountain highlands. The Project topography ranges from sea level at the Intake Pump Station (IPS) to approximately 1,000m above Mean Sea Level in Amman, where the existing Abu Alanda Reservoir (AAR) and Al Muntazah Reservoir (AMR) are located. In Qweirah, where the RE Facility is located, the terrain features a combination of rocky hills and sandy plains, with an average elevation of approximately 819 meters above Mean Sea Level.

The geology of the ESIA Study Area is dominated mostly by sedimentary rocks, with igneous rocks exposed in limited areas. Overall, the ESIA Study Area is characterised by calcareous and saline desert soils with localised fertile zones in the Madaba and Amman plains. In southern areas closer to Aqaba the soil is predominantly saline and sandy with very low fertility. In northern areas closer to Amman the soil is deep, fine-textured, non-saline and the most productive and stable for both agriculture and engineering.

The landscape surrounding the Desalination Plant area is industrial and includes the remnants of industrial buildings and structures that have previously been demolished. The Conveyance Pipeline route from the Intake Pumping Station (IPS) to Booster Pump Station 3 (BPS3) is surrounded by the granite mountains of Aqaba and from BPS3 to Regulating Tank 3 (RGT3) runs in the vicinity of the Wadi Rum, a unique landscape of scenic sandstone mountains divided by extensive open sandy valleys (Refer to Figure 20 for examples of landscapes at various Project locations). The area between Qweirah and the villages of Sallheiah, Shakriyye and Disi is a tourism zone with an open, sandy desert and large sandstone mountains.

Part of the Conveyance Pipeline route is within an agricultural area that has developed over the last 15-20 years on the silt plains between Disi, Sahl as Suwwan, and Al Mudawwara.

From RGT3 to the Desert Highway crossing and between Jurf Al-Darwish and Qatraneh is a desert region and from Qatraneh to Dhab'a is a semi-desert area that transitions between the desert and the Mediterranean region in the Amman governorate. The Al Muntazah reservoir features farms and urban areas whilst the Abu Alanda Reservoir is a heavily urbanised area in the southeast of Amman.

Figure 20: Landscapes at Various Project Facility Locations

Groundwater is the main source of water in Jordan, accounting for 60% of all uses and 76% of sources for drinking water. The current state of groundwater remains critical due to overextraction which has led to a significant decline in the water table within major aquifers. In the coastal areas of Aqaba, groundwater is fed by the discharge from the eastern mountains into the Gulf of Aqaba. Along the Wadi Yutum, the groundwater has been used for more than 50 years as a source of freshwater supply to Aqaba City.

From Shakriyye to Batn El-Ghul, the Disi aquifer is primarily used for domestic and agricultural purposes. From Disi in the west to Batn El-Ghul the groundwater can be used directly for drinking, except in the eastern parts of the proposed Pipeline route, where it requires aeration.

To the north of Al-Husayneyah through Qatraneh, and from Jizah to south Amman the aquifer is subject to heavy extraction for irrigation. The unconfined groundwater to the west of the Amman-Aqaba Highway is used for drinking purposes, although minor agricultural activities also depend on it.

Surface water resources of Jordan are very limited, highly seasonal and unevenly distributed. The ESIA Study Area does not include any perennial watercourses and features numerous wadis with intermittent flow as a result of intense rainfall during the rainy season.

Climate within the ESIA Study Area varies by location. The Aqaba governorate has a hot desert climate characterised by very low rainfall, abundant sunshine, and large seasonal and daily temperature ranges.

The Ma'an governorate has a largely arid, desert climate, with extremely low rainfall, with hot summers and cool winters due to its elevation and inland location. The Tafiela governorate is situated at a relatively high elevation (~1,000 m) compared to many parts of Jordan, which influences its climate to be cooler than that of lower desert areas. Climate in Karak is similar to that of Tafiela and Ma'an governorates.

The Amman governorate is situated on the East Bank Plateau of Jordan, at elevations ranging from ~700 to 1100 meters above sea level, which moderates temperatures compared to the lowland desert areas.

Much of the ESIA Study Area is formed of predominantly desert-like habitats, as such, these regions do not typically experience significant air pollution, which is often associated with urban or industrial settings. The primary air quality concern in these areas arises from particulate matter, which is naturally generated due to the desert conditions and can be exacerbated by frequent dust storms.

The Conveyance Pipeline is adjacent to roads, the existing Disi Water Pipeline or a combination of both for most of the overall 438 km route. The pipeline is adjacent to greenfield areas for approximately 10% of the overall route mostly in Aqaba Governorate, for 18.8 km, to the south of Diesah and in Amman Governorate, for 16.2km, to the south of PS ADC. A smaller portion of the route, 6.9km, in the south of the Ma'an Governorate is also adjacent to greenfield areas.

6.1.1 Baseline Biodiversity Surveys

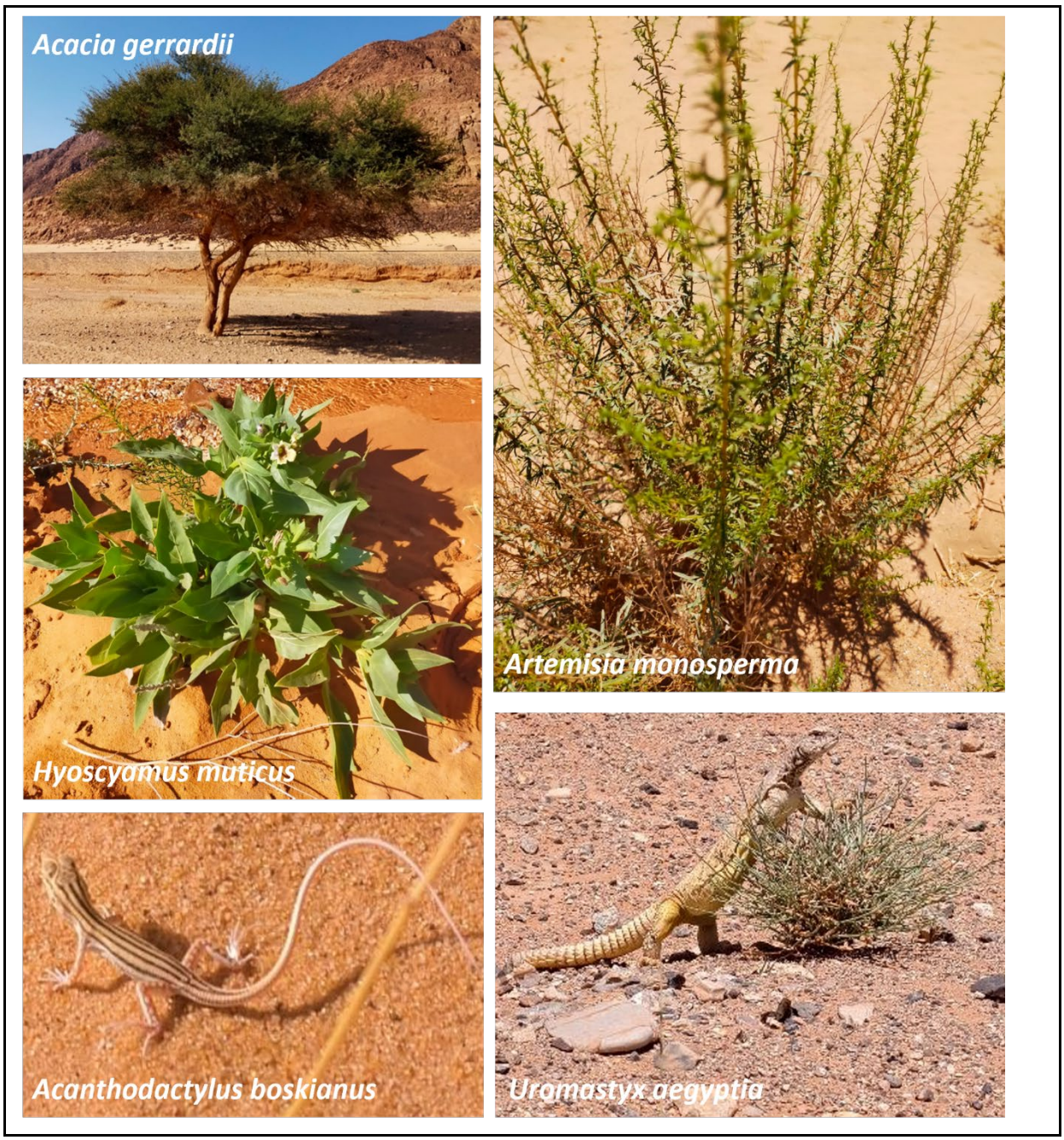
6.1.1.1 Terrestrial Flora and Fauna Surveys and Habitat Summary

The ESIA consultants commissioned national fauna and flora experts to survey local flora and fauna in July and August 2025. The Conveyance Pipeline route from the Port of Aqaba up to the two existing reservoirs in Amman was surveyed on both sides for approximately 100m, with a light visual search up to 1 km on both sides of the route. Habitat features of interest were selected for more detailed study during the Terrestrial Baseline Survey.

Several desert-adapted plant species, including shrubs and flowering plants that are nationally classified as Endangered, Vulnerable, or Near Threatened were recorded, with some found to be relatively common within their specific segments of the survey area (Refer Figure 21 to below).

Documented fauna included one globally and nationally Vulnerable mammal, the Nubian Ibex (*Capra nubiana*), which was recorded on a single occasion. A suspected burrow of a globally Vulnerable and nationally near threatened reptile, the Egyptian Spiny-tailed Lizard (*Uramastyx aegyptia*), was also documented in two surveyed segments.

Figure 21: Examples of Terrestrial Flora and Fauna within the Project Area



6.1.1.2 Baseline Avifauna Survey

Avifauna (bird) surveys, carried out during the spring and autumn 2025, focused primarily on the overhead transmission line (OHTL) route, which was considered to pose the greatest risk to birds, as OHTLs are known to cause mortality through electrocution and collisions. Additionally, part of the OHTL overlaps a Key Biodiversity Area (KBA), the Aqaba Mountains and Coast KBA (See Figure 23), designated specifically due to the high numbers of the migratory Levant Sparrowhawk (*Accipiter brevipes*).

Jordan is part of the Rift Valley/Red Sea migratory flyway, which is one of the most important routes in the world for migratory soaring birds (MSB), such as raptors, storks and pelicans. The southern portion of the Project area overlaps the Aqaba Mountains and Coast KBA which is an important area for soaring bird migration, especially during spring. Some of the species that occur in the area (Steppe Eagle, the Levant Sparrowhawk and the Sooty Falcon) can potentially trigger critical habitat (Refer to Figure 22 below). Levant Sparrowhawk and Sooty Falcon are relatively small and agile birds of prey that can be considered low risk regarding transmission line impacts. However, the IUCN Red listed Steppe Eagle (*Aquila nipalensis*), which was detected in high numbers in the study area, is known to suffer from collisions and electrocutions (more frequently in distribution lines).

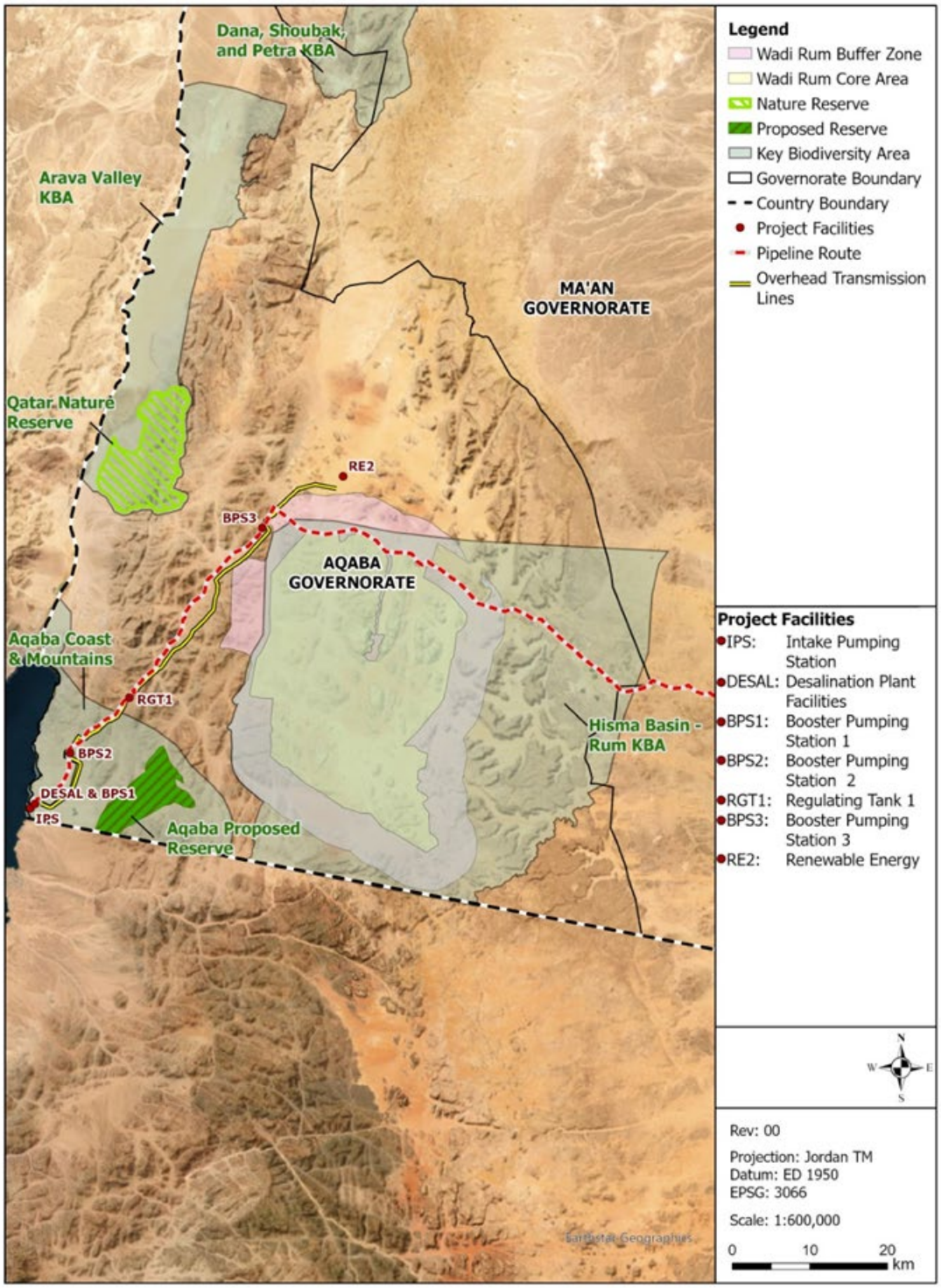
Another species that is also likely to trigger critical habitat is the Syrian Serin, but impacts on this species transmission lines are unlikely to be significant.

Figure 22: Steppe Eagle (*Aquila nipalensis*) and Levant Sparrowhawk (*Accipiter brevipes*)

6.1.1.3 Terrestrial Critical Habitat Assessment Summary

Critical Habitats (CH) are high biodiversity values (i.e., species, habitats or ecosystems), that meet one or more of the criteria specified by lender policies and guidance. The CH process for the terrestrial environment initially identified a total of 702 biodiversity values through CHA screening with 33 taken forward into the CHA process. This process determined CH status for 7 biodiversity values (3 confirmed and a further 4 possible candidates) and identified 14 as PBFs (see Table 31 for further detail).

Figure 23: Protected and Other Designated Areas within or near Ma'an and Aqaba Governorates



6.2 Marine Environment

The Project is located within the Jordanian sector of the GoA, within the Red Sea region, an area known globally for its high biodiversity value. The closest distance between the Project infrastructure and the boundary of the nearest protected area (the Aqaba Marine Reserve (AMR)) is approximately 2.5km (refer to Figure 24).

The Aqaba Marine Reserve (AMR) spans 7km of the Jordanian coast and supports over 150 coral and 500 fish species. Coral reef ecosystems form part of the Red Sea biogeographic zone, recognized by the World Wide Fund for Nature (WWF) as a Global 200 Eco-Region for its outstanding ecological significance and unique coral diversity. The reserve also features four public beaches, including the Blue Beach, which holds multiple Blue Flag certifications.

The ESIA Study Area, including the Conveyance Pipeline route from IPS to RG3 falls within the jurisdiction of Aqaba Special Economic Zone Authority (ASEZA). The ASEZ industrial facilities and infrastructure are shown in Figure 25.

Fertilizer, chemical and LNG facilities also abstract seawater for industrial purposes (understood to be for use within closed loop cooling systems) and subsequently discharge it in proximity to the Project intake and outfall.

The Port of Aqaba is Jordan's only seaport which handles over 50% of Jordan's trade by volume and is the primary gateway for imports and exports of Jordan's key commodities (phosphate, potash and chemicals). The Port is operated as a multi-terminal port complex with 12 terminals operating on a 24-hour, 7-day-a-week basis.

The GoA provides Jordan's sole maritime trade route. It serves as a transit hub, connecting Asia–Europe shipping lines via the Suez Canal, and supporting regional logistics corridors that link Jordan, Iraq, and Saudi Arabia.

Jordanian fishery resources are limited, contributing less than 0.01% of Jordan's GDP. Fishing activities along the Jordanian coast of the GoA are primarily artisanal and small-scale, representing a traditional livelihood.

Aqaba is Jordan's sole coastal city, serving as both a port and a resort destination. The city has been heavily promoted for tourism, especially for marine activities (notably diving), beach life, coral reefs and as a base for exploring nearby desert and historical sites. Together with Wadi Rum and Petra, Aqaba forms the tourism "Golden Triangle" of Jordan's most visited destinations.

The Gulf of Aqaba's maritime history encompasses Nabataean, Roman, Islamic, and Ottoman phases. Modern archaeological investigations have focused primarily on the terrestrial remains of ancient Aqaba, while the submerged cultural landscape offshore remains largely un-investigated. No confirmed marine archaeological sites are currently recorded within the immediate footprint of the proposed intake and outfall pipelines.

Figure 24: Protected, Designated and Recognised Sites within Northern Gulf of Aqaba

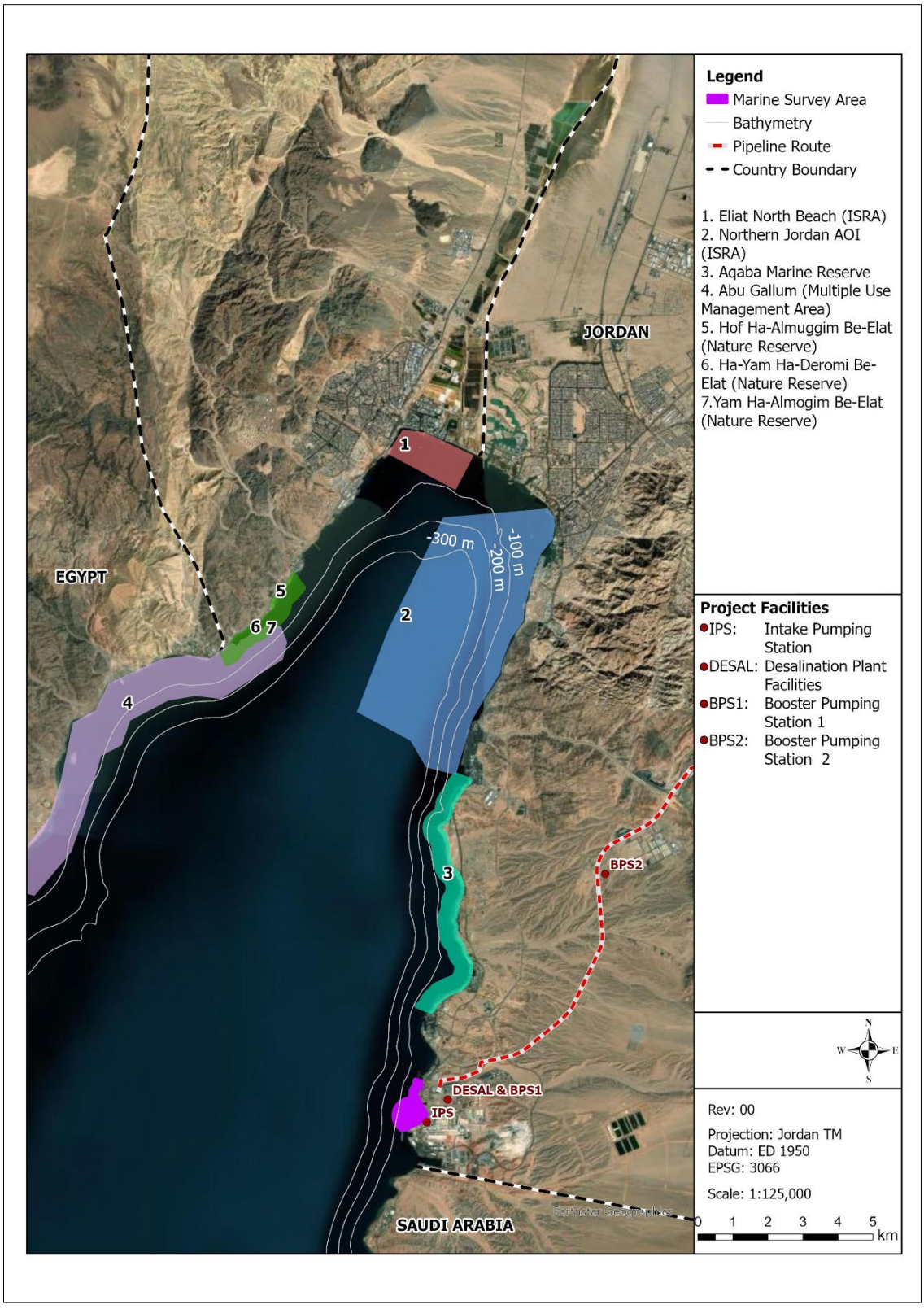
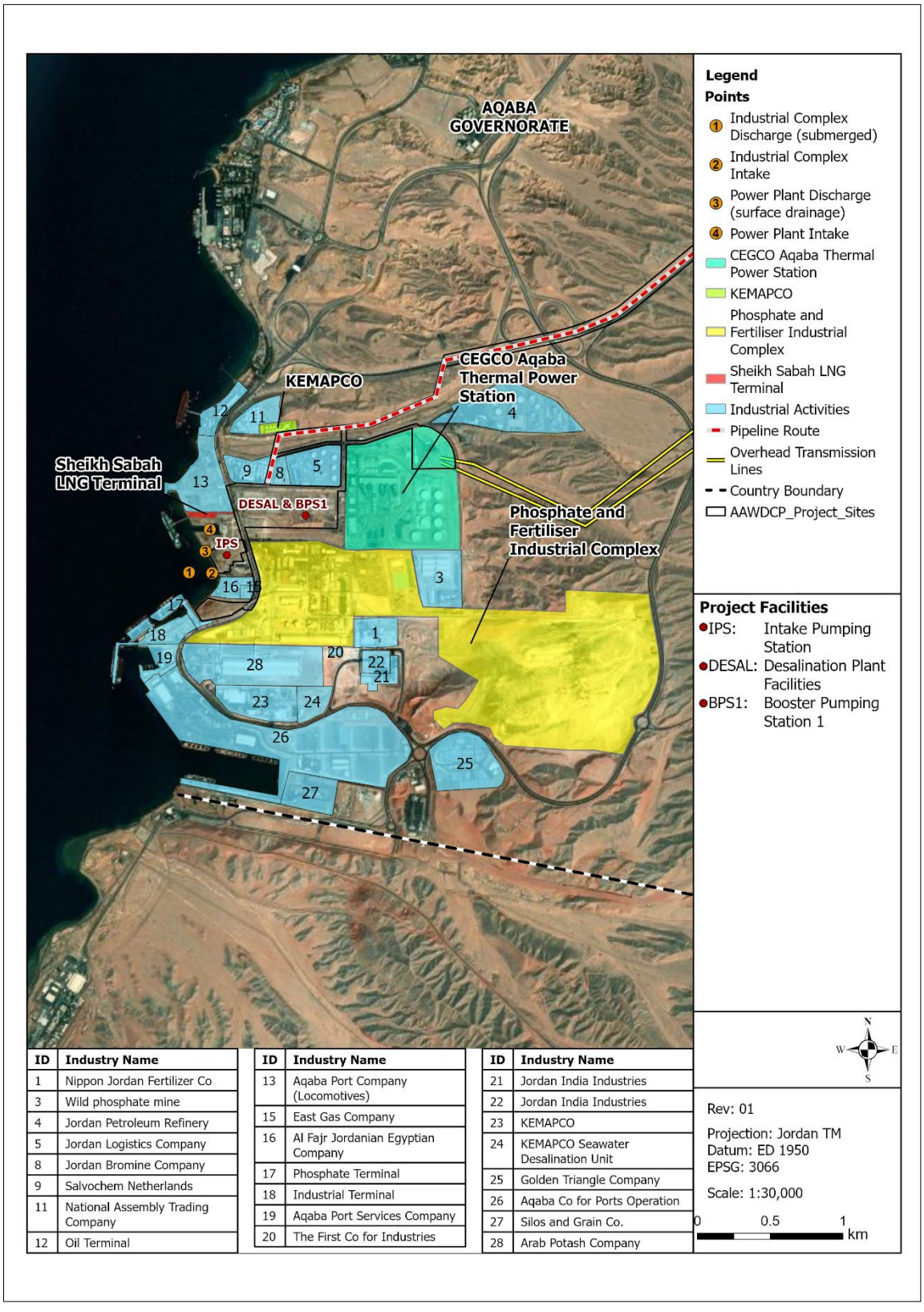


Figure 25: Industrial Facilities and Infrastructure within the ESIA Study Area



ID	Industry Name
1	Nippon Jordan Fertilizer Co
3	Wild phosphate mine
4	Jordan Petroleum Refinery
5	Jordan Logistics Company
8	Jordan Bromine Company
9	Salvochem Netherlands
11	National Assembly Trading Company
12	Oil Terminal

ID	Industry Name
13	Aqaba Port Company (Locomotives)
15	East Gas Company
16	Al Fajr Jordanian Egyptian Company
17	Phosphate Terminal
18	Industrial Terminal
19	Aqaba Port Services Company
20	The First Co for Industries

ID	Industry Name
21	Jordan India Industries
22	Jordan India Industries
23	KEMAPCO
24	KEMAPCO Seawater Desalination Unit
25	Golden Triangle Company
26	Aqaba Co for Ports Operation
27	Silos and Grain Co.
28	Arab Potash Company

Underwater Environmental Conditions

The coastal area of the ESIA Study Area is mainly a rocky reef structure. The bottom slopes steeply from east to west dropping into deep water and gently slopes from south to north. The northern side accommodates a Gas Pipeline laid in a sandy valley and the southern side is adjacent to a Phosphate and Fertiliser Terminal, where the seabed is mostly composed of rubble from damaged corals.

The National Monitoring Program (NMP) (MSS, 2024) found that the GoA remains a relatively well-preserved and ecologically significant area; however, increasing human activities and potential effects of climate change are beginning to impact the health of the marine environment. The marine environment is characterised by high salinity, warm temperatures, nutrient-poor conditions, steep depth gradients, and complex seabed habitats predominantly comprising coral reefs, seagrass beds, and sandy sediments that support rich biodiversity in terms of coral, fish and other seabed species.

Monitoring has been conducted nearby the proposed Project inlet and outfall infrastructure since the late 1990s. A recent comparison of coral cover in this area showed no significant difference year-on-year between 2013 and 2021 (MSS, 2021) and surveys of coral in 2024 found high coverage with low mortality. Several endangered or vulnerable Coral reef-associated fish species are found with the GoA including the AMR. The GoA and the northern Red Sea also forms a globally significant marine ecosystem for marine megafauna, i.e., marine mammals, marine turtles and large elasmobranchs (sharks, skates and rays).

6.2.1 Marine Baseline Biodiversity Surveys

In 2025 a screening survey of benthic habitats was conducted in the vicinity of the Project, utilising ROV technology, drop-down video, and diver surveys which aimed to identify and classify major seabed types and generate habitat distribution maps to inform subsequent detailed sampling and environmental assessments.

The survey results confirmed a fringing-reef system with habitats ranging from seagrass meadows and patchy coral in shallow water to well-developed coral reefs on the mid-slope, and mixed coral-sediment habitats that transition to sandy seabed at depth (see Figure 26 and Figure 27). The highest coral abundance occurs in the shallows at 10-15m. Abundance then declines with depth which is expected of reef habitats when light availability shapes coral zonation. A significant proportion of coral species recorded during the survey are identified on the IUCN Red List of threatened species.

Figure 26: Distribution of Marine Habitats within ESIA Study Area

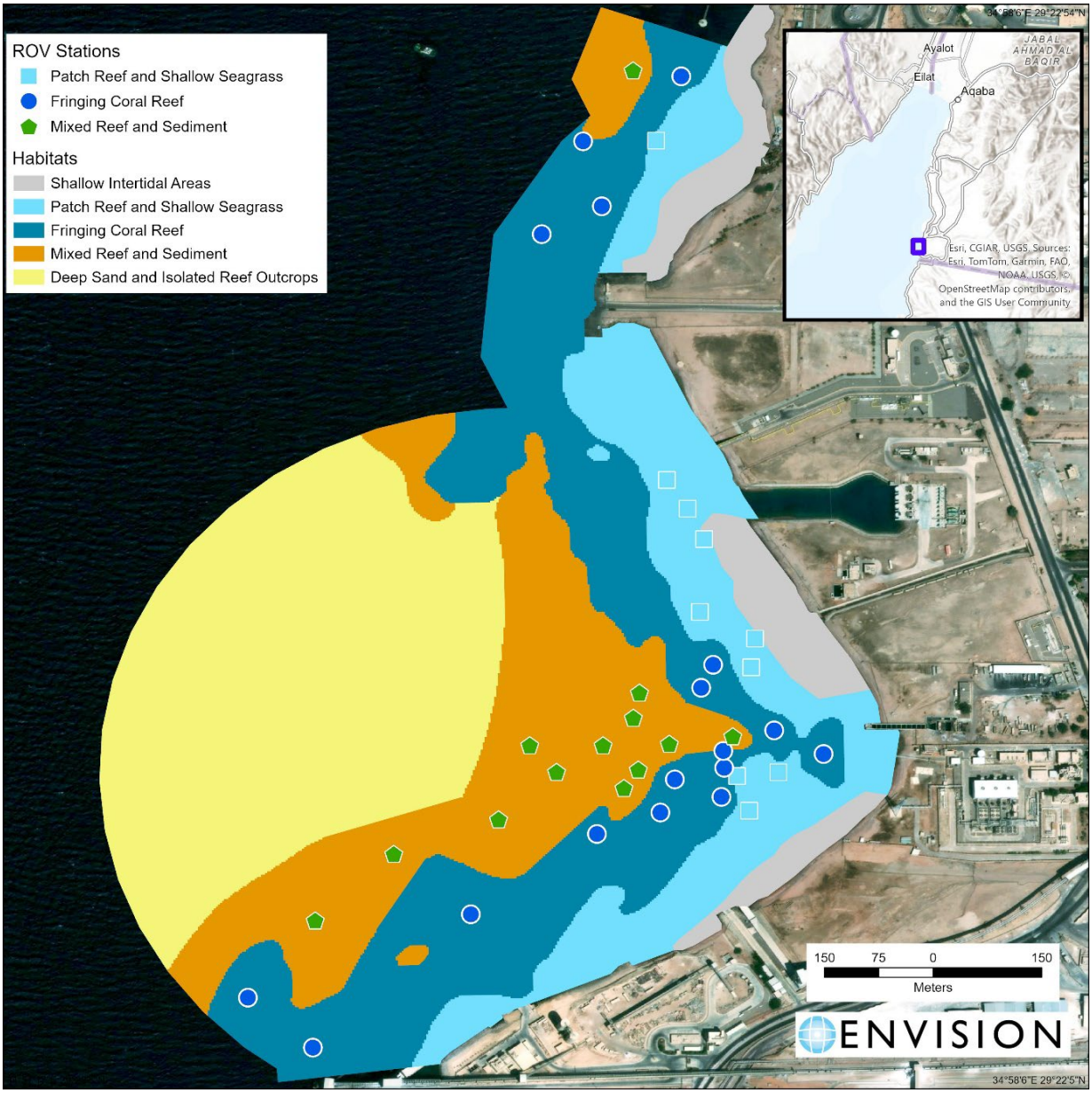
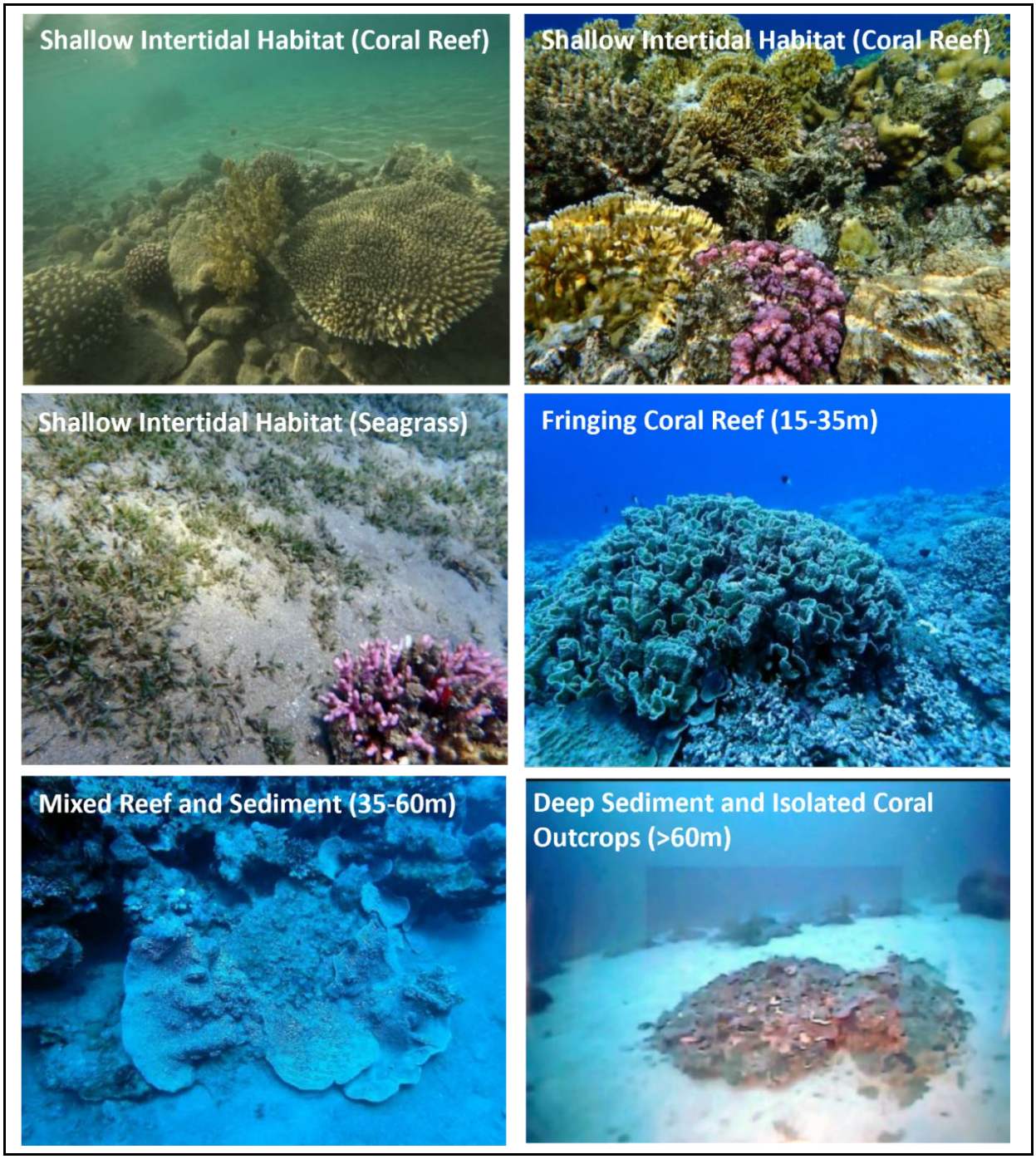


Figure 27: Examples of Shallow Intertidal, Fringing and Deeper Water Coral and Seagrass Habitats



6.2.1.1 Marine Critical Habitat Assessment Summary

The CH process for the marine environment was completed as initially identified a total of 213 biodiversity values through CHA screening with 92 taken forward into the CHA process. This process determined CH status for 6 biodiversity values and identified 13 as PBFs (see Table 27-Table 30 for further detail).

7 Socio-Economic Description

7.1 Introduction: Approach and Methodology

The purpose of the social baseline is to provide an understanding of the social, economic and political environment of the Project context, as well as contextualise the feedback received from stakeholder engagement, to ultimately enable the assessment of potential Project impacts and development of appropriate mitigation measures.

The social baseline Study Area is defined as the geographic area within which AAWDC Project activities may generate social impacts, primarily along the Pipeline route between the Aqaba Special Economic Zone (ASEZ), up until the water storage reservoirs at Abu Alanda and Al Muntazah in Amman, as well as the areas associated with the Desalination Plant site, the overhead transmission line (OHTL) and the proposed RE Facility site. The focus of social baseline data collection and stakeholder engagement have been on:

- The towns, villages and settlements within the ESIA Study Area, where construction-related impacts are most likely to occur (see Table 4). This includes residences, businesses and municipal services and infrastructure. Listed towns, villages and settlements generally lie within 10km of the Project components anticipated footprint
- Land users within the ESIA Study Area, who are most likely to experience land access and construction-related impacts (e.g. Bedouin herders, farmers)
- Bedouin representatives of tribes and clans who may consider that the ESIA Study Area overlaps with their customary tribal lands
- Districts, sub-districts and municipal authorities and representatives from the towns, villages and settlements within and adjacent to the ESIA Study Area

The social baseline is based on qualitative research from the following data sources:

- Primary qualitative data collection undertaken between September and October 2025, involving:
    - 95 key informant interviews with former local government officials, local residents, business owners, farmers, farm labourers, herders, Bedouin community respected people
    - 35 focus group discussions, with local women residents, local male youth residents, women herders, male herders, community-based organisations (CBOs), and marine users' representatives
    - 30 group interviews with district, sub-district and municipal officials and documentation of relevant feedback during larger community and stakeholder meetings
- Local baseline data derived from seven larger stakeholder engagement community meetings
- Field observations from several visits between September and October 2025 to all the towns and villages located in or near to the Project footprint, including casual conversations with local residents and land users along the Pipeline route
- A social infrastructure observational study carried out along the entire Conveyance Pipeline route in June 2025

- Review of secondary sources, including academic texts, news and media sources, official demographic data, legal documents, and reports from Government, non-governmental organisation (NGO)s and international organisations

7.2 Overview of the Project Social, Economic and Political Context

The Project, including the 438km Conveyance Pipeline, covers an area that stretches across the five Governorates of Aqaba, Ma'an, Karak, Tafiela and Amman, crossing through eleven districts, seven sub-districts, and either through or near to more than 47 towns and villages.

The ESIA Study Area is largely situated in the Southern Badia and the Central Badia, which are the desert and arid areas of the Jordanian territory. Within these Badia areas, the large majority of the population are of Bedouin heritage, largely living in settled towns and villages. In the Aqaba areas south of the Badia and Amman urban areas north of the Badia, the local population can be characterised as a settled urban population made up of a diversity of livelihoods and heritages.

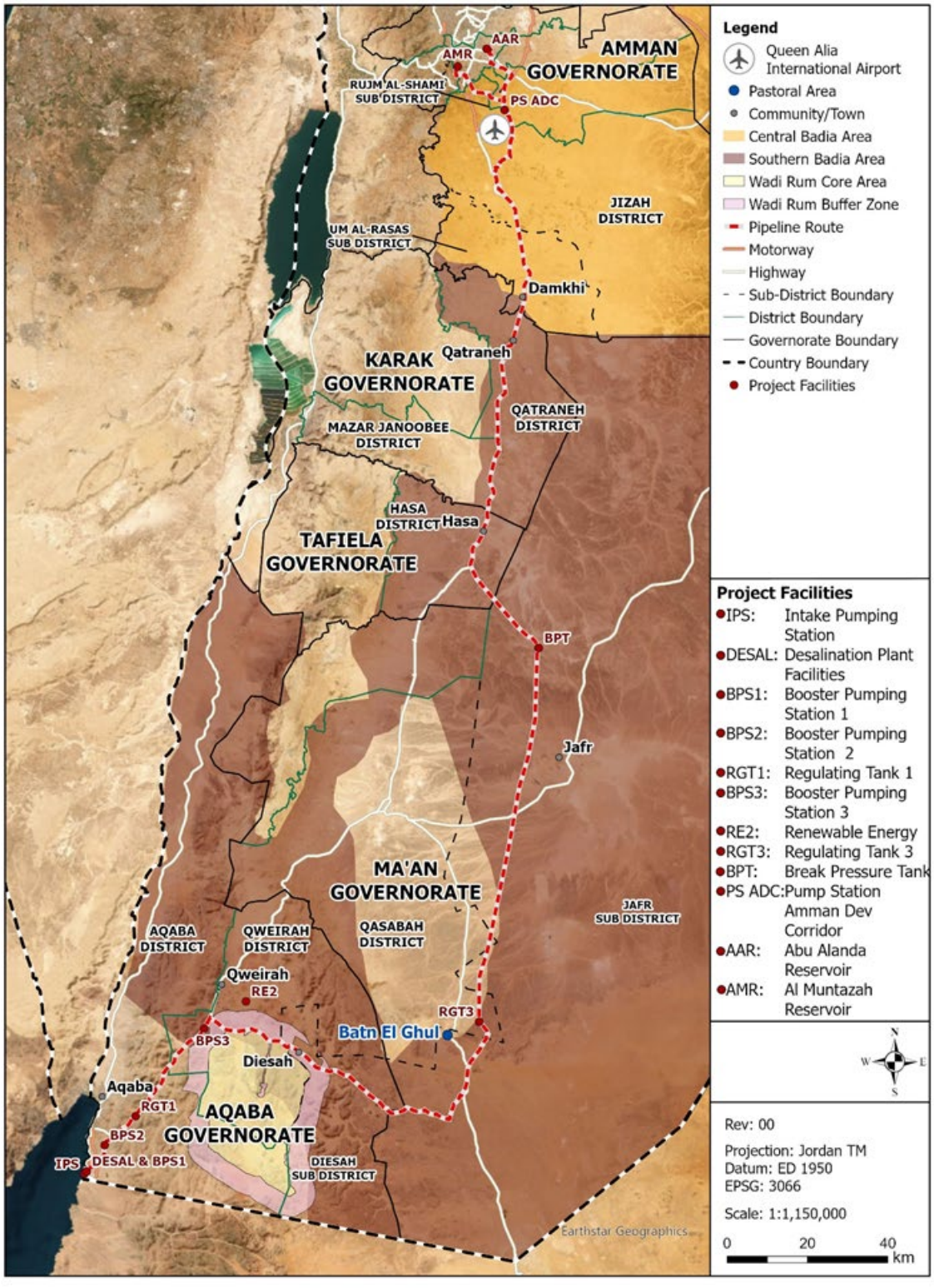
Table 4 outlines the relevant governorates, districts, sub-districts and towns/and villages in the ESIA Study Area. Figure 28 presents an overview of the social and administrative context of the Project.

Table 4: Administrative Divisions and Settlements within the ESIA Study Area

District	Sub-District	Municipality	Towns/Villages
AQABA GOVERNORATE			
AQABA		ASEZA	Aqaba, Mezfer, Al-Mamlah (resort)
QWEIRAH		Qweirah Al-Jadedah Municipality	Um El-Basatien, Sallheiah , Rashdyah, Shakriyyeh, Qweirah
	Diesah Sub-District	Hud Al-Diesah Municipality	Diesah, Taweel, Twaiseh, Mnaishier, Ghal
MA'AN GOVERNORATE			
QASABAH	Jafr Sub District	Jafr Municipality	Jafr, Shadeiah, Abu Amoud
TAFIELA GOVERNORATE			
HASA		Hasa Municipality	Hasa, Jorof
KARAK GOVERNORATE			
MAZAR JANOOBEE			Fraifrah
QATRANEH		Qatraneh Municipality	Qatraneh
		Al-Sultani Municipality	Al-Sultani, Wadi Abyadh
AMMAN GOVERNORATE			
JIZAH		Um Rasas Municipality	Damkhi, Swaqa, Abu Al-Hasani
	Um Rasas Sub District	Al-Amiriyah Municipality	Zmaileh, Khaldieh, Ḍabʿah
		Jizah Municipality	Areinbeh Al-Sharqiyah, Al-Sayfiyah, Al-Qunaitirah , Al-Mushatta, Al-Tuneib, Qiba'a
MOWAQQAR		Mowaqqar Municipality	Dhaibeh Al-Sharqiyah

District	Sub-District	Municipality	Towns/Villages
	Rujm Al-Shami Sub District	Rujm Al-Shami Municipality	Rujm Al-Shami , Ktaifeh, Dhaibeh Al-Gharbiyah
SAHAB		Sahab Municipality	Sahab
AL-QWEISMEH	Al-Qweismeh, Abu Alanda, Al-Juwaideh, and Alrajeeb	Greater Amman Municipality (GAM)	Ghamadan, Yadoodeh, Abu Alanda, Al Maghaba Al Sharqi, Alrajeeb
	Khraibet Al-Souq, Jawa, and Yadoodeh		Ḥayy Abu Sowaneh
NA'OOR	Um El- Basatien Sub District	Um El- Basatien Municipality	Hayy Um El-Kindam Hayy Al-Amal

Figure 28: Project Administrative Context



From a socio-economic and political and spatial perspective, the ESIA Study Area can be grouped into the following Project areas.

7.2.1 Aqaba and Coastal Areas

The Project begins within the Aqaba Special Economic Zone (ASEZ), where the Desalination Plant will be located in the southern industrial and port area. ASEZ is managed and overseen by the Aqaba Special Economic Zone Authority (ASEZA) and includes the city of Aqaba, the coastal areas and the southern industrial and port zones. The area's economy is shaped by tourism, maritime services, logistics, port activities and trade, underpinned by ASEZA's mandate to position Aqaba as an investment-and-development hub. Coastal tourism, diving and beach resorts along the northern shoreline are significant sources of employment, alongside small-scale fisheries and maritime operators who rely on healthy marine ecosystems for their income.

Labour market statistics indicate that Aqaba Governorate recorded the lowest unemployment rate nationally in 2024 at 17.3%, though unemployment rates among women and youth are higher. The Governorate also hosts a high prevalence of foreign workers, especially in industrial, port and logistics operations, which contributes to a dynamic but complex labour environment with strong demand for skills and a diverse workforce. Local livelihoods and economic activities in this area are therefore strongly dependent on preserving marine ecosystems, maintaining tourism attractiveness and ensuring that future industrial projects contribute to rather than undermine coastal economic opportunities.

7.2.2 Qweirah District & Diesah Sub-District & Wadi Rum

From the Desalination Plant location, the Conveyance Pipeline and OHTL route runs north roughly parallel to the Desert Highway (Highway 15), which is the major transport corridor linking Aqaba to Amman and serving the southern and central Badia. The Qweirah District boundary at the village of Mezfer lies approximately 30–35km north of the Aqaba port and industrial zone,and marks the beginning of the Southern Badia. Qweirah town is the administrative centre of Qweirah District.

The Pipeline route runs through Qweirah District and turns east off the Desert Highway at Um El-Basatien village, entering the Wadi Rum UNESCO World Heritage Site (see Section 7.10 below for more detail) and passing near to several villages within the of the Wadi Run Protected Area (WRPA) buffer zone before reaching Diesah town, which is the administrative centre of Diesah Sub-District. The Wadi Rum UNESCO World Heritage Site is a globally significant protected landscape and major domestic and international tourism destination.

Four villages within the ESIA Study Area fall under the Qweirah Municipality, while four villages located in the Wadi Rum area fall under the Diesah Municipality. The proposed RE Facility and the OHTL will be located to the east of Qweirah town. Large parts of this District, including areas outside municipal boundaries and the Wadi Rum UNESCO World Heritage Site, remain under the jurisdiction of ASEZA. Tribal and clan affiliations also play an important role in local representation and community organisations in the towns and villages in the wider area.

Overall, the economy of this area is rooted in a combination of tourism, agriculture, and pastoral livelihoods. The Wadi Rum UNESCO World Heritage Site is a major domestic and international tourism destination, supporting a range of commercial camps, guiding services, jeep tourism, and hospitality businesses. Agricultural activities are also significant and vary in scale — ranging from large privately owned farms (such as the Wadi Rum Corporation holdings) to medium-sized holdings and household-level cultivation. Many households in the Qweirah area have vegetable gardens or olive plots, although water scarcity has increasingly constrained production. Livestock herding remains a central livelihood,

especially for Bedouin households, with pastoral activities forming part of flexible, seasonal income strategies.

Stakeholder feedback from interviews and focus groups in the area has highlighted how tourism is increasingly recognised locally as the most economically transformative opportunity and a major source of local revenue, and there are concerns that construction activities could disrupt tourism operations or affect the environmental and visual quality of the landscape. Feedback also highlighted that local tourism operators and businesses in Wadi Rum have experienced prolonged economic strain in recent years, following the dual shocks of the COVID-19 pandemic and regional instability. These events led to a sharp decline in visitor numbers and tourism revenues, and the sector is only now beginning to show signs of gradual recovery.

Despite these diversified livelihood sources, poverty and unemployment remain high and is particularly acute among women and youth. Both Diesah Sub-District and Qweirah District are formally identified as poverty pockets (a district where the percentage of individuals below the absolute poverty line exceeds 25% of the total population of the district). These economic vulnerabilities shape stakeholder expectations and feedback from engaged local stakeholders in the area reveal high expectations that national projects such as AAWDC should create concrete local economic opportunities—either through employment, vocational training and contracting opportunities—or through funding for sustainable livelihood projects.

7.2.3 Jafr Sub-district in Ma’an Governorate

Moving eastwards from Diesah Sub-District, the Conveyance Pipeline route follows the main road towards Jafr Sub-District in Ma’an Governorate. The route then intersects the Disi pipeline infrastructure before turning north. From here, the alignment largely follows the same general route as the Disi pipeline, veering east off the road just south of the Batn el-Ghul area. Batn el-Ghul is a wide valley with historic significance linked to the Arab Revolt and the old Hejaz railway, and remains a seasonal grazing area, particularly during the autumn and winter months when nomadic and semi-nomadic Bedouin herders can move into the area.

North of Batn el-Ghul, the Conveyance Pipeline route continues off-road through the Southern Badia sparsely populated desert landscape before approaching the wider vicinity of Jafr town (located around seven kilometres to the east of the route). In the areas near Jafr, there are irrigated farms (from groundwater sources) alongside the Conveyance Pipeline route, and semi-nomadic and nomadic Bedouin herders, are commonly encountered across the surrounding landscape during the autumn and winter grazing period. These agricultural enterprises mainly cultivate fodder crops such as barley and alfalfa and are farmed through lease agreements where farmers pay nominal annual fees to the State. Compared to household-scale farming in parts of the Wadi Rum basin, pivot farming in Jafr (irrigated farming based on groundwater pumping) tends to be more capitalised and commercially oriented, with access to machinery, hired labour (often foreign), and established supply chains.

Despite this, the wider Jafr Sub-District is characterised by longstanding socio-economic vulnerability. Official poverty pocket assessments by the Ministry of International Planning have described Jafr as facing fragile economic and development conditions, with most households reliant on public sector employment, national aid programmes, and subsistence pastoral livelihoods. Private sector investment is limited due to weak purchasing power, remoteness from markets, and inadequate transport infrastructure.

Tribal and clan affiliations continue to play an important role in local representation and community organisations in Jafr and villages in the wider area.

7.2.4 Along the Desert Highway Through Hasa, Qatraneh and Jizah Districts

The Conveyance Pipeline route rejoins the Desert Highway corridor just east of the town of Jorof, and south of the town of Hasa. From then onwards it follows the Desert Highway corridor through and near to several towns, including the administrative district centres of Hasa and Qatraneh, and the town of Damkhi, and near to various villages and industrial facilities. As the route moves north, settlement density gradually increases, with more established towns, roadside commercial activities, services, and increasing numbers of agricultural enterprises. Some areas in this section of the route include settled herding households in addition to mobile pastoralism. The population of these districts is socially diverse, reflecting the area's role as an industrial and transport hub. The presence of the Jordan Phosphate Mines Company, one of the largest mining enterprises in the country, has attracted workers from various regions across Jordan, creating a socially mixed community that includes families from the local Bedouin tribes, as well as people from other governorates. Tribal relations and family networks continue to play an important role in local governance and community cohesion in the towns (Jorof, Hasa, Qatraneh, Damkhi) and villages in the wider area.

The economies of Qatraneh and Hasa Districts are shaped by their strategic location along the Desert Highway, linking Aqaba with Amman. The accessibility of land and direct connectivity to the national transport corridor has attracted industrial investment, positioning Al-Qatraneh in particular as a developing industrial and agricultural hub in southern Jordan. The local economy is characterised by major industrial enterprises in the broader area such as poultry, cement, gypsum and phosphate industries, roadside commerce and transport services linked to the Desert Highway corridor, providing basic goods, repair services, and retail trade for travellers and local residents, and employment in education, municipal services, and the army. The area also has various medium and large-scale irrigated farms producing grapes, vegetables, and fruit trees, and many of these enterprises are commercial in nature and employ seasonal or migrant workers during planting and harvest periods. Pastoral livestock production continues to extend into the eastern desert through settled, semi-nomadic and nomadic herding practices.

Despite these assets, structural challenges remain in integrating the local workforce into these industrial activities, with most skilled and managerial jobs in industry filled by labour brought in from outside the districts. Public sector and services employment therefore remain an important income source for many households, alongside agriculture, livestock, roadside commerce and transport services linked to the Desert Highway corridor.

Unemployment — particularly among youth and women — was consistently reported by engaged stakeholders to be significantly higher locally than official governorate aggregates suggest, due to limited local vocational training, skills mismatches, and weak integration of local labour into the industrial base. Water scarcity, declining rangeland productivity, and the rising costs of fodder are also placing pressure on traditional herding-based livelihoods. Many households rely on informal income sources or social assistance programmes, underscoring both the vulnerability of local livelihoods and the strong expectation among local communities that major national projects — such as the AAWDC — should support local employment and economic opportunities.

7.2.5 Amman Urban Areas

Moving further north into the southern boundaries of Amman, and past the international airport, the route splits and the wider areas become increasingly urbanised and economically diversified, interspersed with agricultural enterprises, and a few settled herders. Both routes ultimately reaching the

metropolitan areas of the capital where population density is significantly higher and livelihoods are predominantly more urbanised.

As the Pipeline route enters the southern parts of Amman Governorate, the context transitions into a peri-urban landscape where agriculture remains highly present and economically significant. Along this route, there is a mix of medium-scale commercial farms, orchards, fodder production areas, as well as smaller household farms, alongside roadside commerce, light industrial activity, workshops, logistics yards, and expanding residential development. Many settled Bedouin families continue to farm in these areas, and agriculture remains an important income source for some households, although land conversion pressures linked to urban expansion are increasing. Livelihoods in this zone therefore remain mixed — combining agricultural production, public sector employment, small trade, construction work, transport services, and informal work.

Further north into metropolitan Amman, the economy becomes far more diverse, service-oriented, and integrated into national labour markets. Amman is the largest employment centre in Jordan, with strong public sector, private sector, retail, logistics, construction, hospitality, IT, and service industry employment. Households in the city and outer peri-urban belts are far more likely to have permanent wage-based employment rather than pastoral or agriculture-based livelihoods.

7.3 Project Stakeholder Groups

Across this landscape, stakeholders of the Project include all individuals, groups, and organisations who have the potential to be affected, or have an interest in the Project's planning, construction, and operation. Stakeholders are grouped below according to their roles and characteristics, and relationships to the Project.

- **Government Authorities and Administrative Entities:** The administrative and political entities from central government to the governorate, district and municipal levels, who may be involved or interested in any potential impacts from the Project due to their mandates and responsibilities
- **Bedouin tribal and clan representatives:** Tribal traditional leaders (sheikhs) and key respected people, representing tribal and clan groups areas with customary tribal land use claims to Project areas in the Central and Southern Badias
- **Residents of municipalities, towns, villages and smaller settlements located within or near the Project footprint:** These include people who may be affected by land acquisition, livelihood disruption, construction related impacts, as well as those who have expectations or may benefit from local employment and local procurement opportunities. Local residents within the Badia areas of the Project – between Aqaba and the southern outskirts of Amman – are predominantly Jordanians of Bedouin heritage. Those local residents outside those Project areas in Amman urban areas and along the Aqaba coast will reflect the diversity of the general Jordanian population. Finally, local residents can be grouped into demographic segments who may have distinct perspectives or vulnerabilities, such as women and youth, and there is a common tendency in Jordan for local residents to organise themselves into different interest or livelihood related community-based organisations (e.g. women's associations, youth associations, farmers associations, etc)
- **Business stakeholders:** Private sector entities that may experience direct or indirect impacts, such as land acquisition, access issues and construction related disruptions
- **Agricultural stakeholders**: There are different types of agricultural enterprises in the ESIA Study Area, including non-intensive and intensive crop and livestock farming, who may experience

direct and indirect impacts such as land acquisition, loss of crops or assets, access issues, and construction related disruptions. Agricultural enterprises include farm landowners, farmers and agricultural labourers

- **Herders:** This includes different types of Bedouin herders – settled, semi-nomadic and nomadic – along the Pipeline route, who may experience construction related impacts such as impeded access to grazing areas or water points, and health and safety issues related to themselves or their animals around construction sites

7.4 National and Community Governance in Jordan

7.4.1 Overview

Jordan is divided into 12 governorates, each overseen by a Governor appointed by the King, upon recommendation from the Minister of Interior. Governorates are further structured into districts (*liwāʾ / qada*) and sub-districts (*nāḥiya*). Governors serve as the central government's executive representative in their area and oversee public security, coordination of government services, and local development projects. They also approve municipal budgets and expenditures.

Districts and sub-districts, headed by appointed local governors and administrative directors, are local extensions of the governorate, under the Ministry of Interior. Their main responsibilities include local law enforcement coordination, coordination of central services at the district level, liaising with community leaders and local notables, and monitoring compliance with national laws and local governance. Districts and sub-districts do not have elected councils or formal planning roles, but often interface with tribal traditional leaders, other key local people who might represent a community social organisation, and municipal officials to coordinate service delivery and maintain order.

Elected municipalities, overseen by the Ministry of Local Administration (MoLA), also play a role in local governance, service delivery, and local development planning. While all municipalities share a set of core responsibilities, the scope and quality of services they provide vary depending on their classification, revenue base, and administrative capacity. Their core responsibilities include service delivery, urban planning, local development, licensing and regulation.

Elected municipalities and elected governorate councils were dissolved by the Jordanian government in July 2025. According to official statements, the decision was 'intended to ensure transparency, integrity, and neutrality in the lead-up to upcoming elections'. New elections are expected in 2026, but no firm date has been provided, and it is unclear whether this will encompass governorate councils. The Minister of Local Administration has stated that new legislation concerning the local governance system is pending.

There are two distinct models of local governance in Jordan that differ markedly from municipal and governorate structures elsewhere in the country. These are the Greater Amman Municipality (GAM) and the Aqaba Special Economic Zone Authority (ASEZA). Home to around 40% of the national population, the capital Amman and its immediate surrounding areas are administered by the GAM, which has a special legal and administrative status in Jordan. The Aqaba Special Economic Zone Authority (ASEZA) replaced elected municipal and local councils within the defined boundaries of the Aqaba Special Economic Zone (ASEZ) with a single appointed Board of Commissioners that exercises municipal, regulatory and development powers in the Zone. The ASEZ includes Aqaba city, the coastal tourism areas north of the city, the southern industrial and port zones, and inland areas extending north towards Qweirah District, including Wadi Rum. ASEZA's remit includes urban planning, land use and infrastructure development, investment and tourism promotion, regulation and licensing.

7.4.2 Community Governance

Community governance in Jordan operates through several complementary channels, from elected municipalities to community-based organisations and trusted and traditional leaders.

Elected municipalities (under MoLA) are the principal public interface for service delivery and local development planning, with participatory needs-assessment mechanisms introduced under decentralisation reforms. In certain areas, local Community Councils have been established by municipalities to promote citizen participation in local planning and service delivery. These councils typically include representatives of women, youth, CBOs, and community leaders, and serve as advisory forums to support the municipality in identifying community priorities and facilitating communication with residents. Their role is consultative rather than decision-making, but they represent an important platform for engagement and information sharing.

Community-based organisations (CBOs) such as women's associations, youth associations, and agricultural or business cooperatives also play an important representative role at the local level in both the Badia and in urban areas. These organisations are recognised and regulated under national cooperative legislation and often act as trusted intermediaries, especially for groups whose voices may be less visible within more formal representative structures. In most local areas within the ESIA Study Area, women's associations and youth associations, as well as agriculture, tourism, camel racing and machinery operators' cooperatives are active and will be important interlocutors for the AAWDC Project.

From a Bedouin tribal specific governance perspective, Bedouin tribes and clans are generally headed by traditional leaders (Sheikhs) whose authority is also recognised by the State, and who can negotiate on behalf of their members with other tribes and political bodies. Bedouin tribes and clans also place great importance on trusted or respected people within the community (sometime referred to as *Wajah*). These are not always necessarily sheikhs, and can also be individuals who have done a lot for the community through charity work for example. Additionally, in many rural and Badia communities along the Project route, local representation can be exercised through mukhtars — community figures formally recognised by the Ministry of Interior who serve as intermediaries between residents and the local administration. In more urban areas, this role is generally fulfilled by municipal councils and elected representatives, and formal mukhtars are often absent.

Finally, it is worth noting that consistent feedback from focus group discussions and interviews with women, male youths, and other local residents, highlighted that in the Southern and Central Badia, district and sub-district local governors often play a significant and trusted role in convening all different segments of the local community, as well as taking a role in mediating local disputes between different groups, tribes or clans.

7.5 Land Tenure and Use in the Project Context

Jordan has a mixed legal system drawing on civil law, Islamic (Shari'a) law and customary tribal law, reflected in a pluralistic land tenure regime. Land rights are recognised and exercised through statutory, customary, religious, and informal systems. Over the past century, Jordan's legal and institutional framework has gradually moved toward land privatisation, including provisions allowing foreign nationals and investors to purchase land.

Approximately 80% of Jordan's total land area is classified as state land, the majority of which is located across the Badia regions of Jordan (Northern, Central and Southern Badia). These areas in the Badia also have long-standing customary tribal use arrangements. In contrast, private, formally registered landholdings with the Department of Lands and Survey (DLS), are more dominant in the urban and peri-

urban areas of Jordan, particularly in Amman Governorate, but also within the municipal boundaries of towns and villages.

Most Bedouin households have undergone a gradual process of sedentarisation over the past century, accelerating from the 1960s onwards. Today, Bedouin communities are largely settled in towns and villages across the Badia, particularly along the main transport corridors (e.g. the Desert Highway and the King's Highway). From the Mandate period and early Hashemite state formation, throughout the 1960s through to the early 2000s, successive governments actively encouraged permanent settlement by formalising land allocation for cultivation, granting individual land parcels to tribal/clan households, and extending services such as education, healthcare, and infrastructure to settled communities. This contributed to a progressive process of land privatisation in certain areas of the Badia.

A minority of Bedouin households, however, continue to reside in settlements that are unauthorised or unregistered—either because settlement took place more recently without formal allocation, or because expansions occurred outside approved municipal planning boundaries. In many such cases, regularisation processes can be eventually negotiated over time, and arrangements may be reached with the State allowing formal registration; however this is not guaranteed and tenure insecurity, and lack of services and infrastructure remain a key vulnerability for these households.

Historically, Bedouin tribes governed land and grazing through communal systems that regulated access to pasture and conserved resources. Although these customary rights were annulled legally in 1973, they continue to shape lived practice: tribal use, norms and dispute resolution mechanisms (including mediation by tribal judges) remain socially influential, and overlapping customary and State claims persist in the Badia areas outside of towns and villages. Bedouin tribes continue to use land for grazing, water access, and subsistence, and intertribal/clan agreements (*urf*) remain important in managing access to these resources. In recent years, many Bedouin households in the Badia have expressed growing interest in expanding agricultural activity on lands they consider part of their tribal areas. These initiatives depend on State permission, including allocation of land and permission to drill deep wells.

Modern-day tribal land in Jordan therefore reflects a complex and sometimes ambiguous patchwork of State land, private land, and areas where customary access and use continue to be asserted through social legitimacy rather than legal title. Although tribal lands are not formally recognised in law today, there remains what can be described as a "de facto informal formalism" in which customary land usage and claims are socially acknowledged and negotiated. There are also different forms of informal State acknowledgement of tribal land use in the Badia, which contributes to ambiguity and differing interpretations of the extent and legitimacy of tribal claims over State land. These informal understandings are not codified in law, but may be reflected in long-standing local practice, tacit permissions, or historical agreements at governorate or district level.

In practice, district and sub-district local governors, as well as municipalities, are often the most reliable institutional entry points for understanding which areas are subject to recognised tribal usage or expectations, as these authorities usually maintain a working knowledge of where customary claims and seasonal use patterns are locally understood to apply.

These differences in land tenure patterns have direct relevance for the Project. Along much of the Conveyance Pipeline route in the Badia, the alignment will pass within or adjacent to existing linear infrastructure corridors (e.g., the Desert Highway right-of-way and the Disi Pipeline route). The surrounding land in these areas is predominantly State land, where customary tribal use and claims related to grazing, access to water, seasonal mobility and agriculture remain socially recognised even if not formally registered. By contrast, as the alignment approaches the southern outskirts of Amman, land bordering the Conveyance Pipeline route becomes increasingly characterised by individually owned private freehold parcels, as well as municipal lands under the jurisdiction of local authorities.

Informal settlement and land use also exist in parts of the ESIA Study Area. In some Badia locations, Bedouin households reside informally on State land, either in tent structures (bait sha'ar) or mixed informal tent–housing settlements that have evolved over time without formal registrations. In other cases, settlements have expanded beyond municipal boundaries—such as in parts of the Diesah Sub-District—without formal planning approval or regularisation. These contexts create situations where the social reality of land use and expectations differs from formal legal title.

7.6 Overview of Labour Context in Jordan

Jordan's unemployment rate remains very high at around 21% (Q2 2025), with a stark gender gap – female unemployment is about 33% versus 18% for males. There are also regional disparities: for example, Ma'an governorate faces the highest unemployment (34%), while Aqaba has the lowest (16%). Overall employment-to-population is low (with 32% of adults aged 23+ working for wages). Youth unemployment (age 15-24) is acute, peaking at roughly 46% in 2022. Jordan has one of the lowest female labour force participation rates in the world, at just 13–18% in recent years.

A large portion of Jordan's workforce is in the informal economy, meaning they work without formal contracts or full legal protections. Roughly 46%–52% of all workers are considered informally employed (estimates vary, but nearly half of labour force is not registered for social security). These include many self-employed individuals, day labourers, and migrant workers who do not have stable contracts. People in informal jobs typically lack benefits like health insurance, pension, paid leave, and often earn less secure incomes. This divide particularly affects young workers and refugees, who often resort to informal work. The government has recognised this issue and is working on policies to formalise more jobs (for instance, simplifying business registration and enforcement of social security mandates). Nonetheless, informality remains high, meaning a significant share of Jordanian workers have no safety net or legal protection in practice.

Jordan sets a national minimum wage of JOD 290 per month (about $408), effective 01, January 2025. This minimum wage level is slightly above the individual poverty line, and extreme working poverty is very low (only 0.3% of workers live under $1.90/day in 2021). However, in practice some low-skilled and informal workers earn less than the legal minimum. Reports indicate issues with non-payment of overtime, non-compliance with safety standards, and some workers (especially in informal jobs) not receiving the minimum wage due to lack of enforcement.

Jordan's economy relies heavily on migrant labour, which makes up nearly half of the workforce. As of 2025, the proportion of foreign labour in total employment was 45%. The largest groups are Egyptians and Syrians, along with workers from South and Southeast Asia (e.g. Bangladesh, India, Sri Lanka, the Philippines, Myanmar). These migrants are predominantly employed in labour-intensive sectors – agriculture, construction, manufacturing (garment factories), and domestic work (household servants). Many of these jobs are low-wage and some fall outside full legal protection (Syrian refugees, for instance, often work informally). Jordan's *kafala* (sponsorship) system ties migrant workers' residency to their employer, which can make them vulnerable despite recent reforms. The reliance on foreign labour has slightly decreased in recent years as the government encourages hiring Jordanians, but migrants still fill critical roles in the economy.

Female labour force participation in Jordan remains very low. In 2024, only 14.9% of Jordanian women were economically active, and just 10% were employed. Participation is highest among women with higher education — yet overall unemployment figures amongst Jordanian women are 32.9%. Marriage and motherhood further reduce women's likelihood of entering or remaining in the labour market, and women with young children are the least likely to participate. Women who do work are concentrated in a small number of sectors, primarily education, health, public administration, and household-based

micro-enterprises. Barriers to women's employment in Jordan are shaped by a combination of restrictive social norms, limited availability, affordability and geographic access to formal childcare options (particularly outside major cities), inadequate, unsafe and costly transportation, and gaps in legal enforcement. Furthermore, research on gender-based violence and harassment (GBVH) and sexual exploitation and abuse and harassment (SEAH) indicates that sexual harassment also constitutes a significant barrier to women's retention and advancement in the labour market.

These national patterns are directly relevant to the AAWDC Project. During stakeholder engagement, women in all Project areas repeatedly stressed the importance of fair access to employment and contracting opportunities within the Project — particularly given the limited availability of suitable jobs for women locally, and the high unemployment rates among educated women.

7.7 Pastoralism

Pastoralism remains an important livelihood system in Jordan, amongst Bedouin households, particularly in the Southern and Central Badia, where small ruminant herding continues to be culturally significant and economically relevant. Most livestock are sheep, followed by goats, with camels now representing a smaller proportion of total herds due to their higher cost and because they are not covered under existing feed subsidy allocations.

While the majority of Bedouin households are now settled, pastoralism has adapted rather than disappeared. Herding in the Badia is best understood as a livelihood system, although for many Bedouin households it also remains closely linked to cultural identity and heritage. Bedouin herders may be settled, semi-nomadic, or nomadic, and these categories are fluid rather than rigid. Many households that are considered settled may continue to practice seasonal livestock mobility, while others shift between patterns of movement depending on rainfall, grazing conditions, and access to water. Settlement therefore does not imply the disappearance of mobility but rather reflects adaptive strategies that combine permanent residence with continued use of seasonal grazing areas and water points.

The Hashemite Fund for the Development of the Jordanian Badia estimates that only a small minority of Bedouin families still practice full nomadism (2%), while approximately 15% are semi-nomadic. However, settled herders are most common, ranging from commercial livestock owners, who employ hired shepherds (often Egyptian agricultural labourers, or in recent years refugees from Syria), to settled Bedouin households owning livestock animals for livelihood and subsistence purposes. Across these groups, livestock rearing continues to play a key role in household economies, cultural identity, and local land use practices in the Badia.

It should be noted that nomadic or semi-nomadic pastoralism is not associated with a particular tribe or clan, but rather with certain families choosing to maintain this type of pastoralism livelihood. Semi-nomadic herders maintain a fixed home base but still move their livestock in relation to pasture and water availability. This type of semi-nomadism typically involves men moving seasonally with their herds, while their families remain settled in permanent homes. In this arrangement, women and children stay in town or village residences—often near schools, services, and extended relatives—while the male herders alternate between the household and the grazing areas. The herders live temporarily with the livestock in what is locally called an *Ezbah*, a smaller version of the traditional Bedouin tent, usually set up near grazing sites or water sources. Nomadic herders are Bedouin herder households who live in Bedouin tents and move seasonally with their herds, primarily sheep and to a lesser extent camels, across Jordan in search of grazing and water.

Both nomadic and semi-nomadic herders move their herds seasonally to access grazing—especially during winter and spring. These seasonal movements generally involve moving eastward into deeper

Badia areas in winter where temperatures are warmer and wadi basins hold vegetation, and returning westwards, particularly to the highlands part of Jordan or towards agricultural zones in spring and early summer where access to crop residues or post-harvest grazing is available.

Natural rangeland productivity has declined significantly over the past decades due to overgrazing, vegetation loss, land conversion and climate pressures, and as a result herders rely increasingly on purchased fodder to supplement grazing. Interviewed herders indicated that due to the depletion of natural rangeland resources in the Badia, many herders increasingly depend on vegetation that grows in wadi basins, which has become a critical factor shaping their current grazing movements, as well as bought livestock feed. Government-subsidised feed (primarily barley and wheat bran), distributed through feed centres managed by the Ministry of Agriculture, is critical to herd viability. Distribution is managed through authorised feed centres in the governorates, where herders collect their assigned quotas monthly or seasonally upon presenting their livestock registration cards. However, interviewed herders noted that the livestock census used to allocate feed quotas is outdated, resulting in subsidy allocations that do not reflect current herd numbers or needs. Veterinary vaccines and basic animal health services are also subsidised through the Ministry of Agriculture, and usually available in towns, near to feed centres. Veterinary service coverage is limited in remote grazing areas, and interviewed herders highlighted the need for mobile veterinary units.

Access to water remains one of the most significant constraints on pastoralism. Herders rely on traditional wells, wadi basins, ponds (*haffirs*), and in more remote areas trucked water, particularly in drought years. Concentration of livestock around scarce water points has contributed to localised degradation. The distance between water points can reach tens of kilometres, significantly affecting herd mobility and increasing costs.

Bedouin herders in the ESIA Study Area predominately include settled herders/pastoralism, and to a lesser extent semi-nomadic herders and nomadic herders as follows:

- **Settled herders/pastoralism**: Settled herders or pastoralism associated with settled Bedouin households, is very common across the ESIA Study Area in the Southern and Central Badia, particularly in the urban and peri-urban areas, and include households that reside permanently in the villages or towns listed in Table 7.1, across Aqaba, Ma'an, Tafiela, Karak and Amman Governorates. You can also find small numbers of settled herders residing in tents and living informally on state or private land, across all five Governorates of the ESIA Study Area. Small herds of sheep, goats, and camels (in the Wadi rum general area), associated with settled households, can be found grazing across the ESIA Study Area, including along the Desert Highway. Feedback from interviewed Bedouin community members and livestock owners indicated that their main concerns with regards to the Project were related to the potential for noise or dust to disturb their animals, for livestock to fall into open trenches, and for construction to impede the movement of livestock or access to water points, grazing areas or livestock feed centres
- **Semi-nomadic and nomadic herders**: Depending on the climatic conditions in any particular year, some semi-nomadic, and to a lesser extent nomadic, herders can be found in autumn, winter and early spring in grazing areas stretching from the wadis east of Qatraneh and Hasa, down south to areas around Jafr, Batn-Al-Ghul and Wadi Rum. While these areas are likely to lie several kilometres away from the pipeline corridor, these herders and livestock may move across or near the corridor at certain times of the year in response to rainfall, grazing availability, and access to water points or grazing corridors. These movements are typically seasonal and adaptive in nature, however further studies will need to confirm whether the pipeline construction has the potential to temporarily restrict access to some of these grazing areas or water points, or to

intersect the movement of livestock. These studies will be carried out as part of the resettlement action plan

7.8 Community Health, Safety & Security

7.8.1 Overview

Community health, safety and security conditions in the ESIA Study Area are closely linked to the quality and availability of local infrastructure and service provision across the Badia and urban Amman and Aqaba areas. Issues raised through stakeholder engagement included: road safety and increasing traffic risks along the Desert Highway and local internal roads; the capacity of emergency and health services to respond to incidents in remote or sparsely populated locations; and adequacy and quality of household and livestock water supply. Across the ESIA Study, these conditions are uneven: areas that are more remote and further from major urban centres generally experience weaker and more constrained public services and infrastructure, more limited health facilities, and more constrained municipal resources. This is also connected to the differing revenue generation capacities of municipalities, with better resourced urban municipalities generally able to provide higher service coverage than those in more remote Badia areas.

These themes are directly relevant to the Project, as construction will involve large-scale movement of materials and workers, increased heavy-vehicle traffic, and works in remote stretches where emergency response, water access, and security coordination can be challenging.

7.8.2 Water Access

Water scarcity is one of the most critical development challenges in Jordan, and this was reflected strongly in stakeholder feedback across the ESIA Study Area. Concerns were repeatedly raised in the Central and Southern Badia areas, that the Project will transport water across these lands, but these local communities themselves will not benefit from improved access. This issue was among the most emotionally sensitive and politically charged topics raised during engagement.

The Ministry of Water and Irrigation (MWI) is responsible for water sector regulation and policy. The Water Authority of Jordan (WAJ) is responsible for the operational and service delivery functions of the water sector. Service provision is delivered through regional water companies (e.g. Aqaba Water Company in Aqaba Governorate).

Jordan's water supply comes primarily from groundwater aquifers (renewable and non-renewable), supplemented by surface water reservoirs and treated wastewater. Deep groundwater wells are the dominant source across much of the Badia. In many towns and villages along the Pipeline route, household piped supply originates from such wells, pumped into main trunk lines and then distributed into local networks. Over-abstraction of aquifers, combined with declining recharge, has contributed to reduced availability, water quality decline in some locations, and greater reliance on tanker deliveries during summer months or in high-demand periods.

Water supply and household access patterns vary across the ESIA Study Area but are generally characterised by intermittent, rationed supply. Most households do not receive continuous piped water. Instead, water distribution is organised by rotating schedules which differ by location. For example, in Amman, many households reported receiving piped water once per week for approximately 24 hours. In Wadi Rum Basin, communities reported receiving piped water approximately three times per week for limited durations (around two hours each cycle). These patterns require households to rely heavily on rooftop tanks, water storage, and tanker purchases—particularly during summer months.

. The national allocation balance is widely understood by government stakeholders, however it is not widely perceived as equitable at the local level in the Badia, where communities consistently raised concerns about lack of access, declining reliability, and worsening service provision.

Across the Pipeline route, dissatisfaction with water access and reliability was widespread. While scarcity affects all regions, stakeholder engagement indicated that more remote Badia communities—particularly in parts of Jafr and the Wadi Rum basin—face some of the most severe service gaps.

7.9 Sensitivities

7.9.1 Vulnerabilities in the Project Context

Within the Project footprint, certain population groups are likely to experience higher vulnerability to potential Project impacts due to their socio-economic status, limited access to services, and/or reduced ability to absorb or recover from disruption.

Stakeholder groups in the Project area who may experience specific vulnerabilities in relation to potential Project impacts have been identified as follows:

- Women, who face structural barriers to mobility and access to transport, economic participation, and representation in public decision-making, as well as heightened risks of experiencing gender-based violence and harassment (GBVH) and sexual exploitation and abuse and harassment (SEAH). Women's limited participation in mixed-gender spaces may also constrain their ability to raise concerns through conventional consultation or grievance channels
- Youth, especially in Badia areas where unemployment is extremely high and where economic opportunities are scarce, making them more vulnerable to project-related expectations, frustrations, and potential livelihood disruptions
- Children, who may be more vulnerable in relation to potential construction community health and safety impacts due to their lack of awareness around construction hazards, or their use of local roads or paths to travel to school
- Households living in informal and unregistered residential areas. These include any households living on state land without formal tenure security, such as herders residing in tents or mixed tent–household structures on state or privately owned land, or agricultural labourers living in tents on or near farms. This also includes unplanned settlements that lack basic municipal services, including regular water supply, electricity, waste management, and infrastructure and who may rely on self-installed service connections, which increases exposure to health and safety risks and leaves residents vulnerable to any construction-related disturbance or access restrictions.
- Persons with disabilities, particularly disabled youth, who may face additional barriers to accessing employment, transport, services, and consultation processes
- Casual, seasonal, and informal labourers, particularly in agriculture (including Syrian refugees), who have low and unstable incomes and limited protection against temporary livelihood disruption
- Informal businesses who could be overlooked for any potential compensation measures due to their lack of formal status

- Small scale tourism businesses in and around the Wadi Rum area, that are only just beginning to recover from recent prolonged economic strain, following the dual shocks of the COVID-19 pandemic and regional instability. These businesses could be particularly sensitive to temporary access restrictions or disturbances during construction should they experience them
- Small-scale herders, who operate under increasingly precarious conditions due to declining rangelands, limited access to water, and high feed prices. These households may be particularly sensitive to temporary access restrictions or disturbances during construction should they experience them
- Economically vulnerable households, including those receiving National Aid Fund (NAF) assistance, who typically have limited buffers against even short-term disruptions to income, mobility, or access to services
- Residents of towns and villages who experience respiratory health conditions (e.g. asthma) or existing health conditions relating to the dusty environment (e.g. dry eyes), and who may be more sensitive to potential dust generated during construction

7.9.2 Contextual Sensitivities

Two contextual sensitivities repeatedly raised by stakeholders across the Project footprint were: (i) the legacy of the Disi Pipeline Project, and (ii) the widespread concern about "wasta" (perceived favouritism / inequity in access to opportunities). These issues were raised across all five Governorates, by local authorities, tribal representatives, women, youth, municipal officials, and business owners, and are essential to understanding the social risk environment for the Project.

- **Disi Pipeline Project**: Feedback from stakeholders demonstrated high awareness of the Disi Project construction period – including the conflictual nature of implementation and incidences of violence, perceptions of exclusion and lack of fairness in benefit allocation, and the belief that this Project did not deliver adequate local benefits despite crossing local lands. Many stakeholders explicitly referenced Disi as a warning of "what can go wrong" if local communities are not engaged fairly and transparently, and if benefit expectations are not met. In this sense, Disi acts as a strong contextual risk signal: stakeholders are already comparing the AAWDC Project to Disi and expect it to avoid the same conflict drivers and construction related negative impacts, particularly around compensation, security, hiring, contract allocation, water benefit expectations, and grievance responsiveness
- **Wasta**: Across the ESIA Study Area, the demand for fairness, transparency, equitable inclusion, and non-discrimination in employment, procurement and compensation was strongly linked to concerns about wasta. Wasta is widely understood in Jordan as obtaining advantages, access, or preferential treatment through personal relationships or social influence, and is commonly associated with unfairness, favouritism and exclusion. Because of this, if community members perceive that jobs, equipment contracts, land compensation, or social investment are being distributed unfairly, this can very quickly generate grievance and social tension

7.10 Cultural Heritage

7.10.1 Cultural Heritage Overview

The Project crosses a landscape that has been used by people for thousands of years. It runs from the Gulf of Aqaba, through the desert around Wadi Rum, across the central Badia and highlands, and into the

outskirts of Amman. This corridor has carried traders, pilgrims, armies, herders, and modern road traffic. As a result, it holds a mixture of buried and visible archaeological remains, historic sites, and living cultural practices that are still important to local communities today.

Within this wider route, Wadi Rum is the most sensitive area of the project. It is listed by UNESCO as a mixed natural and cultural World Heritage. Its value lies not only in its dramatic rock formations and desert scenery, but also in its rock art, inscriptions, ancient camps and cairns, and the ongoing traditions of Bedouin communities who live in and around the protected area. The AAWDC pipeline crosses the northern buffer zone of this site, but does not enter the core World Heritage area.

The cultural heritage work has engaged with Jordan's Department of Antiquities (DoA) and ASEZA, UNESCO for Wadi Rum and applied international lenders standards for cultural heritage (such as IFC Performance Standard 8 and EBRD Environmental and Social Requirement 8). This has required a level of investigation and documentation well beyond a basic national EIA.

7.10.2 Cultural Heritage Work Undertaken

The cultural heritage work undertaken for AAWDC ESIA has four main pillars:

First, the ESIA team updated and expanded the 2022 cultural baseline studies. The earlier ESIA focused mainly on the northern part of the route and did not adequately cover the southern section, including Wadi Rum, the marine area off Aqaba, and intangible (living) heritage associated with local communities and traditional land use. The updated work corrected this by reviewing DoA records, older survey reports, academic publications, aerial and satellite imagery, and international and national inventories for both tangible (archaeological) and intangible heritage.

Second, the project undertook a dedicated Heritage Impact Assessment (HIA) for Wadi Rum. This included an HIA Screening, HIA Scoping Report and a full HIA Statement following UNESCO's 2022 HIA Toolkit. The HIA focused on how the pipeline, overhead lines and solar PV might affect the Outstanding Universal Value, authenticity and integrity of the Wadi Rum World Heritage property, including both physical impacts and changes to landscape views, setting and access. The work combined desk study, field reconnaissance in the buffer zone, targeted walkover survey, and a visual and landscape assessment.

Third, a detailed Cultural Heritage chapter was prepared for the ESIA, covering the full 445 km right-of-way. It sets out the legislative framework, describes the archaeological and cultural history of the region, summarises known sites and new discoveries, assesses impacts on both tangible and intangible heritage, and sets out mitigation and management measures. It also links the HIA findings for Wadi Rum with the broader project-wide assessment.

Fourth, an Intangible Cultural Heritage Impact Assessment (ICHIA) was prepared. This examines living traditions, oral histories, social practices, religious and community spaces, pastoral routes, and other non-archaeological values along the pipeline corridor. It pays particular attention to Bedouin communities in the south, the Wadi Rum area, and the communities that live along the Desert Highway and around the Amman end of the route.

These studies will be supported by a Cultural Heritage Management Plan (CHMP) and Environmental Social Management Plan (ESMP), which will set out how cultural heritage will be managed during detailed design, construction and early operation. It establishes governance structures, permitting procedures, and a roadmap for field investigations and Chance-Find Protocols, setting out five key stages for heritage management, from data mobilization to ongoing monitoring. The CHMP will be aligned with Jordanian law and lender expectations. It will be approved by DoA.

7.10.3 Key Findings

Cultural heritage encompasses the traditions, customs, knowledge, and artifacts that communities cherish and pass down through generations, shaping their identity and connection to the past. It's broadly categorized into two main types: tangible and intangible cultural heritage.

Tangible cultural heritage refers to physical items like archaeological sites, historical buildings, monuments, and artifacts that hold historical, artistic, or scientific value. These are things you can see and touch, offering direct links to past human activity and creativity. For instance, in Jordan, this includes ancient Roman ruins, Nabataean structures, and prehistoric settlements.

Intangible cultural heritage (ICH), on the other hand, consists of living traditions, expressions, and knowledge that are continually practiced and adapted by communities. It includes things like oral stories, performing arts (music, dance, theatre), social customs, rituals, festive events, traditional craftsmanship, and knowledge about nature and the universe. For example, Bedouin oral poetry, camel husbandry, and traditional weaving are important elements of Jordan's intangible cultural heritage.

Below is a summary of the key findings of both the tangible and intangible cultural heritage.

7.10.3.1 Archaeological and Historic Findings

The updated studies confirm that the project crosses a landscape with real and varied archaeological potential, but not one dominated by large or monumental sites. The typical heritage features along the route are small-scale: lithic scatters, ephemeral camps, cairns, low stone structures, industrial features such as metalworking areas, and route-related markers and installations. Many of these are early prehistoric or protohistoric; others date from the Roman–Byzantine and Islamic periods; some have modern elements or reuse earlier locations.

Within the Wadi Rum buffer zone, the fieldwork confirmed what is already known from wider research: the area has a dense but subtle archaeological record. The area contains numerous rock inscriptions and ancient drawings, temple ruins, and evidence of human settlements that show how people lived in the desert over time. The project identified new sites which include lithic scatters, structural traces, a fragment of Roman cooking pot, a possible stone sickle blade, and a metalworking feature with slag and burnt stone. These sites are not visually dramatic but are important for understanding long-term use of the desert and the continuity of routes through Wadi Yutum and the northern fringe of the protected area.

The work also revisited known sites in and around Wadi Rum, including rock art and cairn complexes such as WR-14_19. These retained their integrity and setting, even in a landscape that already contains modern intrusions such as roads and existing transmission lines. The HIA concluded that these key receptors remain sensitive and that preservation of their wider landscape context is essential to protect Wadi Rum’s World Heritage status. However, while many sites are known, there isn't a complete, up-to-date inventory of all inscriptions, rock art, and archaeological locations in Wadi Rum.

Outside Wadi Rum, the route passes through terrain known to support archaeological remains linked to ancient trade, pilgrimage, and pastoralism, especially near Qatraneh and Hasa. The ESIA notes that the overall dataset for these central and northern sections is incomplete and that the apparent scarcity of sites more often reflects gaps in survey work rather than a genuine absence of heritage.

The route of the planned pipeline, which largely follows an existing road, is expected to have a low potential for new archaeological finds because the area has already been significantly disturbed. However, areas undisturbed by modern development, such as the proposed site for a new solar power

plant, are expected to have a moderate potential for buried archaeological remains, including those related to ancient metalworking. The assessment therefore treats these areas as having at least moderate archaeological potential, particularly where the pipeline and OHTLs leave existing road corridors and cut across previously undisturbed desert.

7.10.3.2 World Heritage and Cultural Landscape Findings

For Wadi Rum, the central question was whether the AAWDC Project could damage the Outstanding Universal Value of the World Heritage Site. The HIA confirms that the pipeline alignment runs in the northern buffer zone, outside the UNESCO-approved core boundary. The pipe will be buried, with no permanent above-ground structures in the buffer zone except short-term construction works and temporary tracks. The overhead transmission line and solar PV site are located to the north and east in areas that already contain some infrastructure.

7.10.3.3 Intangible and Living Cultural Heritage Findings

The ICHIA shows that the project route passes through active cultural landscapes, not empty spaces. Bedouin and rural communities along the corridor maintain ties to land, grazing areas, wells, religious sites, and community gathering spaces. Practices include seasonal mobility, livestock herding, family-based land use, religious observance, and social events that rely on access to particular places and routes.

In Wadi Rum, intangible heritage is strongly tied to the desert itself: named mountains and wadis, places associated with famous stories or families, and desert navigation and hospitality practices. The "Cultural Space of the Bedu in Petra and Wadi Rum" is a recognized intangible cultural heritage by UNESCO, highlighting the Bedouin's enduring traditions and their deep connection to the desert. The current assessment aims to ensure that the project will not negatively impact the outstanding universal value of the WRPA or the intangible cultural heritage of the Bedouin communities, provided all recommended protective measures are followed.

In the central and northern sections, the main sensitivities include cemeteries, mosques, village edges, informal gathering places along the Desert Highway, and the underlying systems of tribal and family-based land tenure and influence. The ESIA acknowledges that these relationships are often unwritten but remain central to how communities perceive the landscape and any new infrastructure within it.

The main risk is not permanent loss of intangible heritage, but temporary disruption or perceived disrespect: blocked access to a cemetery or mosque, noisy works near a gathering space during a key period, or construction that fails to follow local protocols for dealing with graves or religious structures. The current information on intangible cultural heritage is not complete due to limited fieldwork. More on-site research and engagement with communities are needed to fully understand and document these living traditions.

8 Stakeholder Engagement and ESIA Disclosure

8.1 Overview of the 2025 AAWDC Project ESIA Stakeholder Engagement with Local Authorities and Community Stakeholders

As part to the development of the 2025 AAWDC Project ESIA, an early stakeholder engagement programme with Local Authorities and Community stakeholders was implemented throughout September and October 2025. The objective of this early stakeholder engagement was to ensure that:

- Stakeholders are informed about the purpose, nature, and scale of the Project as it currently stands, its status and expected timeline
- Stakeholders are informed about the ESIA, its objectives and what it entails, and the associated timelines
- Stakeholders are informed about a grievance mechanism that provides a transparent and accountable process for raising and responding to stakeholder grievances
- Stakeholders can inform the ESIA team and the wider AAWDC Project team about the Project environmental and social context, including potential sensitivities
- The perceptions, expectations, and concerns of all stakeholders are understood, noted and their feedback is incorporated into the impact assessment analysis, the development of mitigation/management measures, and informs the AAWDC Project design

The stakeholder engagement process was designed to be inclusive, with specific attention to groups who might be considered vulnerable and who may be at risk of being overlooked or disproportionately affected by the Project, such as women, youth, informal agricultural workers and herders. The engagement covered all five (5) governorates crossed by the Project and involved a range of meetings with official, administrative and community stakeholders as follows:

- Meetings with governorate, district and sub-district officials to introduce the Project, discuss its anticipated impacts, and gather local institutional perspectives
- Consultations with municipal representatives and officials, particularly in the Amman urban area, to introduce the Project, discuss its anticipated impacts, and gather local institutional perspectives and to understand urban interface issues and municipal priorities
- Larger community meetings at the district and sub-district central towns (*Qasabah*) levels, bringing together community representatives from different stakeholder groups alongside local district/sub-district authorities, and municipal representatives
- Focus group discussions with specific stakeholder groups — including community-based organisations (CBOs), women, youth, herders, and marine users in the Aqaba area — to ensure the inclusion of groups who may not have had equal opportunity to express their views in larger public meetings
- Key informant interviews with relevant officials, community leaders, farmers, herders, and business owners to obtain in-depth insights on social, economic, and environmental issues relevant to the Project
- Project information was shared with engaged stakeholders through a Project Leaflet and the ESIA Stakeholder Engagement Plan

It should be noted that the following contextual and participation issues were taken into consideration:

- Women's participation in the large community meetings was limited, so several dedicated women-only focus group discussions were held in the governorates to ensure that their perspectives and priorities were properly captured
- While some youth attended the broader community meetings, their participation was often limited; therefore, youth focus groups were also organised to provide a safe space for young men to share their views, concerns and expectations related to the Project
- While some herders were present in the youth focus groups and larger community meetings, their participation was limited, so efforts were made to seek out herders directly in locations where they were residing
- In Amman urban areas, engagement was primarily carried out through the municipal authorities given the high population density and the administrative role municipalities play in community representation and service delivery. This approach was further reinforced through engagement with local community-based organisations representing a range of different stakeholder groups, as well as a high number of key informant interviews with relevant officials, community leaders, farmers, and herders
- Municipal elected councils were dissolved earlier this year, in preparation for upcoming elections in 2026. As a result, it was not possible to engage formally with these councils during the early engagement in September and October; however, formerly elected municipal representatives were present in the district/sub-district community meetings, as well as in youth focus groups and key informant interviews

Overall, 37 meetings, 35 focus groups and 95 interviews were carried out between September and October 2025, across the governorates, districts, sub-districts and municipalities that are likely to be affected by the AAWDC Project, targeting and estimated 677 individual stakeholders, including 186 women. These are summarised in Table 5 below.

Table 5: Stakeholder Engagement Summary

Governorate/District	Governorate/ District/ Municipalities Officials Meetings	Community District Meetings	Community Focus Groups	Key informant Interviews	Total
Amman Governorate Na'oor District Al-Qweismeh District Sahab District Mowaqqar District Jizah District	• 8 district/sub-district meetings • 16 municipality meetings ○ 61 participants ○ 12 women	• 1 Sub-District community meeting ○ 10 participants ○ no women	• 11 CBO focus groups ○ 58 participants ○ 38 women	• 48 interviews ○ 7 women	36 meetings 48 interviews 177 participants 57 women participants
Karak Governorate Mazar Janoobee District Qatraneh District	• 1 governorate meeting • 1 district meeting ○ 7 participants ○ no women	• 1 district community meeting ○ 55 participants ○ 2 women	• 4 focus groups (1 male youths, 1 women, 2 general community) ○ 64 participants ○ 15 women	• 10 interviews ○ no women	7 meetings 10 interviews 136 participants 17 women participants
Tafiela Governorate Hasa District	• 1 governorate/ district meeting ○ 3 participants ○ no women	• 1 district community meeting ○ 30 participants ○ 3 women	• 7 focus groups (1 male youths, 1 women, 2 general community, 2 herders, 1 women herders) ○ 77 participants ○ 23 women	• 15 interviews ○ 7 women	9 meetings 15 interviews 127 participants 33 women participants
Ma'an Governorate Jafr Sub-District	• 1 governorate meeting ○ 2 participants	• 1 sub-district community meeting	• 2 focus groups (1 male youth, 1 women)	• 6 interviews ○ no women	4 meetings 6 interviews

Governorate/District	Governorate/ District/ Municipalities Officials Meetings	Community District Meetings	Community Focus Groups	Key informant Interviews	Total
	○ No women	○ 16 participants ○ 3 women	○ 20 participants ○ 12 women		44 participants 15 women participants
Aqaba Governorate Aqaba District Qweirah District Diesah Sub-District	• 1 governorate meeting • 1 district meeting ○ 4 participants ○ no women	• 3 district/sub-district community meetings ○ 58 participants ○ 7 women	• 11 focus groups (5 male youth, 5 women, 1 marine users) ○ 115 participants ○ 57 women	• 16 interviews ○ no women	16 meetings 16 interviews 193 participants 64 women participants

8.2 Summary of the 2025 AAWDC Project ESIA Stakeholder Engagement Feedback

This section provides a high-level summary of the ESIA teams' understanding of the stakeholder engagement feedback received from the 38 meetings, 35 focus groups and 95 interviews carried out between September and October 2025.

It should be noted that due to the high national prominence of the AAWDC Project, and its discussion in the national media, most Project stakeholders were already aware of the Project before the 2025 ESIA stakeholder engagement took place. Furthermore, due to the past experience around the Diesah Pipeline Project, most engaged stakeholders were already knowledgeable about the types of impacts a project of this nature can bring.

Stakeholder engagement carried out across all five (5) governorates along the Project corridor revealed a high level of awareness, interest, and expectation from local stakeholders. Discussions reflected both the opportunities that the Project could bring and concerns about its potential impacts during construction and operation. Overall, the main themes emerging from the consultations are summarised below.

- **Transparency and fairness in benefits allocation and engagement**: A consistent view was expressed by all stakeholders that the Project should ensure it engages with community Project stakeholders and allocates local employment and local contracts and other benefits, in a transparent, fair and inclusive way. Engaged women and youth stakeholders stressed the importance of making sure they are not sidelined in any AAWDC Project engagement or benefit allocation
- **Addressing local water issues**: While designed to supply water to Amman and Aqaba, stakeholders across the pipeline route believe the Project should also contribute to addressing water shortages faced by communities, herders and farmers along the pipeline route
- **Employment and local contracts**: Strong expectations that local stakeholders should be prioritised for job opportunities and local contracts, through transparent and fair processes, and that youth and women should not be sidelined from opportunities. Requests for investment in vocational training to prepare youth and women for employment and other contracting opportunities
- **Public health, safety and traffic management during construction**: Based on their previous experiences around the Diesah Pipeline Project, stakeholders across the entire AAWDC Project area expressed concerns about open trenches, children and livestock falling into excavations, traffic congestion and accidents, and the need for clear signage, safe crossings, and close and ongoing coordination with municipalities during construction. Widespread concern about dust generation and respiratory problems, especially in residential areas; calls for active dust-suppression measures during construction
- **Impacts on land, houses, farms, and businesses:** Business and agricultural stakeholders, as well as local residents stressed the importance of the Project providing fair, transparent, and timely compensation for all affected assets, including residential houses, businesses, farms, crops and irrigation systems. Stakeholders stressed that compensation should reflect market value, not lower administrative rates, and that eligibility should not depend solely on formal ownership or licence documentation, and should also respect tribal rights in relevant areas

- **Herders**: Engaged herders requested safe animal crossings, clear safety signs around trenches, and that the Project ensure access to grazing areas and water points; many suggested that the AAWDC Project could install additional watering points for livestock along the route
- **Social investment and community support**: Community stakeholders, including women and youth, expressed the expectation that the Project demonstrate tangible social responsibility by supporting sustainable, locally led projects—implemented through community-based organisations and aimed at improving livelihoods in a fair, transparent, and sustainable way
- **Coordination with municipalities and Districts**: All stakeholders across the AAWDC Project areas stressed the importance of the AAWDC Project coordinating closely with municipalities and district/sub-district governors in both managing construction related impacts, as well as in community engagement and the allocation of local benefits, such as local employment and local contracts
- **Respect for tribal customary rights**: Many Bedouin stakeholders highlighted the importance of ensuring that the transparent allocation of Project-related benefits—such as local employment and procurement opportunities—respect local tribal affiliations and customary understandings of tribal lands, to avoid inadvertently creating tensions between different tribal groups. It was also stressed that respecting tribal interfaces and their central role in Bedouin communities is essential, as they hold significant social value.

8.3 Planned Stakeholder Engagement as Part of the Formal 2025 ESIA Disclosure

The disclosure of the 2025 Environmental and Social Impact Assessment (ESIA) Package will be undertaken once the 2025 AAWDC Project ESIA report is finalised and approved for public release from the 19th December 2025. The Disclosure process will run from the 19th December 2025 for 60 days.

Disclosure will involve the following steps:

1. **Announcement of disclosure and public access to the 2025 ESIA package**:

- Disclosure, including how long it will run for, where the 2025 ESIA package documents can be accessed, and the public meetings that will be taking place will be communicated to the Project area Governorate, District and Sub-District offices, as well as Municipal offices by the ESIA team, as well as in national and regional newspapers, and on Municipal social media pages
- The ESIA consultant team will reach out to all stakeholders that were engaged in the ESIA stakeholder engagement process to inform them of where they can access the updated ESIA package documents. This will include community-based organisations (CBOs) in the Project areas, including women associations and youth associations. The QR code to access the ESIA package documents will also be shared with these CBOs
- The Updated ESIA package comprising the ESIA, the ESMMP, the NTS, the RPF and the SEP will be made available to the public, in Arabic and English, from the 19th December 2025, through the following means:
    - Published on the NCPC website (https://ncpc-jo.com/) and the Lenders websites
    - Published on the Ministry of Environment's and Ministry of Water and Irrigation (MWI) websites

- Printed copies sent to each of the 5 Governorate offices (Aqaba, Ma'an, Tafiela, Karak, Amman). These copies will be made available for walk-in review to any member of the public
- A QR code to access the online version of the ESIA package documents will also be made available to the public by being posted on Municipality notice boards and social media pages, in the following municipalities: Aqaba, Qweirah, Diesah, Jafr, Hasa, Qatraneh, Al-Sultani, Um Rasas, Al-Amiriyah, Jizah, Mowaqqar, Rujm Al-Shami, Sahab, Um El-Basatien and Greater Amman
- A one-page announcement (circular) with the QR code, details on how to provide feedback and details of the planned public meetings will be posted on doors and noticeboards of mosques and the main supermarkets in each of main towns of the municipalities listed above
- The ESIA consultant team will reach out to all stakeholders that were engaged in the ESIA stakeholder engagement process to inform them of where they can access the updated ESIA package documents. This will include community-based organisations (CBOs) in the Project areas, including women associations and youth associations. The QR code to access the ESIA package documents will also be shared with these CBOs. These CBOs will be able to the disseminate the QR code to their networks amongst the communities in the Project areas
- The QR code to access the online version of the ESIA package will also be made available to all those attending the planned public meetings

2. **Public and stakeholder meetings in all 5 Governorates**:

   The disclosure process will include a series of public meetings and smaller focused pre-disclosure stakeholder meetings, from 19th December, throughout January 2026, convened at both the Governorate and District and Sub-District levels across the AAWDC Project area, ensuring that all key stakeholder groups—governorate, district and sub-district authorities, municipal representatives, community members and other members of the public, tribal representatives, community-based organisations and associations, and other interested parties—have the opportunity to participate.

   A series of pre-disclosure smaller community stakeholder meetings will be held from the 14th to the 19th December, including meetings with herders, community residents, businesses, farmers, fishers and marine users, women and youth, in all five Governorates in the Project areas. These meetings have the objective to provide information to the public about when disclosure will happen, as well as to discuss the proposed Project mitigation measures.

   In January, eight (8) larger public meeting will be held, 2 in Amman Governorate, 1 in Qatraneh District (Karak Governorate), 1 in Hasa District (Tafiela Governorate), 1 in Ma’an Governorate (including Jafr Sub-District), and 3 in Aqaba Governorate (Aqaba city, Qweirah District, Diesah Sub-District) (see Table 6 below). The ESIA Team will coordinate with the MoEnv and ASEZA to issue invitations for these sessions, each within their jurisdictions, and will ensure that a broad representation of local community members are invited and able to join these meetings.

   Transportation assistance will be provided for remote communities, or those community members who would otherwise struggle to attend due to lack of suitable transport.

   - During these public meetings, the NCPC ESG Team and the ESIA consultants (ECO Consult) will present the following information:

- The main findings and mitigation measures of the ESIA, using a "What We Heard" feedback table to summarise the key issues raised during previous consultations with stakeholders and to explain how these have been addressed through Project design and management measures
- Information about how to access the updated 2025 ESIA package documents, and how to provide feedback outside of the meetings
- The Project GRM: how to access it and how it works
- Next steps going forward, including how feedback from Disclosure will be managed and addressed by the ESIA consultants, and NCPC plans for further consultation and engagement with Project stakeholders
- The table below outlines the proposed 2025 ESIA Disclosure meetings that will take place in January 2026

Table 6: Proposed 2025 ESIA Disclosure Meetings (Taking Place in January 2026)

Governorate	Nb. of Meetings	Meeting Location & Districts	Invited Participants
Amman Governorate	2	1 meeting at the Amman Governorate Office 1 meeting for Jizah District & Mowaqqar District	Governorate, District & Sub-District officials (Na'oor, Al-Qweismeh, Sahab, Jizah and Mowaqqar). Project relevant Municipality officials (Greater Amman Municipality (GAM), Al-Amiriyah, Um Rasas, Jizah, Mowaqqar, Rujm Al-Shami, Sahab, Um El-Basatien Municipalities) CBOs representing a broad group of stakeholders (women, youth, farmers, herders). Tribal and clan representatives Members of the public
Karak Governorate	1	Qatraneh District, Qatraneh Town	Governorate, Qatraneh District officials Al-Sultani and Qatraneh Municipality officials CBOs representing a broad group of stakeholders (women, youth, farmers, herders). Tribal and clan representatives
Tafiela Governorate	1	Hasa District, Hasa Town	Governorate and Hasa District officials Hasa Municipality officials CBOs representing a broad group of stakeholders (women, youth, farmers, herders). Tribal and clan representatives Members of the public
Ma'an Governorate	1	Ma'an Governorate office	Governorate and Jafr Sub-District officials Jafr Municipality officials CBOs representing a broad group of stakeholders (women, youth, farmers, herders). Tribal and clan representatives Members of the public

Governorate	Nb. of Meetings	Meeting Location & Districts	Invited Participants
Aqaba Governorate	3	1 meeting Aqaba District, Aqaba Town 1 meeting Qweirah District, Qweirah Town 1 meeting Diesah Sub-District, Diesah Town	Governorate, District & Sub-District officials ASEZA officials Aqaba, Qweirah & Diesah Municipalities officials CBOs representing a broad group of stakeholders (women, youth, farmers, herders). Tribal and clan representatives Members of the public

3. **Follow up with vulnerable groups and other community stakeholders**:

   The ESIA consultants will follow up by phone, WhatsApp and a select number of meetings with each of the women's associations, youth associations, CBOs, and farmer and herder stakeholders, who were engaged during the ESIA stakeholder consultation in September and October 2025, to ensure they are aware of where they can access the 2025 ESIA and supporting documents, and how they can provide feedback. This follow up will include stakeholder groups in the Project area who may experience specific vulnerabilities in relation to potential Project impacts (e.g. women, youth, disabled youth, herders, economically vulnerable households, etc). Should members of these groups choose not to attend the public meetings in their area, or be unable to, the ESIA consultant team will offer to have a phone call to answer any questions they might have and collect their feedback

4. **Collation of Disclosure feedback**:

   The disclosure period will remain open for a minimum of 60 calendar days from the date of publication (19th December 2025) to allow adequate time for stakeholders to review and comment on the documents, up until the end of February 2026. During this period, stakeholders and members of the public will be able to provide feedback through multiple channels, including written submissions through email or online feedback forms, or verbal comments recorded during disclosure meetings. All feedback will be logged in a Disclosure and Comments Register, documenting the date, source, and substance of each comment together with the Project's response or follow-up action

   At the conclusion of the 2025 ESIA disclosure period, the Project will prepare a Disclosure Summary Report summarising the engagement activities conducted, the comments received, and how key inputs have been considered in finalising the Updated 2025 ESIA package documents. This report will also be made publicly available through the same disclosure channels

5. Finalisation of the 2025 ESIA Package

Following the conclusion of the public disclosure period, NCPC and the ESIA consultants will review all feedback received from stakeholders and, where relevant and appropriate, integrate this input into the final ESIA Package documents. A Final ESIA, together with the updated Non-Technical Summary (NTS) and supporting management plans (ESMMP, RPF, SEP), will then be issued. Once finalised, the ESIA Package will be made publicly available through multiple channels, including:

- The NCPC website
- The Ministry of Environment's ESIA disclosure platform
- The websites of participating lenders (e.g. EBRD, IFC)

- Hard copies placed at Governorate, District and Municipal offices in the Project areas
- A QR code to access the final ESIA package online will be made available in Governorate, District and Municipal offices in the Project areas

The final ESIA Package will remain publicly available for the duration of the Project

8.4 AAWDC Project Stakeholder Engagement Plan

Following disclosure and completion of the 2025 AAWDC Project ESIA, the AAWDC Project will continue to apply a proactive, transparent, and responsive approach to stakeholder engagement throughout the subsequent detailed design, construction, and operational AAWDC Project phases.

NCPC and the EPC Contractor will maintain a structured Stakeholder Engagement Log to record all engagement activities throughout pre-construction, construction and operations. The log will document the date, location, stakeholder groups, purpose, key issues raised, Project responses, commitments made and follow-up actions. This tool will support transparency, allow issues to be tracked to closure, and ensure that engagement remains inclusive, responsive and aligned with Lender requirements.

The approach and plan for stakeholder engagement will be outlined in a detailed Stakeholder Engagement Plan (Project SEP). The SEP will be a living document and will be updated by the AAWDC Project as the Project moves from the ESIA phase into detailed design and construction.

9 Impact Assessment

The assessment of environmental and social impacts associated with the construction and operation phases of the Project are presented in ESIA Chapter 9.

Chapter 9 should be read in conjunction with:

- Cumulative and Transboundary impacts are assessed within ESIA Chapters 10 and 11 (see Sections 9.3 and 9.4 of this NTS)
- GHG and climate change risk are covered within the Climate Vulnerability Risk Assessment (CVRA) presented ESIA Chapter 12 (see Section 10 of this NTS)

9.1 Summary of Impacts

Impacts assessed in ESIA Chapter 9 are summarised in Tables 7-26 below.

As explained in section 3, these impacts were initially assessed based on the predicted magnitude of impact and receptor sensitivity, considering existing controls, and the significance of the impact has been determined. Mitigation has been identified to determine the additional controls to be implemented prior to detailed design, at the commencement of construction, during construction, and prior to and during operations. Where relevant, the monitoring and reporting activities to be undertaken to confirm that these controls are implemented and effective were provided. The controls form commitments for the Project to be implemented through the Environmental and Social Management and Monitoring Plan (ESMMP) and associated supporting plans and procedures, and through the Environmental and Social Management System (ESMS).

Table 7: Impact and Mitigation Summary – Pecker Trenching and Physical Disturbance, Generation of Underwater Sound and Marine Disturbance

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)
Minor Adverse Assessed based on numerical modelling of the highest underwater sound sources during construction to predict distances at which injury or disturbance effects may occur to sensitive receptors (identified as cetaceans, fish and turtles). Industry best practice methodology and thresholds adopted to determine worst case distances at which effects may be experienced, assuming no mitigation in place and using conservative assumptions, e.g. simple radial spreading of sound, no allowance made for existing background sound levels. Spatially, the modelling predicted no potential for mortality or injury at distances greater than 76m, but potential for temporary disturbance and behavioural changes in fish up to 684m and in cetaceans within 500m. Temporary impacts are anticipated for the period of the works (estimated at approximately 1 month), will be intermittent (not continuous for 24 hours), and will cease when the sound source is removed, i.e., the effects will be reversible. Impacts associated with other disturbances include lighting within the vicinity of construction works and permanent lighting associated with the intake and outfall infrastructure was also considered. During construction, lighting will be temporary with permanent lighting during the operations phase anticipated to be limited and not anticipated to elevate existing levels of light pollution to the marine environment. A negligible to minor adverse magnitude of effect is anticipated.
Receptor Sensitivity (based on vulnerability, value and resilience)
High Cetacean species known to be routinely present in the Study Area that are sensitive to underwater sound include the Bryde's whale, the false killer whale (Pseudorca crassidens) and several species of dolphin. In addition, receptors also include adult fish, fish eggs, larvae and turtles with the highest sensitivities anticipated for cartilaginous fish (i.e. those with no swim bladder), which include species of sharks and rays and for eggs and larvae, which, unlike cetaceans, turtles and adult fish, cannot move away from sound energy. These receptors are all known to be present, particularly in the shallow reef systems of the Gulf of Aqaba (GoA), with no species restricted to the Jordanian waters. No unique habitat features that could support aggregation and/or breeding areas are present in the Study Area as compared to the wider GoA. While vulnerability is therefore assessed as relatively low, receptor value recognises that 3 fish species are expected to be present, triggering Critical Habitat criteria, and 13 species, including turtles, cetaceans, and fish, triggering Priority Biodiversity Feature (PBF) criteria. From a resilience perspective, however, receptors (aside from fish larvae) will move away from the sound source unless they are conservatively within 76m of the sound source (based on worst-case injury estimates). Numbers affected are likely to be on an individual basis if at all. No irreversible impact to the ecological function of habitats (including critical habitat) through underwater sound impacts are anticipated. It is noted that receptors are likely to be habituated to a degree to various underwater sound sources given the existing marine and port activities across the area on a long-term basis.
Impact Significance (Pre-Mitigation)
Medium Adverse
Mitigation
Pre-construction: • The Marine Construction Works Management Plan to include underwater sound avoidance, mitigation and monitoring requirements consistent with applicable guidance that will include the JNCC guidance and the IMCA ES005 "Guidance on Mitigation of Underwater Noise" (2025) and "World Bank Environmental, Health, and Safety Guidelines Ports, Harbors, and Terminals February 2, 2017

- The Marine Construction Works Management Plan will include an underwater sound adaptive management and reporting system to integrate a marine mammal observation program with construction vessel and trenching equipment management controls that will include a soft start and a stop work protocol in the event underwater sound receptors are observed by Marine Mammal Observers
- Once the final construction activities and vessel and equipment types are defined, the associated schedule and underwater sound sources are confirmed, a competent underwater sound expert uses the E&S Management of Change Process to validate that there is no material change in impact
- Prior to the start of construction, complete a pre-construction survey of the shoreline construction to confirm the absence of nesting birds and require the application of appropriate mitigation if nesting sites are found
- Working at night during construction will not occur routinely
- A lighting plan for the careful selection and placement of lighting to reduce additional light pollution to the marine environment will be developed for the construction phase
- Prior to the completion of detailed design, undertake review of the lighting requirements and measures to reduce additional light pollution to the marine environment

Construction:

- Underwater sound components during construction, supported by trained Marine Mammal Observers (MMO)

Residual Impact

With the application of the mitigations incorporated into a Project ESMS with verification and reporting, the residual impact is assessed as **Negligible**

The justification for the reduction in impact significance is due to:

- A reduction in impact magnitude due to a decrease in the potential exposure, through the use of a soft start and stop work protocol to reduce the potential for disturbance or harm to marine mammals, fish and turtles exposed to underwater sound by allowing any such species present in the area to move away.

Table 8: Impact and Mitigation Summary – Outfall and Intake Lagoon Installation and Temporary Jetty Construction (Including Pecker Trenching and Vessel Anchoring), Physical Seabed Effects

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)

Minor Adverse

Assessed based on the estimated footprint of the intake lagoon, outfall trench (within shallow waters), temporary jetty and estimated area affected by vessel anchoring. The project will use turbidity curtains to prevent the release of sediment into the marine environment and material removed from trenching will be transferred and stored on shore and then subsequently used to back fill the trench.

Spatially, the physical impacts to the seabed for marine construction activities is estimated to cover 2646m^2, affecting habitats including shallow intertidal areas (28%), patch reef and shallow seagrass (19%), fringing coral reef (15%), mixed reef and sediment (28%) and deep sand and isolated reef outcrop (10%) prior to backfilling activities. The area affected includes 0.35% of the coral habitat present in the Study Area. The use of the turbidity curtains and removal of trenched material to shore is predicted to effectively avoid the potential for turbidity effects. While survey results show potential for contamination of sediments with PAH across the Study Area which may be potentially mobilised through the seabed disturbance this effect is expected to be limited due to the construction approach. The effect of the permanent intake and outfall structures within the marine environment are not expected to have a significant impact on shoreline dynamics due to low currents and wave action. The new intake structure will be constructed in an area currently comprising mixed sand and

hard substrate and will be protected by structures be similar in seabed profile to the undulating coral reef structures already naturally occurring.
Receptor Sensitivity (based on vulnerability, value and resilience)
High The vulnerability of fish, turtle, and cetacean species within the water column to the anticipated effects from the construction activities is considered low due to controls in place to avoid turbidity and the behavioural responses of these animals that allow them to sense and avoid prolonged exposure. Coral and seagrass habitats are, however considered to be more vulnerable with the potential to be affected indirectly by potential smothering from placement of materials used construct the jetty, install the outfall infrastructure and intake lagoon. Sediment communities, particularly those sensitive to light and dependent on sediment composition, are also vulnerable to smothering. Both coral reef and seagrass are classified as Critical Habitat and Priority Biodiversity Features, as is the giant clam, which resides within the benthic environment and is therefore of high biodiversity value. In the water column several species of fish are also classified as Critical Habitat and also classified as being of high biodiversity value (Teleosts fish (Humphead wrasse (*Cheilinus undulatus*), Sky emperor (*Lethrinus mahsena*), Red Sea coral grouper (*Plectropomus marisrubri*)) In terms of resilience, while areas of coral and seagrass present within the Area of Influence will be directly affected by marine construction, natural regeneration is anticipated; hard substrate will be colonised by coral as observed within the Study Area, with coral growing on existing marine infrastructure. As coral habitats re-establish following construction, there will be no permanent physical loss of hard substrate; there will likely be an increase in hard substrate from the lagoon seawall, outfall and concrete collars. Losses to coral habitat are not considered irreversible or permanent, and overall habitat functionality/value could be enhanced by the installation of additional hard substrate to support coral growth and fish habitat. Taking a precautionary approach, based on the value of benthic habitat and the uncertainty about the degree and timescale of recovery without intervention, a high ranking is assigned to receptor sensitivity.
Impact Significance (Pre-Mitigation)
Medium Adverse
Mitigation

Pre-construction (and prior to the completion of the detailed design):
• Translocation of all critical habitat (coral and giant clams) within water depths that can be safely accessed by divers. In Jordan, it is an established practice to translocate coral under the supervision of the ASZEA and the Jordan Marine Reserve, with reported survival rates of 80%. Coral Translocation Plans will be developed in consultation with applicable authorities, and finalised at least 3 months before the start of construction
• The final design and marine construction methods selection process shall incorporate requirements for the avoidance and reduction of impacts, including:
  ○ Silt curtain deployment
  ○ Consideration of the feasibility of seasonal sensitivities associated with breeding/reproduction periods, especially coral, giant clam and seagrass
  ○ Onshore storage of trenched material storage with appropriate drainage control to prevent impacts to seawater quality, seagrass and coral
  ○ Post-construction benthic habitat restoration goals
  ○ An assessment of the construction, temporary, and permanent shoreline and submerged structures will be completed. The assessment will identify appropriate mitigation to avoid impacts associated with changes in shoreline dynamics, which will be incorporated into the design and associated monitoring plans, including the Biodiversity Management Plan

- Materials and handling methods that will not leach pollutants and affect water quality will be promoted

- Undertake a pre-construction marine environmental survey, including a diver cultural heritage assessment, before the start of construction, ensuring sufficient time to support:
  - Focusing on ROV data below 70m, the need for EDNA sampling to confirm the presence of fish and other CH and PBF fauna and the need to quantify coral to be impacted by construction
  - Survey of coral settlement using settlement tile arrays and assessing the potential to collect and include as supplementary material for the translocation plan
  - The evaluation of micro-routing of temporary and permanent shoreline and submerged Project infrastructure
- Prepare the Coral Translocation Plan that will include:
  - Detailed mapping of coral/reef substrate within the construction footprint to identify material to be translocated
  - The process to create an inventory of associated corals to quantify the number, health and types of coral
  - How the inventory data will be integrated into defined reinstatement goals
- Develop a spill prevention plan for the construction and operations phases, supported by engagement with the 3rd party asset owners and competent authorities integrated into the Pollution Prevention Management Plan
- Construction Phase Pollution Prevention Plan will include hazardous materials, waste management, drainage and surface water controls to be implemented at the IPS to ensure avoidance of discharge to the sea of any potentially polluted drainage or run off
- Pollution Prevention Plan to include design safeguards, hazardous materials storage and handling, waste management, drainage and surface water, as well as the operational controls, including housekeeping, to be implemented at the Desalination Plant to ensure avoidance of discharge to the sea via the site drainage system of any potentially polluted drainage or run off, including elevated levels of suspended solids. The Pollution Prevention Plan will be prepared for the construction phase and updated for the operations phase and include inspection and monitoring requirements to verify controls effectiveness
- Prepare Pollution Prevention Management Plan to:
  - Prepare a hydrotesting procedure detailing how water will be sourced, describing and assessment the treatment, reuse and discharge activities, ensuring avoidance of pollution and erosion as well as management of water reuse for agricultural purposes
  - Assess contamination risk at the Project sites, using a risk-based approach
  - Hazardous materials (selection, management and use), drainage, wastewater (including all camp and construction site wastewater) and surface water discharges comply with applicable standards in Chapter 2 and avoid risk of pollution
- Prepare Navigation Safety Plan commensurate with the risks and impacts of the construction phase and operation phase, if required
- The Marine Construction Works Management Plan that will be included in the marine construction and installation contractor specification will include:
  - Requirements and controls for avoidance/reduction of benthic (seabed) habitat loss, turbidity, underwater sound, daily operational monitoring and reporting, refuelling, hazardous materials management, waste management, emergency and spill response, including the requirement for all galley waste, solid and liquid waste from vessels, is contained and shipped to shore, all vessel black and grey water is contained, collected and shipped to shore, vessel ballast water is segregated from sources of pollution and vessel deck drainage and wash water will be discharged to sea as long as no visible sheen is observable

- Adaptive management requirements to respond to defined thresholds, within defined timescales, to manage construction and operational underwater sound, turbidity in the water column and other environmental criteria

Construction:

- Prior to the demobilisation of the marine construction and installation contractor, undertake a diver survey of the construction area to confirm that the marine habitat restoration targets have been achieved
- Prior to demobilisation of the lagoon construction contractor, undertake a walkover survey of the construction area to confirm habitat restoration targets have been achieved and integrate the findings into the Contractor's completion and demobilisation governance system.

Residual Impact

With the application of the mitigations incorporated into a Project ESMS with verification and reporting, the residual impact is considered **Medium Adverse.**

The justification for the impact significance is due to:

- The translocation of coral and giant clams in water depths of less than 35m, will target 1,641m^2, 62%, of the seabed habitat where coral is present within the study area. Coral translocation within a total area of 1,005m^2 is considered non-viable due to the water depths preventing access by divers
  - The Jordan Marine Reserve has reported a survival rate of 80% for translocated coral
- The outfall, the concrete collars, the lagoon seawall and the concrete mattress to protect the outfall to a depth of 10m, will provide an estimated 1,500m^2 of suitable substrate for coral, giant clam and fish habitat. This is considered sufficient to provide replacement habitat for which is considered non-viable due to the water depths preventing access by divers to translocate corals
  - Assess the feasibility of providing suitable habitats for the giant clam that embeds into substrate, noting that concrete will likely not be suitable
- The operational and monitoring controls that will support the planning of the work, effectiveness of the mitigations, as well as BMP and BAP that will validate the residual impact and mitigations
- A residual impact on Critical Habitat is currently predicted, associated with the forecast 80% survival of translocated coral. An offset to provide a net gain of an estimated 1,313 m^2 of equivalent habitat with coral cover ranging from 40% to 10% and consideration of seagrass cover, is required; this is further assessed in the BAP framework, which also considers the need for quality habitat metrics and offset multipliers (including time discounts) to provide net gain to all critical habitat species.

Table 9 Impact and Mitigation Summary - Desalination Plant Operational Discharges, Water Column and Seabed Effects

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)

Minor Adverse

Assessed based on numerical modelling of the routine and non-routine discharges to predict dispersion characteristics and determine if mixing zone criteria (determined for salinity and key components in the discharge). The mixing zone approach and the criteria adopted are based on industry best practice. These criteria consider the increase in concentration at the edge of the mixing zone (defined as 100m from the discharge) above ambient seawater concentrations, with a conservative 2% increase above ambient at the edge of the zone adopted for salinity (in line with the previous 2022 ESIA) and a more typical 5% increase for other components present in the discharge.

Spatially the modelling results indicated the maximum excess salinity at 100m from the outfall (equipped with a diffuser) would be close to the 2% criterion with all other inorganic components within the effluent discharge under routine and non-routine discharge conditions, aside from iron, predicted to below the +5% criteria

within 17m from the point of discharge (which is where the discharge plume is predicted to reach the seabed). The extent of seabed habitat affected by the increase in salinity of 0.82 psu (defined by the 2% threshold) is estimated as 9076m^2. The area affected represents 1.2% of the coral habitat within the Study Area

Concentrations of other chemical components within the discharge plume were assessed and found to be result in insignificant impacts based on anticipated operating scenarios, safeguards and monitoring in place, the behaviour and break down of the chemicals in the environment and their insignificant effects e.g. in terms of low potential to contribute to eutrophication and oxygen depletion.

Concentrations of iron in the discharge (from the addition of ferric chloride as a coagulant) were predicted above the 5% threshold due to insufficient dilution in the plume within the mixing zone. While corals are known to be tolerant to heavy metals in environments where they are not acclimatised there is potential for effects. Literature suggests non-acclimatised corals have been shown to be affected at iron concentrations above 0.005mg/l. The predicted iron concentration at the edge of the 100m is highest (during non-routine discharge) at 0.014 mg/l.

Considering the conservative assumptions made within the modelling, spatial impacts are anticipated to be limited to within the defined mixing zones (except for iron) with less than less than 2% of the total coral habitat in the Study Area exposed to the discharge within the mixing zone.

Temporally, the routine discharge and associated effects will occur continuously over the operational. Non-routine discharge associated with Cleaning-in-Place would occur approximately once per week during the operational period.

Receptor Sensitivity (based on vulnerability, value and resilience)

High

Receptors potentially sensitive to the desalination plant effluent discharges include pelagic species that may be present within the area affected by the discharge (i.e. within the defined mixing zone). These include cetaceans, turtles and fish. Vulnerability of the species likely to be present within the area affected by the discharge is considered low due to the low habitat quality compared to the higher quality shallower water coral and seagrass habitats. While some of these species of fish and some species of turtle, cetacean and fish trigger Critical Habitat and PBF criteria respectively, indicating a higher vulnerability, the changes in water quality from the discharge will be limited and localised. Where changes are detectable, these species will avoid the area.

Within the benthic environment, habitats include coral and seagrass, which trigger critical habitat criteria. The habitat predicted to be exposed to the discharge plume comprises deep mixed reef and sediment, and deep sand and isolated reef outcrops habitats. The area of exposure represents less than 2% of the total coral habitat in the Study Area. Furthermore, the deep coral habitats potentially exposed have up to 15% coral cover and have the lowest biodiversity within the Study Area; the shallower, more diverse and abundant coral and seagrass habitats will not be affected. From a reliance perspective there is evidence that coral has the potential to adapt to higher salinities within the expected range and that natural succession may enable salt-tolerant coral taxa to replace those taxa that are not tolerant. The vulnerability, value and resilience of the benthic habitats potentially affected is however conservatively considered to be high primarily due to the presence of critical habitats.

Impact Significance (Pre-Mitigation)

Medium Adverse

Mitigation

Pre-construction (and prior to the completion of the detailed design):

- Completion of a Remotely Operated Vehicle survey of the outfall diffuser and plume area where the 2% salinity criteria is exceeded, to assess presence, abundance and quality of seabed habitats
- The final outfall and Desalination Plant design and operations and maintenance (O&M) procedures selection process shall incorporate the findings of this assessment and:

- Assess the feasibility of process controls or treatment that can be integrated into the plant to reduce the discharge concentration of iron

- Diffuser and port configuration will be designed to maximise dispersion near the diffusers and to minimise the extent of the area where salinity exceeds 2%
- Prior to the selection of the outfall and Desalination Plant design and O&M procedures, implement the E&S Management of Change Process to validate that there is no material change in impact
- Desalination Plant O&M procedures to comply with the discharge standards and the results of this assessment of operational discharges, which will include a reporting system for process controls and chemical usage that are critical to maintain compliance with discharge standards Desalination Plant O&M procedures to comply with the discharge standards and the results of this assessment of operational discharges, which will include:
  - Reporting system for process controls and chemical usage that are critical to maintain compliance with discharge standards
  - Detailed commissioning and operational sampling and monitoring plan to include intermediate sampling points monitoring, not only at the end of pipe, with the frequency of sampling consistent with a review of plant operational variability and O&M activities
  - An online water quality monitoring station that will be installed on the discharged water line, if equipment available in Jordan and if security authorities allow. This will continuously monitor, at a minimum, turbidity, conductivity, temperature, residual chlorine, pH and pressure
  - A non-continuous, routine sampling and offline laboratory analysis will be performed of chemical oxygen demand, iron and halogenated organic compounds and other parameters included in the Project Discharge Standards
- The plant commissioning sampling schedule will initially be frequent (e.g. at least daily) and ensure that discharges during all modes of plant operation are sampled and analysed
- Additional sampling of upstream locations will be defined in the process to provide additional information on items of concern, such as complete neutralization of DBNPA, and the potential formation of halogenated organic compounds after treatment of the intakes with hypochlorite. The frequent sampling should continue until the chemical profile of the plant effluent has stabilised and a good dataset describing the effluent's variation with operating modes is established and understood
- After an initial phase, the sampling frequency should be reviewed to ensure that the sampling schedule is such that robust information is available to demonstrate compliance of the discharge with respect to discharge standards for iron (0.3 mg/L average, 0.5 mg/l maximum) and halogenated organic compounds (zero)
- Feasibility of whole effluent toxicity testing will be assessed, noting a review will be completed of the needs and benefits, including the implications of establishing a locally accredited facility
- Detailed design of the Desalination Plant, Pumping Stations and AGI, to include measures to prevent pollution to soils, groundwater and/or surface water from potentially contaminated drainage

Prior to the start of operations:

- Update the Project Pollution Prevention Plan and ensure the resources to implement the commissioning and operational sampling and monitoring plan are available
- Update the Biodiversity Management Plan and benthic habitat monitoring program to support the operations phase

Operations phase:

- Implement the operations phase Project Pollution Prevention Plan
- Implement the Biodiversity Management Plan, Biodiversity Action Plan and associated biodiversity monitoring requirements

Residual Impact

With the application of mitigations incorporated into a Project ESMS with verification and reporting, the residual impact is considered **Medium Adverse.**

The justification for the impact significance recognising that magnitude of effect will reduce through the application of the mitigation measures, the magnitude cannot be reduced to negligible. Further reductions in the impact magnitude would require integrating the mitigations described above into the Desalination Plant process and outfall design.

A residual impact on critical habitat is currently predicted, associated with increased salinity within the plume above the 2% ambient threshold. An offset to provide a net gain of an estimated 9,076 m^2 of coral habitat with coral cover of 15% or lower is required; this is further assessed in the BAP framework which also considers the need for quality habitat metrics to provide gain to other critical habitat species.

Table 10: Impact and Mitigation Summary - Operational Abstraction of Seawater, Water Column Effects

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)
Minor Adverse Assessed based on numerical modelling of entrainment velocities and available project design information. The potential for effects on receptors in the water column is focused on coral larvae, seagrass that pollinate through the water column (which includes most species in the Gulf of Aqaba), and bivalves (specifically the giant clam) that trigger critical habitat. Entrainment control measures included in the design to prevent the entrainment of larger marine life include bubble curtains and a fish recovery and return system. With respect to seagrass the intake suction area where current speeds are predicted to exceed normal currents, no seagrass or seagrass habitat has been recorded. On this basis and, considering use of the bubble curtain, the potential effect to seagrass reproduction through pollen or seed entrainment is deemed low. With regard to coral larvae and other species with planktonic larval life forms, including giant clam gametes, it is estimated that the bubble curtain is likely to reduce potential entrainment by around 40-50% with coral larvae that may be entrained expected to not be viable evidenced through the lack of existing coral habitat in the shore/beach area. The footprint of the area affected by the increased current velocity due to the intake covers an area of approximately 3,500m^2 of intertidal habitat which has the lowest coral cover at 2% across the Study Area. On the basis of the assessment above the magnitude of effect to coral larvae is assessed as being negligible. The magnitude of effect to giant clams is assessed as being of moderate adverse significance given the potential for some reduced reproductive success (albeit natural reproductive success is less than 10%) as prevailing currents will keep gametes close to shore. Conservatively it is estimated that 4.2% of the coral area within the Study Area affected by the increase in current velocity due to abstraction and where coral larvae and clam gametes recruitment is estimated to be viable may be affected. On this basis a magnitude of effect to coral larvae and clam gametes of minor adverse significance is predicted.
Receptor Sensitivity (based on vulnerability, value and resilience)
High The key receptors potentially affected by the seawater abstraction include seagrass pollen or seeds, coral larvae, giant clam gametes and fish. Impacts on these receptors in the water column can affect the wider marine ecosystem, with a specific focus on coral and seagrass habitats, giant clam and teleosts fish (Humphead wrasse (*Cheilinus undulatus*), Sky emperor (*Lethrinus mahsena*), Red Sea coral grouper (*Plectropomus marisrubri*) which are recognised as critical and hence of increased value and considered vulnerable.

The marine surveys and secondary data have confirmed that coral reefs are present locally adjacent to the planned intake location and along the majority of the Jordanian and GoA coastlines, with active reproduction known to occur. On this basis, receptor sensitivity is ranked as high.
Impact Significance (Pre-Mitigation)
Medium Adverse
Mitigation

Pre-construction (and prior to the completion of the detailed design):
• Design and start a coral settlement field study that will confirm the baseline planktonic larval spawning/reproduction periods, and assuming access to the existing intake lagoon can be arranged, install settlement plates in this lagoon
• EPC to integrate into final design, operations and maintenance (O&M) procedures the results of an intake entrainment mitigation assessment to select:
  ○ Feasibility and optimum bubble curtain design, including the need for an additional deflector curtain (in addition to the curtain across the mouth of the lagoon) (using results of coral/plankton reproduction assessment
  ○ Feasibility and optimum design of the fish recovery and return system
• The outcome of the intake entrainment mitigation assessment and confirmation of the construction benthic habitat impacts and coral settlement field study shall be integrated into the Biodiversity Management Plan and updates to the BAP framework
• An appropriate coral and seagrass monitoring program will initially support the planning, implementation and target setting to achieve measurable goals (No net loss and or Net Gain) for all critical habitat species and habitats, considering potential entrainment impacts and the environmental baseline limitations identified in Chapter 6
Prior to the start of operations:
• Integrate the intake entrainment mitigation assessment and O&M controls to support the entrainment mitigation to reduce planktonic larval spawning/reproduction entrainment
Operations phase:
• Implement the operations phase Biodiversity Management Plan, Biodiversity Action Plan, associated biodiversity monitoring requirements and support the coral replenishment program

Residual Impact
With the application of the mitigations incorporated into a Project ESMS with verification and reporting, the residual impact is considered **Medium Adverse.** This recognises that magnitude cannot be reduced to negligible. Further reductions in the impact magnitude would require integrating the mitigations described above into the intake lagoon bubble curtain and completing studies to validate the impacts of viable coral larvae, seagrass and clam gamete recruitment. A residual impact on Critical Habitat is currently predicted, associated with seawater abstraction. An offset to provide a net gain of an estimated 21,447m^2 of coral habitat with coral cover of 10% or lower is required; this is further assessed in the BAP framework, which also considers the need for quality habitat metrics to provide gain to other critical habitat species.

Table 11: Impact and Mitigation Summary - Conveyance System Construction Works - all Project Components, Terrestrial Biodiversity Effects

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)
Moderate Adverse Assessed based on expert judgement, best practice and available project design information. Potential effects on the terrestrial environment were assessed based on construction impacts associated with access, site and conveyance pipeline right-of-way clearance, civil works, earthworks and installation of facilities (including the overhead transmission lines (OHTL) which are Associated Facilities), resource use, waste and hazardous material handling, reinstatement of temporary areas, and long-term landscape changes and alterations to drainage and surface water flows. Spatially, it was determined that the Project had the potential to affect terrestrial habitat covering a total of 2437 hectares comprising modified (37%), natural (54%) and semi-natural/degraded (9%) habitats (excluding the OHTL) with impacts extending beyond this footprint to generate indirect impacts associated with noise, light, and dust related disturbance. Habitat loss would be both permanent (where above-ground facilities are planned to remain) and temporary (assuming reinstatement), with indirect impacts, e.g., due to noise, expected to be temporary. Habitat fragmentation is not anticipated based on baseline surveys conducted. Spatially, the effect of the permanent land and associated habitat lost due to the project is not considered significant, as most of this habitat is not of high value. The direct effects of the habitat lost associated with the permanent facilities will be permanent. Habitat temporarily lost through construction works, later reinstated, will be temporary, as will indirect effects due to noise, surface water, light, and dust, which will cease when the works stop. 2437 hectares of habitat is expected to be affected in total with 162 hectares of natural and degraded habitat permanently lost due to the presence of permanent facilities. Other potential effects to fauna assessed include potential loss or injury due to entrapment with trenches and fencing and potential vehicle collisions. Impacts associated with the presence of the OHTL relate to the potential for avifaunal collision risk with the majority of species assessed as being at low risk of fatality, however larger species including the White Stork and species of birds of prey including eagle and vulture species that trigger Priority Biodiversity Feature (PBF) criteria are at higher risk although expected mostly in discrete hotspots where individuals arrive at low altitude after crossing the Gulf of Suez. A ranking of moderate adverse is assigned to terrestrial environment effects.
Receptor Sensitivity (based on vulnerability, value and resilience)
High The key receptors potentially affected by the construction works comprise the habitats and ecosystems along the conveyance pipeline route and at the permanent project facilities where land will be cleared and civil works undertaken, as well as access routes and temporary areas used by the Project. The value of habitat is considered high on the basis of three species that are likely to qualify as critical habitat including two plant (the Jordan Wormwood *Artemisia jordanica* and Egyptian Henbane *Hyoscyamus muticus* and one bird species (the Levant Sparrowhawk *Accipiter brevipes*). In addition two further species of bird and two species of plant may also qualify and a number of species of bird, reptile, plant and mammal that trigger EBRD's PBF criteria. The Project also overlaps with two Key Biodiversity Areas (KBAs) and Important Bird and Biodiversity Areas (IBAs) and the buffer zone of the Wadi Rum Protected Area. Plant, reptile and mammal species present within the footprint of the project in the areas are considered most vulnerable to earthworks during construction. Flora present that qualify as critical habitat are perennial and as such have stable locations where they occur on a regular basis making them vulnerable to direct impacts of construction. Reptile species include species identified as PBF and are vulnerable to open excavations and mechanical disturbance. Mammal species are limited but include the Nubian Ibex (*Capra nubiana*) recorded

within the Wadi Rum Protected Area, which triggers PBF criteria, and is vulnerable, in particular to entrapment in open trenches and excavations.

Other than avifauna sensitive to the OHTL impact discussed above, species that breed or forage on the ground in bare or sparse vegetation desert habitats may be sensitive to ground clearance works. Typically, vulnerability is expected to be low although higher during nesting.

On the basis of the primary baseline survey and secondary data collected covering the Area of Influence for terrestrial biodiversity, the majority of the area is of relatively low biodiversity value, however the anticipated presence of both critical habitat (CH) and PBFs result in a receptor ranking of high.

Impact Significance (Pre-Mitigation)

Medium Adverse

Mitigation

Pre-construction (before the finalisation of the construction plans and schedule:):

- Conduct the spring 2026 terrestrial biodiversity survey along the proposed Project works corridor to support the preparation of a Biodiversity Sensitivities and Constraints Assessment
- Undertake a terrestrial Biodiversity Sensitivities and Constraints Assessment to:
  - Support the integration of biodiversity sensitivities into the final design and construction methods selection process
  - Confirmation of the seasonal restrictions where the risk to breeding birds is considered significant, and if required, define seasonal construction restrictions to avoid impacts to CH, PBF and Natural Habitat
  - Confirmation of spatial restrictions for temporary construction facilities and activities where avoidance is recommended to support the avoidance of impacts to CH, PBF and Natural Habitat
  - Confirm the scope and schedule for pre-construction environmental surveys
  - Confirm the locations required for seed collection and replanting. The process for their replanting within the pipeline right-of-way will be defined in the BAP, supported by the BMP that will define construction operational controls, to avoid residual impact on flora
  - Confirm the location for fauna translocation, including the release location. The process will be defined in the BAP, supported by the BMP that will define construction operational controls, to avoid residual impact on fauna
- Within the Biodiversity Management Plan, include the outcome of the Ecological Constraints Assessment and confirm the pre-construction environmental survey program and define the below controls:
  - Demarcation of all areas where construction will occur to ensure that all earthworks will be strictly limited to the required areas, with particular emphasis in areas of natural habitat
  - The need to avoid all construction activities during the breeding season (mid-February to early June) in areas where Buff-rumped Wheatear or any other PBF species (unlikely) has been found in the current/previous breeding seasons
  - Install Bird Flight Diverters along the whole OHTL following good international industry practice
  - Ensure OHTL pylons are wildlife-friendly, meaning that the distance between energised components is enough to prevent electrocutions and/or that these are appropriately insulated, following good international industry practice

Construction planning, to be completed before construction:

- On an annual basis, undertake a breeding bird assessment survey to assess the construction areas where work will be undertaken during breeding seasons and update the Biodiversity Sensitivities and Constraints Assessment
- Undertake the pre-construction environmental survey program, including an assessment of erosion potential/risk and update the Biodiversity Sensitivities and Constraints Assessment

- The EPC will prepare an Ecological Constraints Assessment with the results of the pre-construction environmental survey program and maintain a register of constraints to support construction
- Develop a habitat reinstatement protocol and a wadi crossing protocol to be applied for major wadis
- Prepare a Terrestrial Construction Works Management Plan that will be included in the construction and installation contractor specification and that will include the provisions of the Biodiversity Management Plan relevant to construction
- Construction phase:
- Implement the Terrestrial Construction Works Management Plan for the duration of the construction work
- Prior to the demobilisation of the onshore construction contractor, undertake a walk-over survey of the construction area to confirm the habitat restoration targets have been achieved and integrate the findings into the contractor's completion and demobilisation governance system
- Following confirmation that the onshore construction biodiversity restoration targets have been achieved, update the Biodiversity Management Plan and biodiversity monitoring requirements to support the operations phase and implementation of the Biodiversity Action Plan

Operations phase:

- Implement the operations phase BMP, BAP and associated biodiversity monitoring requirements including bird post fatality monitoring (PCFM) program monitoring to determine the significance of impacts from the OHTL and inform the need for adaptive management

Residual Impact

With the application of the mitigations incorporated into a Project ESMS with verification and reporting, the residual impact is considered to remain **Medium Adverse** as the magnitude of the impact is expected to remain moderate and not be reduced to negligible. Further reductions in the impact magnitude would require integrating the mitigation described above into the final construction schedules as well as full implement of the BAP to avoid all residual impacts to CH, PBF and Natural Habitat.

A residual impact is currently predicted on 368 hectares of natural and degraded habitat including:

- A total 162 of hectares of natural and degraded habitat will be permanently lost due to the presence of permanent facilities, via habitat conversion
- A total of 205 hectares of natural and degraded habitat will be impacted, assuming a 20% residual impact from temporal loss, following reinstatement of the pipeline right of way

Table 12: Impact and Mitigation Summary - Conveyance System Construction Works - all Project Components, Physical Terrestrial Effects

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)

Major Adverse

Assessed based on expert judgement, best practice and available project design information.

Potential effects on the physical terrestrial environment were assessed based on construction impacts associated with access, site and conveyance pipeline right-of-way clearance, civil works, earthworks and installation of facilities (including the overhead transmission lines (OHTL) which are Associated Facilities), resource use, waste and hazardous material handling, reinstatement of temporary areas, and long-term landscape changes and alterations to drainage and surface water flows.

Impacts to surface water flows are limited to intermittent wadis as there are no perennial watercourses in the Study Area with changes to surface flow and associated run off restricted to permanent facilities where the facilities will be designed based on a 1 in 100-year storm intensity. Drainage and runoff systems from Project areas during both construction and operations will be designed to be segregated to avoid sources of

contamination entering the environment. All construction waste will be managed from the point of generation to the final disposal site in accordance with applicable standards. Given the low intensity of rainfall in the region and the seasonal nature of the wadis, impacts to surface water quality due to drainage and runoff would be anticipated to be low but dependant on the composition of the run-off, while normally uncontaminated there remains potential for a polluted release e.g. in the event of a spill. The duration of the impacts will range from weeks in some areas to the full duration of the construction program and the operational phase at the permanent facilities.

A ranking of major adverse is assigned to terrestrial physical effects, taking a precautionary approach

Receptor Sensitivity (based on vulnerability, value and resilience)

Moderate

The key receptors potentially affected by the construction works comprise the surface water, soils, groundwater and land along and adjacent to the conveyance pipeline route and at the permanent project facilities where civil works will be undertaken, as well as access routes and temporary areas used by the Project.

The wadis present across the Study Area vary in character depending on the underlying landscape and geological conditions with high volume fast flows through wadis in rocky areas e.g. Wadi Yutum and slower flows through flatter, sandier areas draining small catchment areas of a few tens of square kilometres water. These wadis are of value from a biodiversity perspective for sustaining biodiversity (with floral and faunal species present being tolerant to desert conditions and little rainfall) and, where water collects either naturally or artificially, provide a drinking supply for livestock and to support herding activity. Water derived from wadis is not used by communities for a potable water source.

There are areas of land that may be affected by Project activities across the Study Area used for herding and grazing activity however there are no areas of land used exclusively for this purpose. Soil is not used as a resource in any location across the Study Area.

Groundwater is an important water source across the Study Area serving as a source of irrigation and potable water through wells. Quality and supply have, however, been severely affected by over extraction and hence there is a strain on supply increasing the value of this resource. There are a significant number of wells present across the Study Area used by the local communities and a system of above ground pipes for supply to communities and farms.

Natural soil erosion and flooding events occur across the Study Area due to natural conditions which include sandstorm events lasting days and concentrated storm rainfall which can occur over a few hours. These events can lead to rapid change in the landscape and integrity. In Diesah specifically, residents raised existing sand encroachment and instability of the dunes as an ongoing concern.

On the basis of the primary and secondary data available covering physical terrestrial aspects within the the Area of Influence, a se sensitivity ranking of moderate is assigned.

Impact Significance (Pre-Mitigation)

Medium Adverse

Mitigation

Pre-construction (and prior to the completion of the detailed design):

- Undertake a review of potential spill risks covering construction and operations phases to, this will be supported by engagement with the 3rd party asset owners, competent authorities. The outcome of these studies and engagement will be used to complete a spill risk assessment and document the safeguards e.g. engineering, process, procedural etc and be integrated into the Pollution Prevention Management Plan
- Prepare Pollution Prevention Management Plan to:
    - Prepare a hydrotesting procedure detailing how water will be sourced, describing and assessment the treatment, reuse and discharge activities, ensuring avoidance of pollution and erosion as well as management of water reuse for agricultural purposes

- Assess contamination risk at the Project sites, using a risk-based approach
- Hazardous materials (selection, management and use), drainage, wastewater (including all camp and construction site wastewater) and surface water discharges to comply with applicable standards in Chapter 2 and avoid risk of pollution

- Prepare a Waste Management Plan, with sufficient time to enable the selection of an appropriate contractor that will:
  - Be supported by a waste forecast, that will be used to plan a due diligence of the potential waste transportation, treatment and disposal companies to confirm their capacity to manage the forecasted waste types and quantities in accordance with the project waste standards
  - Define the waste management operational activities to support all activities from segregation to final disposal, in compliance with applicable standards

Construction planning, to be completed before construction:

- Groundwater risks will be assessed upon completion of the EPC contractor's geotechnical survey and confirmation of groundwater usage during construction
- Prepare a Terrestrial Construction Works Management Plan that will be included in the construction and installation contractor specification. The plan will confirm:
  - The controls for the avoidance/reduction of impacts to biodiversity and soil erosion
  - Topsoil/surface material storage and preservation
  - Micro habitat disturbance management
  - Defined terrestrial habitat restoration goals, including erosion controls and habitat enhancement initiatives to support the BAP
  - Adaptive management requirements to respond to temporary construction works such as dewatering, temporary storage of material, burrow pit for construction material, temporary access road routing and usage. A fit-for-purpose biodiversity risk assessment protocol will be developed to assess the temporary construction works, considering the Biodiversity Sensitivities and Constraints Assessment
  - Monitoring and inspection protocols, including frequency of inspection
  - KPIs to define compliance and performance monitoring and reporting requirements

Residual Impact

With the application of the mitigations incorporated into a Project ESMS with verification and reporting, the residual impact is considered to remain **Medium Adverse** as the magnitude of the impact is expected to remain moderate and not be reduced to negligible.

Table 13: Impact and Mitigation Summary - Conveyance System Construction works - all Project Components, Air Quality and Dust

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)

Air Quality: **Minor Adverse**

Assessed based on numerical screening modelling to determine potential for significant effects to existing air quality at receptors from use of construction plant and equipment and Project related traffic. The screening assessment was based on industry best-practice guidance and took into account existing baseline air quality in the Governorates through which the conveyance pipeline route will pass, and predicted the potential magnitude of the effects. The screening assessment findings and secondary data sources were also used to estimate potential air quality effects from the temporary facilities include construction camps.

Spatially, the screening assessment predicted effects on existing air quality at distances of no more than approximately 45m from the construction sources, with concentrations of key pollutant, NO_2, remaining well

below applicable air quality limit values. Similarly, no exceedances of PM_{10} beyond those already recorded at the existing national air quality stations were anticipated, and no significant long-term further deterioration in air quality due to $PM_{2.5}$ increases was predicted as a result of the use of construction plant and equipment.

Temporally, air quality impacts from construction activities will be temporary, lasting days to weeks along the conveyance route and months at the conveyance facility locations and camps. Effects will cease when the activity stops and will be reversible.

Dust: Moderate Adverse

Assessed using an industry best practice approach, which considers the type of activity, the environment and hence the risk of dust emissions. Based on the types of activity, which include earthworks and soil movements within an arid environment, an elevated risk of dust emissions was identified.

Spatially, there is potential for dust generated to be transported over significant distances (e.g. over kilometres). The environment itself is inherently dusty and subject to frequent sandstorms with frequent exceedances of PM_{10} and $PM_{2.5}$ limit values recorded; the project would therefore contribute to existing natural dust entrainment, dispersion and deposition. In terms of dust generating nuisance this is typically comprised of deposited matter with a higher aerodynamic diameter (e.g. up to 75 micros (µm)) which tends to travel less far, typically deposited within tens of metres of the construction activity. This is, however, highly dependent on wind and weather conditions.

Temporally, dust from construction will cease to be generated when the works cease and effects would be temporary.

Receptor Sensitivity (based on vulnerability, value and resilience)

Air quality and dust: Medium

The key receptors sensitive to changes in air quality and generation of dust due to the Project construction activities comprise the communities located in the immediate vicinity of the works, as well as individual businesses, community facilities and mixed-use areas.

Baseline air quality data from the Aqaba, Tafiela and Karak Governorates, where the conveyance pipeline and facilities (and potentially camps) will be located, indicate that while limit values for NO_2 and SO_2 are routinely met, there are frequent exceedances of PM_{10} and $PM_{2.5}$ limit values with spikes recorded during sandstorms, which can occur over several days, affecting entire regions. The lowest concentrations of PM_{10} and $PM_{2.5}$ were recorded at the two monitoring stations within the Tafiela Governorate. Within the Amman Governorate, baseline air quality, particularly within Amman city, is considered poorer than elsewhere along the route due to the urbanised environment and numerous industrial sources.

Dust is a key area of concern within the communities consulted as part of the stakeholder consultation process, particularly with respect to the potential to contribute to health issues as well as create nuisance.

With regard to vulnerability and value, while there is a potential for a minor deterioration in air quality, there is a higher moderate potential for nuisance due to dust, particularly for receptors in close proximity to the construction works, with potential for greater effects within Amman city, where receptors are denser, and air quality is poorer. In terms of resilience, the creation of dust will be temporary, reversible, lasting over the short to medium term and will have no effect on receptors once the work has been completed. A medium ranking is assigned primarily due to concerns raised by the communities consulted regarding dust.

Impact Significance (Pre-Mitigation)

Air Quality: Minor Adverse

Dust: Medium Adverse

Mitigation

Pre-construction:

- Incorporate the following dust management measures within the Pollution Prevention Management Plan prior to the commencement of works:

  - Identification of dust generating construction activities and identification and classification of potentially affected sensitive receptors
  - Review and evaluate dust management practices for minimising dust impacts to residents, occupants and animals and minimise potential for sedimentation of watercourses/water bodies due to dust. Practices may include, but not limited to:
  - Using windbreaks, netting screens or semi-permeable fences
  - Controlling vehicle speeds to reduce traffic-induced dust dispersion and resuspension by setting and enforcing speed limits
  - Ensuring trucks hauling sand, dirt or other loose materials are covered (sheeting trucks)
  - Suspending topsoil stripping and replacement during strong winds
  - Using a dust collection system for bulk materials unloading
  - Where wet suppression techniques are considered, an evaluation will be required to provide suitable justification including the proposed source of water (with preference for reclaimed water use)
  - Protocols for engagement with residents and occupants to provide advance warning of works taking place where relevant, including the duration and likely dust impacts. In the case of work required in response to an emergency, the local residents and occupants shall be advised as soon as reasonably practicable that emergency work is taking place
  - Dust monitoring program to include:
  - Location, frequency and approach for undertaking onsite and offsite visual inspections during construction activities to confirm the effectiveness of dust control measures and the need, if required, for additional dust reduction measures and management practices to adequately control dust emissions
  - Records of inspections and findings to be kept and maintained
  - Triggers for increasing the frequency of site inspections e.g. when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions
  - Reporting process related to dust visual monitoring results
  - Communication/disclosure lines related to dust visual monitoring results, with the affected households and the applicable government entities
- Ensure the Project Grievance Mechanism includes the process for handling and responding to dust complaints, including requirements associated with conducting reviews of dust management practices and dust monitoring in response to complaints
- Incorporate consideration of dust and air quality impacts in the detailed planning for the construction camps and temporary project facilities to inform siting, layout, equipment selection and dust abatement measures (where required)
- At the detailed design stage, relevant emission source limits will be defined within equipment specifications to ensure that relevant point source emission standards and air quality limits in Chapter 2 are met

Construction:

- When storage, transport and handling of bulk materials is made in the open air and exposed to the wind, the necessary dust abatement measures shall be implemented
- All dust generating materials transported to and from the construction worksites shall be covered by sheeting
- The following shall be implemented to the extent possible/practicable:
  - Minimise storage time of spoil stockpiles
  - Align stockpiles to prevailing wind to minimise surface area exposed to wind erosion
  - Minimise stockpile height and use gentle slopes and compact stockpile surfaces
  - Store materials away from the site boundary and downwind of sensitive receptors

○ Minimise the height and fall of excavation materials during handling • Plan construction layouts so that machinery and dust-causing activities are located away from receptors, as far as is possible • Consider the feasibility of erecting solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site • Where possible / practicable, fully enclose site or specific operations where there is a high potential for dust production and the site is expected to be active for a prolonged period with adjacent receptors • Keep site fencing, barriers and scaffolding clean using wet methods (where feasible to do so) • Remove materials that have the potential to produce dust from site as soon as possible unless being re-used on site • Cover, seed or fence stockpiles to prevent wind whipping • Prohibit bonfires and burning of waste materials • Where applicable, re-vegetate earthworks and exposed areas / soil stockpiles to stabilise surfaces as soon as practicable. Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable • Only remove the cover in small areas during work and not all at once • Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place • Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery • For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust • Use dust sweepers on the access and local roads (water-assisted where feasible to do so) • Avoid dry sweeping of large areas Operations: • Operations Phase Pollution Prevention will be developed and will include measures to ensure air quality impacts during operations are minimised, including the need to operate and maintain equipment pursuant to the manufacturer's specifications, managing complaints and conducting air quality monitoring (where necessary) in response to complaints
Residual Impact
• With the application of the mitigations incorporated into a Project ESMS with verification and reporting, the residual impact associated with both air quality and dust is considered **Minor Adverse.** • The justification for the reduction in impact significance associated with dust impacts is due to: • Reduction in magnitude of impact due to the use of dust management practices and controls

Table 14: Impact and Mitigation Summary - Construction Works, Conveyance Pipeline and AGIs, Noise, Vibration and Glare

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)
Moderate Adverse Assessed based on numerical screening modelling to estimate noise arising from the use of construction plant and equipment along the conveyance route and at the conveyance AGIs and project-related traffic. The screening assessment findings and secondary data sources were also used to estimate potential noise effects from the temporary facilities include construction camps and trenchless crossings. The assessment

conservatively assumed all plant operating simultaneously and no screening effects from topography or existing buildings and structures. Spatially, the results show that distances to where applicable noise limits will be met, ranging from 200m to 925m, with the greatest distances and hence the highest noise levels predicted associated with sheet pile trenching; an activity anticipated to be undertaken as an alternative to conventional trenching in constrained areas, specifically within urban and built-up areas. Noise impacts due to construction activities will be temporary, lasting days to weeks along the conveyance route and months at the conveyance facility locations and over years at the camps. Effects will cease when the activity stops and will be reversible. The assessment recognises the conservative nature of the limit values adopted, with best-practice construction guidance typically providing higher noise limit values that recognise the temporary nature of construction noise and allow for some degree of disturbance. Given this and the assumptions made within the modelling, this assessment and the ranking assigned are considered conservative. A vibration screening assessment was undertaken to consider the potential for effects resulting from vibratory piling along the conveyance route (in urban areas) and vibratory compaction of finished road surfaces. The assessment predicted no potential for vibration nuisance to communities beyond 20m (vibratory compaction) or 25m (vibratory piling) and that worst case cosmetic damage due to vibration was not anticipated beyond 4m (assuming lightweight building structures). As such vibration impacts are expected to be negligible to minor adverse. Mitigation is specified to ensure vibration risk is appropriately managed and minimised including risks to the integrity of sensitive structures. Disturbance effects from the solar panels were considered within a screening assessment undertaken to confirm the potential for glint and glare impacts arising from the operation of the Project renewable (RE) facility which comprises a solar PV facility. Based on the location and distance of potentially affected receptors from the RE facility and the design and orientation of the panels, the assessment concluded that no glint and glare impacts were anticipated, and no impacts were predicted.
Receptor Sensitivity (based on vulnerability, value and resilience)
Medium The key receptors sensitive to noise generated from the construction of the conveyance pipeline and AGIs comprise the residents located in the vicinity of the construction activities, highly sensitive receptors such as the occupants of places of worship, medical facilities and hospitals, places of education and, to a lesser extent, industrial and commercial receptors. The majority of the route (over 73%) passes through areas that are classified as low or negligible sensitivity. These areas are generally rural and non-populated. Approximately 14% is predicted to fall within the “Residential Areas within villages” category and approximately 13% of the route falls within the highest sensitivity category (predominantly within Amman city). Those towns nearest to the route within Aqaba, Tafiela and Karak Governorates are considered most sensitive to noise impacts, along with the suburbs of Amman City that the conveyance route will pass through and community facilities, including places of worship, medical centres, and educational institutions, including schools, in these locations. In towns within the Aqaba, Tafiela, and Karak Governorates, and in the suburbs of Amman, existing noise levels are typical of an urban environment, and receptors are not identified as highly vulnerable or fragile, although there is uncertainty about the specific locations at this early stage of construction planning. Recognising this uncertainty and, taking into account the temporary nature and reversibility of noise impacts, a ranking of medium is assigned to receptor sensitivity.
Impact Significance (Pre-Mitigation)
Medium Adverse
Mitigation
Pre-construction:

- Develop a Construction Noise and Vibration Management Plan aligned to national legislation and international standards in Chapter 2 that includes all feasible and reasonable methods to limit noise emissions and minimise the noise impact on people/properties neighbouring the Project areas/sites. The plan shall include at a minimum:
    - Estimation of the frequencies, duration, days of the week, planned working hours and predicted noise levels anticipated within the vicinity of the Project construction activities at all Project Facilities and along the conveyance pipeline to be completed by a competent noise assessor
    - Protocols for engagement with residents and occupants to provide advance warning of works taking place where relevant, including the duration and likely noise and vibration impacts. In the case of work required in response to an emergency, the local residents and occupants shall be advised as soon as reasonably practicable that emergency work is taking place
- Ensure the Project Grievance Mechanism includes the process for handling and responding to noise complaints, including requirements associated with conducting noise and vibration monitoring in response to complaints. This should include consideration for an accelerated process to handle and respond to critical construction-related noise grievances.
- Within the Construction Noise and Vibration Management Plan, include a Noise Monitoring Program ahead of the commencement of works, comprising the following elements:
    - Identification of noise/vibration sources and identification and classification of potentially affected sensitive receptors
    - Description of applicable legal requirements related to noise/vibration measuring parameters, measuring locations, frequency of monitoring (intermittent or continuous) and planned monitoring programme for the works, considering the location and sensitivity of the potentially affected receptors
    - Description of arrangements for noise/vibration mitigation during construction in relation to identified noise sources and sensitive receptors, including selection of quieter equipment and scheduling
    - Reporting process related to noise/vibration monitoring results
    - Communication/disclosure lines related to noise/vibration monitoring results with the affected households and the applicable government entities
- Incorporate consideration of noise impacts in the detailed planning for the construction camps and temporary project facilities to inform siting, layout, equipment selection and noise abatement measures (where required)
- A review of vibration risk including need to complete a dilapidation survey will be undertaken as part of construction planning.
- All pile driving shall be carried out by plant equipped with a noise reducing system or by silent driving systems. Percussive piling shall only be used where no other suitable system is available.
- Permanent equipment design to comply with noise limits

Construction:

- During construction the contractors shall implement the Construction Noise and Vibration Management Plan and Noise Monitoring Program
- Temporary noise barriers shall be used to reduce noise levels where appropriate and practicable. Such measures can be particularly appropriate for stationary or near-stationary plant such as pneumatic breakers, piling rigs, and compressors. Barriers shall be located as close to the plant as possible and, in order to provide adequate attenuation, shall have a mass per unit area of at least 7 kg/m2. The screens may include soil mounds, site offices, site huts, acoustic sheds, or partitions.
- All compressors and generators used during construction activities shall be “sound reduced” models and fitted with properly lined and sealed acoustic covers which shall be kept closed whenever the machines are in use, and all pneumatic percussive tools shall be fitted with mufflers or silencers of the type recommended by the manufacturers.

- High noise generating works (e.g., piling) shall be planned in line with national regulations and respect maximum ambient noise levels at the nearest receptors
- Stationary equipment (such as temporary generators and compressors) shall be located as far as possible from nearby receptors (e.g., communities). Equipment known to emit noise strongly in one direction, whenever possible, shall be orientated so that the noise is directed away from any sensitive receptors.
- As far as practicable, any activities requiring concrete breaking shall be carried out using equipment that breaks concrete in bending in preference to percussive methods.
- Where reasonably practicable, fixed items of construction plant shall be electrically powered in preference to diesel or petrol driven.
- All ancillary plant such as generators and pumps shall be positioned so as to cause minimum noise disturbance, and, if necessary, acoustic enclosures should be provided.

Residual Impact

- With the application of the mitigations incorporated into a Project ESMS with verification and reporting, the residual impact is considered **Minor Adverse.**
- The justification for the reduction in impact significance is due to:
- Reduction in magnitude of impact due to the use of noise controls including siting of equipment, use of noise barriers and selection of the quietest equipment

Table 15: Impact and Mitigation Summary - Construction Phase, Resettlement, Land, Asset and Livelihoods

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)

Moderate to Major Adverse

Assessed based on no large-scale physical displacement is currently anticipated. However, some residential buildings or informal settlements may be affected. Economic displacement is expected to be the predominant impact type, primarily during the construction phase. These impacts may include:

- Temporary loss of access to land or livelihoods due to construction works and restrictions within the right-of-way (RoW)
- Temporary or permanent loss of agricultural income, grazing access, or damage to livestock, crops, trees, fences, or irrigation infrastructure
- Permanent loss of assets (buildings, kiosks) for businesses
- Temporary relocation of business assets during construction
- Temporary disturbance or reduced access to roadside businesses or vendors
- Temporary disturbance to tourism businesses and reduced access to tourism activities
- In limited cases, permanent impacts where land use cannot be safely or practically reinstated following construction

The predominant type of economic resettlement related impact is the disruption to access to businesses during construction.

In addition, for those relying on grazing lands and limited water points, small-scale farming, or informal roadside activities, even short-term loss of access can have significant livelihood implications.

Spatially impacts could affect significant numbers of people across the Governorates where Project construction activities will be ongoing.

Temporally restrictions (and associated disruption) would likely be in place for periods of weeks to months depending on the location.
Receptor Sensitivity (based on vulnerability, value and resilience)
High The sensitivity of potentially affected people is assessed as **High**, particularly for rural households in the Badia, where access to land, grazing, and water resources is central to livelihoods and social identity. Vulnerability is further elevated among households with informal or customary land use (e.g. unregistered users of state land, settled herders, and informal residents), as they lack formal tenure security and may not be entitled to compensation under national law without additional measures aligned with lender standards. Vulnerability is also elevated for informal businesses, or those small businesses lacking formal documents as they may not be entitled to compensation under national law without additional measures. Women, small-scale farmers and herders, and small-scale businesses also constitute sensitive groups due to lower adaptive capacity, potential economic vulnerability and limited access to alternative income, and potential barriers to participating in consultation or compensation processes.
Impact Significance (Pre-Mitigation)
Major Adverse
Mitigation

Pre-construction:
• Before the start of construction, prepare and implement a Resettlement Policy Framework (RPF) in accordance with EBRD PR5 and IFC PS5, which will guide the preparation of the Project Resettlement Action Plan (RAP), which will include the following mitigation principles:
  ○ Minimisation of land take/access
  ○ Compensation for all affected people, prior to land take/access/disturbance
  ○ Livelihood restoration and assistance
  ○ Targeted support for vulnerable groups
  ○ Construction planning to minimise and manage temporary access distruption
  ○ Stakeholder engagement and disclosure
  ○ Grievance redress
  ○ Monitoring and post-construction commitments
• A targeted land use assessment of potential impacts on all herders, including nomadic and semi-nomadic herders will be included in the RAP, including an assessment of whether the Project could impact grazing areas, water points, or access to these grazing areas and water points and above mitigation will be applied.
Construction:
• Ensure the Project Resettlement Action Plan (RAP) is implemented, noting some elements will be completed before construction to undertaken the above principles
Prior to the start of Operations:
• Before the start of operations, undertake a post-construction audit to confirm the reinstatement of access, the restoration of livelihoods, and the close-out of all commitments

Residual Impact
With the application of the mitigations incorporated into a Project ESMS with verification and reporting, the residual impact is considered **Minor Adverse.** The justification for the reduction in impact significance is due to:

- Adoption of measures to design, plan and implement mitigation to address resettlement, access and livelihood impacts through preparation of a RFP and subsequently a RAP supported by auditing to ensure successful implementation

Table 16: Impact and Mitigation Summary - Construction Phase, Community Health, Safety and Security

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)
Major Adverse Assessed on the basis that construction will involve multiple simultaneous activities across a long linear corridor, intersecting or passing near populated areas, settlements, business and commercial activities, agricultural zones, herding activities and public roads. The range of potential risks includes increased heavy vehicle movements, road safety hazards, construction safety hazards, accidental damage to infrastructure or utilities, nuisance from dust and noise, and potential interactions between workers and local residents. Spatially impacts could affect significant numbers of people across the Governorates where Project construction activities will be ongoing both directly and indirectly Temporally, while the duration of work at any single location will be relatively limited and many impacts (such as noise, dust, or temporary access restrictions) are expected to be short-term and reversible, others carry the potential for serious or lasting consequences. These include traffic-related accidents involving community members, safety incidents linked to unprotected excavations or machinery, and disruption to vulnerable roadside businesses whose income may depend on uninterrupted access and local mobility. Given the pipeline route's geographical extent, the number of potentially exposed people, and the range of potential health and safety risks, the overall magnitude of the unmitigated effect is therefore ranked as Major, even though the duration of most individual disturbances will be temporary.
Receptor Sensitivity (based on vulnerability, value and resilience)
High Assessed based on the large numbers of people potentially affected and the range of diversity and vulnerability of those potentially affected. The Project spans multiple governorates and socio-economic contexts, from more rural areas in the Central and Southern Badia to densely populated peri-urban and urban neighbourhoods near Amman, and includes important tourism, agricultural, herding, and small-business economies, as well as multiple residential areas. Receptor sensitivity is also high as a result of previous experience with the earlier Diesah Pipeline Project, and of feedback from consultations undertaken for this ESIA, including reports of negative impacts from construction, leading to lasting concerns about the adequacy of contractor oversight and enforcement of health and safety standards. While these concerns do not imply non-compliance on the AAWDC Project, they highlight a pre-existing sensitivity and low tolerance from Project stakeholders to any perceived risks to community health and safety.
Impact Significance (Pre-Mitigation)
Major Adverse
Mitigation
Pre-construction: • Development of a Project Community Health, Safety and Security Management Plan (CHSSMP) to be prepared by the EPC Contractor, in consultation with all affected municipalities and other relevant local authorities and approved prior to mobilisation. Specific mitigation measures detailed in the CHSSMP will include: ○ Measures to address potential construction hazards and disturbance impacts, including:

- Avoidance of construction at night in residential areas, wherever feasible
- Dust suppression measures to be implemented near communities, schools, grazing areas and farms (see Table 13 Air Quality and Dust)
- Noise and vibration measures to be implemented near communities, schools, grazing areas and farms (see Table 14 Noise, Vibration and Glare)
- Safe storage and controlled laydown of pipes/equipment to avoid creating hazards or attracting anti-social use
- Clear site fencing, signage, and lighting around open trenches, machinery yards, and material laydown areas, to prevent accidental access
- Hydrological management measures, such as maintaining natural drainage pathways, installing temporary diversions, where necessary, and avoiding obstruction of wadis
- Measures to address potential impacts associated with worker influx, including:
- Workforce accommodation planning to avoid strain on local services.
- Worker camps to have their own medical facilities to avoid putting undue pressure on local health services and facilities in rural and peri-urban Project areas
- Worker code of conduct to be implemented for all Project workers, including contractors and sub-contractors.
- Worker Gender-Based Violence, Harassment and Sexual Exploitation and Abuse (GBVH/SEAH) Code of Conduct to be implemented for all Project workers, including contractors and sub-contractors, and other GBVH/SEAH prevention measures (see Table 19)
- Measures to address potential impacts on community infrastructure and services, including:
- Solid waste and wastewater management measures aligned with municipal capacity.
- Coordination with public security and emergency response services to ensure preparedness for accidents or emergencies, including shared response protocols and contact points
- Coordination with municipalities to address any impacts on community utilities
- Measures to address community risks associated with Project security in line with international good practice (e.g., Voluntary Principles on Security and Human Rights), including:
- Engagement with public security forces to ensure alignment and coordination over Project security measures
- Rigorous screening, training, and monitoring of private security providers on behavioural standards, human rights, GBVH/SEAH prevention, and proportional use of force.
- Clear protocols for engagement with local communities, including respectful communication and cultural awareness.
- Transparent procedures restricting security personnel from engaging in law enforcement beyond their mandate.
- Measures to ensure close coordination during construction with relevant authorities, such as municipalities, districts and sub-districts, ASEZA for the Aqaba section, health directorates, and civil defence
- Any additional measures necessary to address potential community health, safety and security impacts on the vulnerable groups
- Construction and post-construction monitoring and reporting measures

- Development of a Traffic and Road Safety Management Plan, that is based on a detailed forecast of the traffic and transport flows and routes, to be prepared by EPC Contractor, in close coordination with municipalities and the Ministry of Public Works & Housing and approved by NCPC prior to mobilisation. This Plan should take into consideration community access issues, and safety measures around communities and livestock.

Construction:

- During construction implement all measures outlined in the Community Health, Safety and Security Management Plan and the Traffic and Road Safety Management Plan, supported by continuous monitoring, transparent communication, and proactive engagement with local authorities (municipalities and districts/sub-districts) and community representatives
- EPC Contractor will ensure the following public engagement:
  - Early notification of construction schedules to governorates, districts/sub-districts and municipalities listed in the Project SEP
  - Advance public awareness and information campaigns before and during construction to alert communities about work schedules, restricted zones, temporary closures, detours, and safety precautions—especially in schools, herding areas, and tourism zones
- EPC Contractor to maintain a system for continuous observation, recording, and reporting of any community safety incidents, near-misses, or grievances related to construction activities. Key indicators will include the number and type of incidents, response times, grievance resolution rates, and community satisfaction levels.
- Weekly and monthly monitoring reports to be compiled during active construction, supported by periodic joint inspections with local municipalities and districts/sub-districts, and ASEZA (in Aqaba Governorate Project areas). Any emerging risks will trigger immediate corrective action and, if necessary, revisions to the CESMP. Monitoring results and safety bulletins will also be shared transparently with local stakeholders, municipalities, and governorate authorities to maintain trust and accountability.
- Prior to the demobilisation of the EPC contractor implement a post-construction verification and close-out programme to ensure that all commitments and mitigation measures have been effectively implemented, and that any residual risks or outstanding community concerns are addressed prior to commissioning. This will include:
  - Final safety inspections and road reinstatement verification in coordination with the Ministry of Public Works and local municipalities
  - Closure of any temporary access routes, storage yards, and borrow pits with appropriate signage, fencing, and rehabilitation
  - Post-construction consultations with municipalities and districts/sub-districts, including land users outside of urban areas (e.g. farmers, herders) to confirm satisfaction with reinstatement and to identify any unanticipated impacts
  - The results of post-construction monitoring and consultations will be compiled into a Community Health and Safety Close-Out Report, confirming that residual impacts have been effectively mitigated, lessons learned have been incorporated, and that the Project meets both national and lender requirements prior to entering full operational phase.

Residual Impact

With the application of the mitigations incorporated into a Project ESMS with verification and reporting, the residual impact is considered **Minor Adverse.**

The justification for the reduction in impact significance is due to:

- Adoption of measures to design, plan and implement mitigation to address community health and safety impacts through preparation of a Traffic and Road Safety Management Plan supported by grievance management, reporting and monitoring to ensure successful implementation

Table 17: Impact and Mitigation Summary - Construction Phase, Local Employment and Local Content

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)
Major Adverse Assessed on the basis of the scale of temporary employment and procurement required for the project with the effect being adverse or beneficial depending on how the opportunities are managed and the direct and resulting indirect effects are experienced. Conservatively pre-mitigation impacts are considered to be potentially adverse in nature. Spatially the AAWDC Project will generate a substantial volume of temporary employment and procurement opportunities during the construction phase, given the scale and geographical extent of the works, the number of contractors involved, and the duration of construction activities across multiple Governorates. If managed effectively, these opportunities could positively contribute to local livelihoods, household income stability, and local business activity. However, the magnitude of potential adverse impacts is expected to be major if expectations are not met or if recruitment and procurement practices are not transparent and inclusive. Exclusion (real or perceived) of local workers or suppliers, whether due to lack of information, limited skills, or favouritism, could lead to significant dissatisfaction and conflict among Project stakeholders. The large geographic area of the Project also increases the number of directly and indirectly affected people, magnifying the overall scale of potential impacts. Temporally effects are temporary and lasting the duration of the construction period with effects for individuals and businesses based on the duration of their contracts.
Receptor Sensitivity (based on vulnerability, value and resilience)
High The sensitivity of communities in relation to project employment and procurement opportunities and the implementation of these potential opportunities within the AAWDC Project socio-economic context is assessed as high. Unemployment levels in the southern Governorates and Districts are among the highest nationally, particularly in Qweirah District, Diesah Sub-District, and Jafr Sub-District, where limited private investment and public employment opportunities have created sustained economic vulnerability, particularly among women and youth in these areas. Local stakeholder expectations regarding local employment and procurement, particularly among Bedouin stakeholders in the Central and Southern Badia, are high. In these Badia tribal/clan areas, perceived unfairness or exclusion in recruitment processes and local contract allocation can have broader implications beyond individuals, triggering grievances at the tribal or clan level. This risk is intensified by social dynamics in which wasta (personal influence or mediation) is reported by stakeholders to continue to shape access to opportunities, raising concerns about transparency and accountability in hiring and contracting. Women and youth are also particularly vulnerable in this context, given their historically low labour force participation and limited access to formal employment. Without deliberate inclusion measures, they risk being excluded from project-related benefits.
Impact Significance (Pre-Mitigation)
Major Adverse
Mitigation
Pre-construction: • EPC Contractor and NCPC to Register on the Ministry of Labour's (MoL) National Employment Program (NEP), which is a government flagship, performance-based wage-subsidy and placement program to stimulate private-sector hiring of Jordanians, especially youth and women. The program blends (i) temporary wage support, (ii) social security and transport top-ups, and (iii) on-the-job & short classroom training, tied to actual signed work contracts.

- Development of a Project Local Employment and Local Procurement Plan, in coordination with the EPC Contractor, and consultation with local districts/sub-districts and municipalities in order to design the most effective, transparent and fair local employment and local procurement processes for each Project locality. This Plan will integrate the Ministry of Labour NEP process. Further consideration will also be given to different ways to ensure transparency and fairness, including the consistent request from engaged stakeholders in the Badia for inclusive Local Advisory Committees (LACs) to be set up through the Districts/sub-districts with oversight from the local governors. Consideration will also be given to learning from positive examples of employment processes in past infrastructure or construction projects, reported by engaged community and local authority stakeholders
- The EPC Contractor will develop local employment and procurement plans in consultation with the NCPC ESG team and local authorities, integrating the approach set out by NEP and the overall AAWDC Local Employment and Procurement Framework. These plans will set realistic targets for local employment and local procurement, prioritising residents of the directly affected districts and sub-districts. These plans will specify the number and the types of roles specifically targeted to local employment (unskilled, semi-skilled, and skilled), and the procedures for verification and record-keeping, as well as the measures to address local procurement.
- Capacity Building and Skills Development: NCPC and the EPC Contractor will work with the Ministry of Labour, NEP and relevant vocational training centres to promote skills training and pre-employment preparation, particularly targeting youth (including disabled youth) and women to help them qualify for construction-related jobs and contracts.
- Advance Communication with local authorities: The EPC Contractor will share expected criteria for local procurement selection pre-construction through municipalities, districts and sub-districts, so that local businesses can have additional training if required.
- The NCPC and EPC Local Employment and Local Procurement Framework and Plans will include specifications for:
    - Transparent Employment Procedures: All employment opportunities during construction will be announced publicly and in advance through accessible local channels (municipalities, social media, district/sub-district offices). Recruitment criteria will be clear, based on merit and relevant skills. Selection will take place through a diverse selection committee in coordination with local authorities
    - Fair Local Procurement: The Project and EPC Contractors will identify and pre-qualify local suppliers and service providers wherever feasible, subject to compliance with health, safety, environmental, and ethical standards. Procurement procedures will prioritise local companies from within the Project districts/sub-districts, particularly SMEs and cooperatives
    - Coordination with Local Authorities, Tribal Representatives and local community associations: Recruitment and local contracts will be coordinated through governorate, district/sub-district, and municipal authorities, ensuring alignment with official labour regulations and fairness across tribes/clans and localities (including women and youth). Where relevant, Local Advisory Committees (LACs), with inclusive representation (women, youth, etc) will be used to facilitate communication, ensure transparency, and defuse potential grievances over hiring or contract distribution
    - Inclusive Participation: Targeted outreach through local community-based associations and cooperatives, as well a social media platforms (e.g. Facebook) will be made to under-represented groups, including women, youth, and disabled youth and small businesses, ensuring that employment and procurement opportunities are accessible to all segments of the population, not only to well-connected individuals or families.
    - Grievance Redress and Oversight: Any grievances related to employment and procurement will be received, documented, and resolved promptly through the Project GRM.
    - Monitoring and reporting indicators will include:
    - Number and percentage of local hires (by district/sub-district, gender, age, and skill level)
    - Number and value of contracts awarded to local suppliers
    - Number and value of contracts awarded to local women associations/cooperative suppliers

○ Number of grievances related to employment or procurement and their resolution rate ○ Participation levels in training and skills programmes (disaggregated by gender) ○ Community satisfaction levels measured through periodic engagement (disaggregated by gender) Construction: • The Project will produce quarterly monitoring summaries shared with lenders, local authorities, and communities through governorate, district/sub-district, and municipal offices, as part of its transparency commitment. • Prior to the demobilisation of the EPC contractor, implement a post-construction verification and close-out programme to confirm that local employment and procurement commitments have been met, lessons have been learned, and any outstanding community concerns or grievances have been addressed. This will be captured in a Local Employment and Procurement Close-Out Report, summarising achieved benefits, residual issues, and recommendations for enhancing community economic participation and benefits during the operational phase
Residual Impact
With the application of the mitigations incorporated into a Project ESMS with verification and reporting, the residual impact is considered **Medium Beneficial.** The justification for this impact significance is due to: • Adoption of measures to design, plan and implement mitigation to address and maximise local employment and local content through preparation and implementation of a Project Local Employment and Local Procurement Plan supported by additional procedures e.g. grievance management, reporting and monitoring to ensure successful implementation

Table 18: Impact and Mitigation Summary - Construction Phase, Labour Management

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)
Major Adverse Assessed based on the large construction workforce, expected reliance on multiple subcontractors, and the likelihood of employing both local and migrant workers, increasing the complexity of oversight. Effects are assessed based on the potential risk to working conditions, occupational health and safety (OHS), workers' accommodation, equal opportunity, and fair treatment.
Receptor Sensitivity (based on vulnerability, value and resilience)
High Given that construction workers are inherently exposed to physical hazards, variable employment conditions, and power imbalances in the workplace, receptor sensitivity is considered high. Sensitivity is heightened for foreign workers, who may face language barriers, limited access to grievance mechanisms, and restricted mobility. Women workers also represent a potentially vulnerable group, given low female labour participation rates in the construction sector nationally, and the need for explicit safeguards against harassment and discrimination. Informal and low-skilled workers are also a potentially vulnerable group, given the common lack of health and safety protections they often face.
Impact Significance (Pre-Mitigation)
Major Adverse
Mitigation
Pre-construction:

- EPC to develop a Labour and Working Conditions Management Plan that makes the following commitments for all workers (including day and non-full-time):
  - Written contract: (Arabic + worker's language) issued for all workers; daily workers registered in a day-labour log with written day-rate terms, scope, hours, overtime rates, rest entitlements, and injury compensation procedure
  - Fair wages & timely payment: equal to or greater than national minimum wage; overtime at legal rates; no unlawful deductions; transparent payslips
  - No fees, no passport retention: workers never pay recruitment/placement fees; identity documents remain with workers
  - Rest and hours: normal hours not to exceed 8h/day, or 48h/week; at least one 24-hour weekly rest; shift work managed so no individual exceeds 11 hours in any 24h (including breaks); overtime only under legal exceptions and paid at 125–150%
  - Injury compensation & medical care: immediate first aid and transport; notification and compensation per law; incident logged within 48 hours to Ministry of Labour
  - Social protection: workers informed of their injury insurance and compensation rights; contractor must evidence coverage (SSC or equivalent accident insurance) for all workers on site, including day labourers, and explain access steps in case of injury
  - Adverse Weather: Employers must protect workers in adverse weather; following any hours that the Minister may set in which work is prohibited, in accordance with Reg. 31/2023 Art. 9; stop-work or reschedule when ministerial heat bans are announced (e.g., noon-to-afternoon bans during heatwaves), and document compliance in the daily log
- The Plan will identify, assess and provide management measures for natural hazard risks such as weather monitoring, early-warning protocols and location specific safe-work procedures such as suspending works in flood-prone areas when rainfall thresholds are reached, and training for workers on recognising natural hazard warning signs, emergency response actions and safe evacuation routes
- The plan will be supported by a:
  - Code of Conduct and Employment Terms: All workers will receive written contracts in a language they understand, outlining employment terms, wages, working hours, and benefits. A Project-wide Code of Conduct will prohibit discrimination, harassment, gender-based violence and harassment (GBVH) of any kind, forced and child labour, and ensure respect for freedom of association. All workers will be required to read and sign a Worker Code of Conduct (provided in the worker's language) which will also be explained verbally
  - Occupational Health and Safety (OHS): EPC Contractors will implement an OHS Management Plan meeting national and international standards, covering training, supervision, incident reporting, and emergency response.
  - Worker Accommodation Standards: Where workers are housed in temporary facilities, these will comply with the requirements in Chapter 2 of this ESIA, ensuring adequate space, sanitation, potable water, and access to medical care
  - Grievance Redress Mechanism (GRM): A dedicated worker grievance system will be established, confidential, accessible, and separate from the community grievance mechanism, allowing workers to report issues without retaliation
  - Foreign Worker Protection: The Project will ensure recruitment agencies are licensed and ethical, no recruitment fees are charged to workers, and passports or ID documents are not withheld
  - Women Workers' Inclusion and Protection: Contractors will provide gender-sensitive facilities (e.g. Female changing rooms, toilet facilities, and prayer rooms will be kept separate from men. All such facilities will have lockable doors with adequate numbers provided). The AAWDC Project will enforce zero-tolerance policies for all forms of harassment, including gender-based violence and harassment (GBVH) and sexual exploitation and abuse (SEAH) (see Table 19), and ensure equal pay and maternity rights as per law

○ Training and Awareness: All workers, supervisors, and managers will undergo training on labour rights, health and safety, grievance use, GBVH/SEAH (see Table 19), and anti-harassment policies • Monitoring and Reporting: ○ Contractors will report monthly on metrics that will include workforce numbers, gender, nationality, training, incidents, and grievances. ○ The NCPC ESG team will maintain oversight of all contractors through regular labour inspections and compliance audits, supported by documentation review and worker interviews. Construction: • Implementation of the Labour and Working Conditions Management Plan, supporting plans, procedures and policies, and monitoring and reporting requirements
Residual Impact
With the application of the mitigations incorporated into a Project ESMS with verification and reporting, the residual impact is considered **Minor Beneficial** The justification for this impact significance is due to: • Adoption of measures to design, plan and implement mitigation to address labour management concerns through preparation and implementation of a Project Labour and Working Conditions Management Plan supported by additional procedures e.g. grievance management, reporting and monitoring to ensure successful implementation

Table 19: Impact and Mitigation Summary - Construction Phase, Gender-Based Violence, Harassment and Sexual Exploitation and Abuse

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)
Moderate to Major Adverse Assessed based on the large scale of the construction workforce and associated potential risk of Gender-Based Violence and Harassment (GBVH) and Sexual Exploitation and Abuse and Harassment (SEAH)—particularly if workers are housed near communities, where migrant and local workers mix, or where women and girls already face constraints on mobility, economic participation, or access to protection networks. Conservatively ranked as Major Adverse recognising that while the Project will implement Jordanian laws that prohibit harassment and violence, incidents may occur and even a small number of incidents may have serious and long-lasting effects on survivors and can undermine trust in the Project.
Receptor Sensitivity (based on vulnerability, value and resilience)
High Receptor sensitivity is deemed to be high considering local gender dynamics and norms, and a likely low reporting culture.
Impact Significance (Pre-Mitigation)
Major Adverse
Mitigation
Pre-construction and Construction: • Policies, Codes of Conduct & Contractor Requirements: ○ Establish and enforce a AAWDC Project-wide GBVH/SEAH Code of Conduct for all workers, managers and subcontractors, translated into Arabic (or other languages if necessary). All workers will be

required to read and sign this Worker Code of Conduct (provided in the worker's language), which will also be explained verbally.
    - Require EPC Contractors and subcontractors to implement robust GBVH/SEAH Prevention & Response Action Plans.
    - Mandatory induction and refresher training for all workers on behavioural expectations, boundaries, and consequences of misconduct.
- Worker Management & Supervision:
    - Supervision protocols to prevent worker-community misconduct, including restrictions on worker movement where necessary.
    - Prohibit alcohol and drug use in worker accommodation or near communities.
    - Maintain worker accommodation in compliance with IFC/EBRD Worker Accommodation Guidelines.
- Safe, Accessible and Confidential Reporting:
    - Integrate GBVH-sensitive channels into the Project Grievance Mechanism (GRM), ensuring confidentiality, anonymity, and non-retaliation.
    - Provide multiple reporting pathways (CLOs, women focal points, hotline, WhatsApp, trusted community intermediaries).
    - Ensure that staff responsible for GRM and CLOs receive specialised GBVH/SEAH training.
- Partnerships for Survivor Support
    - Pre-identify and partner with specialised local GBV service providers, including shelters, psychosocial services, and legal assistance, to ensure referral pathways for survivors.
    - Map available resources through the Ministry of Social Development and CBOs.
- Inclusive Community Engagement
    - Conduct women-only consultations, ensuring women can raise safety concerns freely.
    - Provide construction updates and worker presence notifications in all urban locations.
- Contractor Accountability
    - Immediate dismissal and legal referral for confirmed GBVH/SEAH violations.
    - Contractual penalties and performance monitoring linked to GBVH/SEAH compliance.
    - Require subcontractor compliance as a condition of contract award.
- Monitoring & Reporting
    - Include GBVH/SEAH indicators in routine monitoring, including training completion, incidents reported, response times, and status of corrective actions.
    - Quarterly reporting to NCPC senior management and Lenders.
    - Third-party audits as required.

Residual Impact

With the application of the mitigations incorporated into a Project ESMS with verification and reporting, the residual impact (in terms of potential risk) is considered **Moderate to Minor Adverse**

The justification for this reduction in impact significance is due to:

- Adoption of measures to design, plan and implement mitigation to address GBVH/SEAH concerns through preparation and implementation of a GBVH/SEAH Prevention & Response Action Plans supported by additional procedures e.g. code of conduct, reporting and monitoring to ensure successful implementation

Table 20: Impact and Mitigation Summary – Tangible Cultural Heritage, Heritage Assets

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)
Minor to Moderate Adverse The Project's impact on heritage assets vary in duration, spatial extent, and reversibility, leading to different magnitudes of effect. Duration of Effect: • Permanent: The loss of sites AHS002-AHS005 and AHF003 due to the construction of the PV plant is a permanent effect, resulting in their total loss. Physical impacts on rock art, inscriptions, archaeological sites, and features within the Wadi Rum Protected Area (WRPA) are also considered permanent (if applicable). • Long-term and Permanent: The visual impacts of permanent visible infrastructure (Overhead Transmission Line and Solar Photovoltaic (PV) renewable facility plant) on the historic landscape character, the setting of certain undesignated heritage assets (Mersed, WR-14_19, Aqaba Railway), and potential surface or buried archaeological remains are considered long-term and effectively permanent, although reversible. • Temporary and Short-term: Construction effects, including noise, dust, pollution, lighting, vibrations, and visual disturbances from machinery and spoil heaps, are temporary and short-term. The disruption to traditional pastoral techniques and the coexistence of Bedouin communities during construction is also temporary. • Spatial Extent: • Localised/Specific Sites: The total loss of sites AHS002-AHS005 and AHF003 is localised to the proposed PV plant footprint. Impacts on the physical remains of the Aqaba Railway are localised to where the pipeline crosses the railway. Damage to AHF004 and AHF005 would occur if the pipeline works overlap with these specific assets. • Wider Area/Landscape: Construction effects and the presence of permanent visible infrastructure can impact the historic landscape character and views from various points across the project area and influence area, including the WRPA buffer zone and northern core area. The visibility of the new OHTL and PV renewable facility plant is limited to certain elevated locations within the WRPA core area and some areas along the northern end of Wadi Rammam. • Within WRPA: Any physical impacts from construction activity on rock art, inscriptions, archaeological sites, and features are confined to the WRPA, particularly near the northern boundary. Reversibility: • Irreversible: The direct physical loss or damage to archaeological sites, finds, and features is irreversible. The total loss of sites AHS002-AHS005 and AHF003 due to the PV plant construction is irreversible. • Reversible: Construction effects (noise, dust, visual disturbances) are generally considered reversible. The visual impacts of permanent infrastructure and operational effects are considered reversible, even if they are long-term and effectively permanent, implying that if the infrastructure were removed, the visual impact would eventually disappear. • Magnitude of Effect: • Moderate Adverse: Before mitigation, impacts on rock art, inscriptions, archaeological sites, and features within the WRPA are considered moderate. Disruption to traditional pastoral techniques and the coexistence of Bedouin communities are also rated as moderate adverse. • Minor Adverse: The impact on heritage sites illustrating the inseparable relationship between natural and cultural spheres, the well-preserved physical remains of the railway, and the setting of certain undesignated heritage assets are generally assessed as slight or neutral-slight. Construction effects on the landscape and heritage assets' settings are largely minor or neutral/slight. The visual impact of permanent infrastructure on the historic landscape character and the setting of some undesignated assets is also slight or neutral/slight. Operational effects are generally minor or slight.

Receptor Sensitivity (based on vulnerability, value and resilience)
Major The overall receptor sensitivity for heritage assets is classified as major due to a combination of high intrinsic value, existing vulnerabilities, and the specific characteristics of the heritage assets within the project's area of influence. The Wadi Rum Protected Area (WRPA) holds Outstanding Universal Value (OUV) as a UNESCO World Heritage site, recognized for its exceptional testimony to cultural traditions, evidence of continuous human activity for 12,000 years, and its significance as an iconic desert landscape. This includes vast numbers of rock inscriptions, petroglyphs, archaeological sites, and features illustrating the deep interaction between human communities and the environment. Additionally, the "Cultural Space of the Bedu in Petra and Wadi Rum" is an internationally recognized intangible cultural heritage, reflecting ancient Bedouin lifestyles, oral traditions, and intricate knowledge of the natural environment. The Aqaba Railway is also noted as a nationally significant industrial heritage asset. Many of the heritage assets, particularly the rock art, inscriptions, archaeological sites, and features within the WRPA, are vulnerable to erosion, vandalism, and increasing pressures from tourism and development. The intangible heritage of the Bedouin communities is also at severe risk of degradation due to globalization, modernization, and the movement towards more sedentary lifestyles. Furthermore, there is a recognized lack of a comprehensive, up-to-date conservation database for all heritage assets within the WRPA, and some key monuments are only in fair condition. While the WRPA benefits from a strong legal and governance framework, with its conservation status assessed as "good with some concerns," the expanding tourism industry poses a significant risk to its long-term preservation. The ability of the heritage assets and cultural practices to withstand impacts is somewhat diminished by the continuous and increasing pressures from external factors and the inherent fragility of many natural and cultural elements. The unique geological and environmental conditions of Wadi Rum have influenced heritage preservation, but also expose sites to natural erosion processes.
Impact Significance (Pre-Mitigation)
Medium Adverse
Mitigation
Pre-construction: • Undertake and complete a full archaeological and cultural heritage baseline prior to construction. This includes a systematic walkover survey of the pipeline alignment and all ancillary areas, supported by specialist analysis of LiDAR, aerial imagery, and any available subsurface datasets. Ground-truthing will be undertaken where anomalies or potential heritage features are identified • Develop and Implement an Environmental and Social Management System (ESMS) and Cultural Heritage Management Plan (CHMP) o These plans must integrate all cultural heritage provisions, ensuring compliance with national laws and international lender requirements throughout the project's lifecycle, from pre-construction to decommissioning. o The CHMP should prioritize avoidance and minimization of impacts, integrate heritage protection into project planning, foster transparency and engagement with stakeholders, and ensure that management measures are proportionate to the significance and potential impact of the heritage. o The CHMP will specify site-specific mitigation measures, monitoring requirements, access controls, and reporting procedures. • Avoid Physical Impacts to Known Cultural Heritage Sites through Project Design o The pipeline route should be carefully designed to avoid damaging the Aqaba Railway by routing the new pipeline through areas already disturbed by existing infrastructure.

- For sites AHF004 and AHF005, the pipeline design should ensure all project works, including excavation and machinery movement, remain on the northern side of the existing road to avoid overlapping with these assets.
- All unspecified project elements, such as access roads, construction camps, and stockpile areas, must be designed to avoid intrusion into the Wadi Rum Protected Area (WRPA) core zone or other identified heritage sites.

- Archaeological Investigation and Recording Prior to Construction
  - Further investigation of sites AHS002-AHS005 and AHF003, the photovoltaic (PV) renewable facility plant site, and the surrounding area should be conducted to confirm or revise their significance and determine the potential for additional buried or surface remains.
  - This evaluation will inform whether the PV renewable facility plant site should be relocated to avoid impacts or if the unavoidable loss of these specific sites (AHS002-AHS005 and AHF003) is acceptable given the potential for greater harm elsewhere.
  - If sites are inevitably lost, they must be fully investigated, excavated, recorded, and published by professional archaeologists under the supervision of the Department of Antiquities (DoA) to offset the impact.

Construction:

- Minimizing Construction Effects
  - The Project will integrate all verified cultural heritage constraints into engineering design and construction planning. This includes repositioning access routes, adjusting pipeline alignment, modifying pylon locations, and adjusting construction methods to reduce risks to heritage. These design measures will be developed in consultation with the DoA.
  - Where known heritage sites are identified, the Project will prioritise avoidance through design modifications, micro-siting, buffer zones, and access restrictions. Where avoidance is not feasible, the Project will agree a mitigation strategy with the DoA, which may include controlled excavation, documentation, or protective engineering measures
  - All ground-breaking and ground-clearance works, including trenching, grading, foundation excavation, access road formation, laydown areas, and any earthworks within the WRPA, will be monitored by qualified Cultural Heritage Monitors under the supervision of the Cultural Heritage Specialist. This commitment includes daily reporting, GPS-based recording, photographic documentation, and immediate escalation of potential heritage discoveries. Monitoring coverage will be continuous until the DoA confirms that risks are fully addressed.
  - Implement measures to minimize noise, dust, pollution, and lighting during pipeline construction and operational maintenance, including using low-noise machinery, dust-tamping, and minimal lighting.
  - Visually monitor dust generation and concentrations, implementing mitigation such as water spraying or stricter speed limits if dust is visible.
  - Periodically monitor noise and vibration levels at cultural heritage sites; work must cease if harmful levels (exceeding 45 dB for noise or vibrations lasting over three minutes) are detected until mitigation reduces them to acceptable levels.
- Protection and Management of Cultural Heritage Sites During Construction
  - Conspicuously mark and protect all identified cultural heritage sites within 50 meters of the construction footprint with "no-go" zones, adhering to Jordan's Antiquities Law No. 23 for buffer distances (5-25m or greater if necessary).
  - Implement a Chance Finds Procedure (CFP) requiring archaeological monitoring of all ground-disturbing activities by a professional archaeologist, with a commitment to temporarily halt work upon new archaeological discoveries.
  - Ensure traditional access to cultural areas and resources is maintained, or alternative access provided, to avoid impacts on heritage significance and community issues.

Residual Impact
After implementing all recommended mitigation measures, the residual impact on heritage assets is considered **Minor Adverse.** The justification for the reduction in impact significance is due to: • The initial moderate impacts on rock art, inscriptions, archaeological sites, features, and the palimpsest of the semi-arid desert, as well as on traditional pastoral techniques and Bedouin communities, will be reduced to neutral. This reduction is achieved by avoiding physical impacts through sensitive design that prevents intrusion into the WRPA, ensuring alternative provision for traditional access during construction and operation, and minimizing construction effects like noise, dust, and light through appropriate provisions. • The initial moderate negative impact from the total loss of these sites due to the PV plant construction is reduced through evaluation of these sites and their surroundings to determine the most sensitive location for the PV plant. If unavoidable, their loss will be offset by a comprehensive program of investigation, excavation, recording, and publishing. • The initial neutral-slight to slight-large negative impacts (depending on the asset's significance) are reduced by minimizing land take through sensitive design and implementing a Chance Finds Procedure (CFP) and archaeological monitoring program.

Table 21: Impact and Mitigation Summary – Tangible Cultural Heritage, Landscape and Visual Impacts

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)
Moderate Adverse The magnitude of the effect on landscape and visual impacts is moderate, and the assessment varies based on the specific element of the project and the type of heritage asset involved. The construction of the pipeline will have a negligible impact on the area's historic character because the effects are temporary and short-term, and are entirely reversible upon completion of the construction phase. These impacts, including visible works, machinery, and spoil heaps, will be confined to specific areas within the Wadi Rum Protected Area's (WRPA) buffer zone and northern core area, mostly visible from elevated points. The new OHTL and PV renewable facility plant will also have a negligible visual impact. The OHTL, even when visible from certain elevated locations, will appear as barely discernible tiny black points due to the vast distance and will not break the horizon or skyline. The PV plant will be even less intrusive due to its lower height and greater distance. These impacts are considered cumulative rather than new, as existing OHTLs are already present in these views, making the new infrastructure's impact negligible to indiscernible. The effects are long-term but effectively permanent, with a limited spatial extent to specific elevated locations or areas along Wadi Rammam.
Receptor Sensitivity (based on vulnerability, value and resilience)
Medium The receptor sensitivity for landscape and visual impacts is classified as Medium. The historic views, particularly those towards Wadi Rum from undeveloped areas, are vulnerable to temporary interruption from construction work for the pipeline. Additionally, the new PV renewable facility plant and Overhead Transmission Line (OHTL) will be visible from some views, introducing intrusive infrastructure, although this is considered negligible due to distance and existing infrastructure. The key historic views of Wadi Rum are considered to have moderate integrity due to modern infrastructure already present in some views, indicating a partial impact. However, views along Wadi Yutum and east-west tributaries within the WRPA maintain high integrity, reflecting how past peoples would have experienced them, and are generally unaffected by modern development. The existing road through the WRPA buffer zone and

the road along Wadi Yutum also provide important views, despite being partially impacted by modern infrastructure.

Construction impacts are generally temporary, short-term, and reversible. The presence of existing infrastructure means that any new impacts will be cumulative rather than entirely new, and some visual impacts, especially from the PV plant, are considered negligible due to distance and low profile. Elevated views into the WRPA are deemed to have a negligible impact from the new OHTL and PV plant.

The overall Receptor Sensitivity is medium, primarily because while some views are already partially impacted by existing infrastructure and new construction will cause temporary visual interruptions, the intrinsic value of the landscape and the views towards Wadi Rum remain significant. The low-lying nature of some proposed infrastructure and the cumulative rather than entirely new nature of some impacts contribute to this moderate classification.

Impact Significance (Pre-Mitigation)

Medium Adverse

Mitigation

Pre-construction and Construction:

- Implement an Environmental and Social Management System (ESMS) and Cultural Heritage Management Plan (CHMP)
  - This ensures adherence to national laws and international lender requirements for heritage protection.
  - The CHMP should integrate all cultural heritage provisions, guided by principles of compliance, avoidance, minimization, integration, transparency, engagement, and proportionality.
  - It also outlines procedures, responsibilities, and technical requirements for safeguarding tangible and intangible cultural heritage throughout the project lifecycle, from pre-construction to decommissioning.
- Refine Project Design to Avoid and Minimize Impacts
  - Avoid physical impacts to the Aqaba Railway: Reroute the pipeline through ground already disturbed by existing roads where it crosses the railway to prevent damage or loss.
  - Avoid physical impacts to AHF004 and AHF005: Develop the pipeline route to remain on the northern side of the existing road in these locations, keeping all construction activities and machinery away from these heritage sites.
  - Avoid physical impacts to known cultural heritage sites: Conspicuously mark and protect identified sites with a 5-25m "no-go" buffer zone, using temporary barriers like brightly colored plastic or wire mesh fencing that is freestanding and removable.
  - Finalize unspecified design details: Ensure that all aspects, such as access roads, work camps, and stockpile areas, are designed to avoid intrusion into the Wadi Rum Protected Area (WRPA) core zone or known heritage sites. This will also help reduce ground disturbance and protect potential buried archaeological remains.
- Conduct Further Archaeological Investigation and Recording
  - Investigate sites AHS002-AHS005 and AHF003, the PV plant site, and the surrounding area.
  - Use magnetometry surveys to identify buried remains and targeted evaluation trenching to assess their nature and significance.
  - Perform additional walkover surveys to characterize surface archaeological resources.
  - If relocation of the PV plant is not feasible, implement a comprehensive program of investigation, excavation, recording, and publishing to mitigate the loss of heritage assets within its footprint.
- Ensure Traditional Access is Maintained

○ Design the final development and its construction to preserve traditional access to pastoral, habitation, industrial, and cultural areas, including cultural heritage sites. ○ If access is restricted, arrange alternative routes with stakeholder input.
Residual Impact
With the application of the mitigations incorporated into a Project ESMS with verification and reporting, the residual impact is considered **Minor Adverse.** There will be no lasting impacts on the OUV of the UNESCO-protected areas. The justification for the reduction in impact significance is due to: • Rock art, inscriptions, archaeological sites, finds, and features (WRPA): The recommended mitigation includes avoiding physical impacts to these assets through sensitive design and minimizing land take. Also, a Chance Finds Procedure and archaeological monitoring program will be implemented to address any unforeseen discoveries. • Palimpsest of semiarid desert, natural landforms, and cultural features (WRPA): Mitigation measures aimed at avoiding and minimizing construction effects such as noise, light, pollution, and dust. • Traditional pastoral techniques, skills, beliefs, and activities of the Bedouin (Cultural Space of the Bedu: Mitigation involves ensuring the maintenance of traditional access or providing alternative access during project operations. • Coexistence and complementary relationship of settled and nomadic Bedouin communities (Cultural Space of the Bedu): Maintaining traditional access or providing alternatives during project operations is the key mitigation. • Heritage sites specifically placed to exploit natural characteristics (Historic Landscape Character): Mitigation focuses on avoiding physical impacts through demarcation and buffer zones around known assets, and sensitive design for unspecified details. • Well-preserved physical remains of the railway, station, and associated structures (Undesignated Heritage Assets): While the mitigation aims to avoid physical impacts where the pipeline crosses the railway route and through sensitive design, some residual impact remains. • Surviving physical remains and setting of AHS002, AHS003, AHS004, AHS005, and AHF003 (Undesignated Heritage Assets): The recommended mitigation includes evaluating these sites to determine the most sensitive location for the PV plant and offsetting loss through comprehensive investigation and recording if avoidance is not possible. • Surviving physical remains and setting of AHF004 and AHF005 (Undesignated Heritage Assets): Avoiding physical impacts through project design that ensures no overlap with these assets mitigates this aspect. • Potential surface or buried archaeological remains (Potential Heritage Assets): Mitigation involves reducing physical impacts through sensitive design details.

Table 22: Impact and Mitigation Summary – Intangible Cultural Heritage, Oral Traditions

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)
Minor Adverse The projected impacts on oral traditions and expressions are anticipated to be temporary and localized, leading to minor disruptions. These effects are considered reversible, and no permanent loss of knowledge or practices is expected. Specifically: • **Duration of effect**: Impacts are expected to be temporary, occurring mainly during the construction phase of the project.

- **Spatial extent**: The effects will be localized, potentially reducing opportunities for oral performances or gatherings due to noise or the presence of the workforce.
- **Reversibility**: The impacts are expected to be fully reversible. With proper mitigation, there will be no long-term effects on the transmission or practice of oral traditions

Receptor Sensitivity (based on vulnerability, value and resilience)

Medium

The receptor sensitivity for oral traditions is assessed as Medium based on the analysis of vulnerability, value, and resilience.

Oral traditions, such as Nabati poetry, storytelling, and oral genealogies, are vulnerable to disruptions that affect opportunities for social transmission. The presence of a workforce or local disruptions could indirectly reduce these opportunities.

These traditions are highly valued for their role in transmitting memory, reinforcing tribal identity, and providing moral education within Bedouin and rural communities.

While oral traditions are generally resilient to short-term external changes if access to key spaces and resources is maintained, the dependence on "continuity of social transmission" suggests a moderate level of sensitivity. Temporary noise or workforce presence could discourage oral performances, but no long-term impacts on transmission are anticipated

Impact Significance (Pre-Mitigation)

Minor Adverse

Mitigation

Pre-construction:

- Adjust Project Alignment to Avoid Culturally Significant Spaces
  - Modify the pipeline route to bypass areas frequently used for storytelling events, poetic recitations, or community gatherings.
  - Early engagement with communities is crucial to identify and map these culturally sensitive locations.
- Integrate Oral Tradition Safeguarding into Management Plans
  - Embed specific commitments for oral traditions into the Cultural Heritage Management Plan (CHMP) and Environmental and Social Management Plan (ESMP).
  - Ensure that contractor documents include requirements for respecting and protecting oral traditions.
  - Construction:
- Implement Work Schedule Adjustments to Avoid Cultural Events
  - Coordinate construction schedules to avoid peak times for storytelling events or oral performances.
  - This minimizes direct disruption to community gatherings where oral traditions are practiced.
- Manage Noise and Workforce Presence to Minimize Disruption
  - Control noise and lighting levels near residential areas and gathering spaces to reduce interference with oral exchanges.
  - Minimize the presence of the workforce in or around villages during times when oral traditions are typically performed.
- Support Community-Led Oral History and Documentation Programs
  - Provide support for initiatives that document and preserve oral histories and narratives related to the affected landscapes.
  - This helps in the long-term safeguarding and intergenerational transmission of oral traditions, especially if temporary disruptions occur.

Residual Impact

The residual impact on oral traditions is expected to be **Minor Adverse.**

The justification for the reduction in impact significance is due to:

- The temporary or localized reductions in opportunities for oral performances may occur due to factors like site access limits or the presence of the workforce. However, no lasting loss of knowledge or practice is anticipated.

Table 23: Impact and Mitigation Summary – Intangible Cultural Heritage, Performing Arts

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)
Minor Adverse The potential impacts on performing arts are expected to be temporary and minor, primarily consisting of disturbances to performance settings or audiences, such as noise or the need for temporary relocation. These effects are localized and are considered reversible, meaning no lasting cessation of traditional performances is anticipated.
Receptor Sensitivity (based on vulnerability, value and resilience)
Medium The receptor sensitivity for performing arts is classified as Low-Medium. Performing arts face vulnerability primarily through potential noise and disruption from construction activities or the presence of the workforce, which could interfere with public events or performance spaces These traditions hold value as a form of collective celebration and expression of identity within communities. While there may be minor disturbances or temporary relocation needs, performing arts are generally resilient, and no long-term cessation of traditional performances is anticipated. The classification of Low-Medium sensitivity reflects that while disturbances can occur, the performing arts are expected to adapt and continue, with no permanent loss of practice.
Impact Significance (Pre-Mitigation)
Minor Adverse
Mitigation

Pre-construction:
• Adjust Project Alignment to Preserve Performance Venues
  ○ Modify the pipeline route to avoid disturbing known performance spaces or areas frequently used for cultural events.
• Integrate Performing Arts Safeguarding into Management Plans
  ○ Embed specific commitments for performing arts into the Cultural Heritage Management Plan (CHMP) and Environmental and Social Management Plan (ESMP).
  ○ Ensure that contractor documents include requirements for respecting and protecting performing arts.
Construction:
• Implement Work Schedule Adjustments to Avoid Cultural Events
  ○ Coordinate construction schedules to avoid peak times for performing arts events or festivals.
  ○ This minimizes direct disruption to community gatherings where performing arts are practiced.
  ○ Manage Noise and Workforce Presence to Minimize Disruption
• Control noise and lighting levels near residential areas and gathering spaces to reduce interference with performances.

○ Provide temporary or alternative venues for performances if disruptions are unavoidable. ○ Support Community-Led Performing Arts Initiatives • Support training, documentation, and community-led workshops for performing arts. ○ Promote community-led cultural tourism involving performing arts.
Residual Impact
The residual impact on performing arts is expected to be **Minor Adverse.** The justification for the reduction in impact significance is due to: • While temporary disruptions such as noise or the presence of the workforce might discourage performances, these effects are localized and reversible. • There is no anticipation of a long-term cessation of performances or a permanent loss of their practice.

Table 24: Impact and Mitigation Summary – Intangible Cultural Heritage, Social Practices, Rituals and Festive Events

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)
Moderate Adverse The magnitude of effect on social practices, rituals, and festive events is expected to be "Moderate" due to potential disruptions to ritual timing, location, or participation, which could lead to reduced community engagement or authenticity. These effects are anticipated to be temporary and reversible. The spatial extent of these effects would primarily be within major towns and villages along the Area of Influence, such as Aqaba, Maʿan, Qatraneh, and Hasa, where these events are commonly held.
Receptor Sensitivity (based on vulnerability, value and resilience)
High The Receptor Sensitivity for Social Practices, Rituals, and Festive Events is classified as High. These practices are highly vulnerable to disruption, as they can experience timing conflicts or restricted access to community spaces during peak construction activities. These events are central to community identity, fostering social cohesion, religious devotion, and conflict resolution While effects to such events are generally reversible, with proper coordination and maintenance of access routes, their high value and direct dependence on uninterrupted timing and accessible spaces make them particularly sensitive to external pressures. This is underscored by the observation that community gatherings are central to identity.
Impact Significance (Pre-Mitigation)
Medium Adverse
Mitigation
Pre-construction: • Coordinate Schedules with Community Calendars ○ Engage with religious and tribal leaders during ongoing stakeholder engagement to align project timelines with important cultural and religious events. ○ This helps avoid disruptions to significant social practices, rituals, and festive events. • Maintain Open Access to Culturally Significant Areas ○ Plan routes and work zones to ensure continued access to ritual sites and community gathering spaces.

○ This prevents interference with community participation and the timing of events. ○ Construction: • Adjust Project Timing to Avoid Cultural Events ○ Implement construction schedules that avoid peak times for social practices, rituals, and festive events. ○ This minimizes direct disruption to community gatherings that are central to identity. ○ Limit Interference and Provide Alternative Access • Control noise and other disturbances near community spaces where events are held. ○ If unavoidable, provide alternative access routes to ritual sites and gathering places. ○ Restore ritual spaces and facilitate rescheduled events after temporary disruptions.
Residual Impact
Residual impacts on Social Practices, Rituals, and Festive Events are expected to be **Minor Adverse.** The justification for the reduction in impact significance is due to: • While temporary disruptions to the timing or location of these events may still occur, leading to inconveniences or schedule alterations, comprehensive mitigation strategies are anticipated to prevent any lasting loss of social cohesion or ritual knowledge. • The suggested actions aim to minimize direct interference with community gatherings and ensure their continued viability, thus preventing severe or permanent alterations to these vital social practices.

Table 25: Impact and Mitigation Summary – Intangible Cultural Heritage, Knowledge and Practices Concerning Nature and the Universe

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)
Moderate Adverse The magnitude of effect on knowledge and practices concerning nature and the universe is anticipated to be moderate. These effects, primarily involving short-term restrictions on mobility or access to traditional resources and routes, are considered temporary. The impact would be felt in the desert plains and wadis of the southern and central Area of Influence, and the effects are reversible.
Receptor Sensitivity (based on vulnerability, value and resilience)
High The Receptor Sensitivity for Knowledge and Practices Concerning Nature and the Universe is classified as High. This domain is vulnerable to alterations of routes, grazing areas, or water points, which could disrupt traditional land use. These practices are highly valued as they represent traditional ecological knowledge, which is integral to environmental stewardship and the livelihood systems of communities, particularly Bedouin groups. This knowledge includes understanding rainfall, grazing rotations, water-harvesting techniques, pastoral mobility, and landscape mapping. While the effects of disruptions are considered temporary and reversible, the strong linkage of these practices to traditional land use and environmental resources means they are highly sensitive to external pressures. Preserving and revitalizing such practices is considered essential for cultural continuity and ecological wisdom.
Impact Significance (Pre-Mitigation)
Medium Adverse
Mitigation

Pre-construction:

- Avoid Blocking Access to Culturally Significant Natural Areas
  - Design the project to prevent obstruction of sacred sites, grazing lands, or critical ecological knowledge areas
- Integrate Traditional Ecological/bushcraft Knowledge into Planning
  - Support documentation and intergenerational learning about traditional land use and environmental stewardship

Construction:

- Minimize Landscape Disturbance and Maintain Access Routes
  - Implement measures to reduce physical disturbance to areas vital for traditional knowledge application.
- Coordinate with Herders and Local Communities
  - Engage with herders to coordinate construction activities, especially concerning seasonal migration routes.

Residual Impact

Residual impacts on Knowledge and Practices Concerning Nature and the Universe are expected to be **Minor Adverse.**

The justification for the reduction in impact significance is due to:

- Although temporary disruptions to mobility or access to traditional resources and routes may still occur, these are anticipated to be localized and reversible.
- No lasting loss of traditional ecological knowledge or alteration of cultural identity linked to nature is foreseen
- The implementation of mitigation efforts such as coordinating with herders and avoiding obstruction of water sources. These measures aim to minimize interference with traditional land use, ensuring the continuity and viability of these practices and preventing severe or permanent alterations.

Table 26: Impact and Mitigation Summary – Intangible Cultural Heritage, Traditional Craftsmanship

Magnitude of Effect (based on duration of effect, spatial extent and reversibility)
Minor Adverse The magnitude of effect on traditional craftsmanship is anticipated to be minor. The effects are temporary, as they primarily involve potential short-term disruptions to markets or access to communal spaces for production or sale. These temporary effects are expected to be localized to the specific areas where Bedouin and rural communities practice crafts, such as Wadi Rum, Ma'an, and Karak. The effects are also considered reversible, meaning that craftsmanship practices are likely to recover once any temporary disruptions cease.
Receptor Sensitivity (based on vulnerability, value and resilience)
Medium The Receptor Sensitivity for Traditional Craftsmanship is classified as Medium. This is due to the vulnerability of these crafts to indirect economic or material-supply impacts. Craftsmanship holds significant value as it represents economic livelihoods, gendered skills, and symbolic heritage. While impacts are often temporary and reversible, the need for continued support for materials, workshops, and markets indicates a moderate level of sensitivity to external pressures.
Impact Significance (Pre-Mitigation)
Minor Adverse

Mitigation

Pre-construction:
• Preserve Access to Raw Materials, Workshops, and Markets
• Conduct early engagement with artisan communities to understand their supply chains for materials and traditional market access routes.
  ○ Integrate plans for maintaining these critical components into project design to prevent disruption of craft production and sales.
  ○ Coordinate with Livelihood Restoration and Economic Development Initiatives
• Align mitigation strategies for craftsmanship with broader project components focused on economic development and livelihood restoration.
  ○ This ensures that support for traditional craftsmanship is integrated into sustainable economic opportunities for local communities, particularly for Bedouin women involved in household production.
Construction:
• Ensure Temporary Access to Materials and Workspaces
  ○ Implement measures to limit supply chain disruptions and guarantee artisans can access necessary raw materials and workspaces.
  ○ This minimizes temporary shortages that could impact the continuity of craft production.
  ○ Support Training, Documentation, and Marketing for Artisans
• Provide support for apprenticeship programs and documentation of traditional techniques to ensure intergenerational transfer of skills.
  ○ Assist artisans with marketing and access to local markets to mitigate indirect economic impacts and promote craftsmanship.
  ○ Fund cooperatives and craft fairs to enhance economic viability and promote traditional craftsmanship.

Residual Impact
Residual impacts on Traditional Craftsmanship are anticipated to be **Minor Adverse.** The justification for the reduction in impact significance is due to: • While there may be temporary effects on markets or access to communal spaces for production or sale, these are expected to be localized and reversible, with no lasting impact on traditional craftsmanship or the continuity of these practices. • The significance of these impacts is reduced to minor due to mitigation efforts such as ensuring temporary access to materials and workspaces and supporting training and marketing for artisans. • These actions help to minimize disruptions to supply chains and promote the continued viability of craft production, thereby preventing severe or permanent alterations to these cultural practices.

9.2 Summary of Residual Impacts

A summary of the potential marine and terrestrial environment impacts (including critical habitat and priority biodiversity features, and natural habitat), mitigation and residual impact, including quantification are provided in the Tables 27 - 31 below.

Table 27: Marine Environment Residual Impact Summary - Construction Impacts from Installation Work

Critical Habitat: Coral, Giant Clam, Seagrass and Teleost Fish		
Impact mechanism	**Proposed mitigation**	**Residual impact and offset summary**
Construction phase trenching, outfall installation, anchor and jetty construction: • Loss/damage of habitat • Loss/damage of individual colonies • Loss/damage by physiological stress • Behavioural change • Reduced reproductive/ settlement success Impacted area: • 2,646m^2 coral habitat, which includes 19% patch reef and shallow seagrass habitat.	Avoidance: • Reduced project physical footprint and micro-siting • Coral translocation • Consideration of seasonal restrictions during seasonal reproductive periods • Use of silt curtains and other turbidity controls • Management: • ESMMP and supporting ESMS • Construction management, including pollution prevention, marine construction operational controls • Environmental monitoring and reporting program to support adaptive management during construction • Restoration: • Physical reinstatement of impacted areas and creation of suitable seabed substrate • Biorestoration via transplanting of coral colonies	Mitigation quantification: • The translocation of coral and giant clams to depths less than 35m ○ Restoration planned of 1,641 m^2 (representing 62%) of the impacted seabed, which includes 491m^2 of patch reef and shallow seagrass habitat ○ The Jordan Marine Reserve has reported a survival rate of 80% for translocated coral • Coral translocation deeper than 35m is considered non-viable due to the water depths preventing access by divers ○ No restoration viable for 1,005m^2 of the impacted seabed • The outfall, the concrete collars, the lagoon seawall and the concrete mattress to protect the outfall to a depth of 10m, will create an estimated 1,500m^2 of new suitable substrate for coral, giant clam (will require further study) and fish habitat. • Residual impact on critical habitat: • 1,313 m^2 coral and patch reef and shallow seagrass habitat • The residual impact will affect 0.35% of the total coral and patch reef and shallow seagrass habitat in the Study Area Offset summary • Net Gain required to critical habitat: Reef habitat to support coral, giant clam, seagrass and teleost fish

Table 28: Marine Environment Residual Impact Summary - Construction and Operational Impacts from Underwater Sound and Disturbance

Critical Habitat: Turtles, Marine mammals, Elasmobranchs (sharks & rays), Seabirds		
Impact mechanism	**Proposed mitigation**	**Residual impact and offset summary**
Construction and operations phase: • Behavioural changes in	Avoidance: • Marine mammal and turtle observer program	• Residual impact on priority biodiversity features and natural habitat: • No residual impact predicted Offset summary:

Critical Habitat: Turtles, Marine mammals, Elasmobranchs (sharks & rays), Seabirds		
Impact mechanism	**Proposed mitigation**	**Residual impact and offset summary**
response to underwater sound during construction • Temporary physical presence of construction vessels and equipment • No operational phase activities considered significant Impacted area: • No potential for mortality or injury at distances greater than 76m • Potential for temporary disturbance and behavioural changes in fish up to 684m and in cetaceans within 500m	• Soft start and a stop work protocol in the event that underwater sound receptors are observed • Management: • ESMMP and supporting ESMS • Marine Construction Works Management Plan, including an underwater sound adaptive management and reporting system • Restoration: • Not required/applicable	• No offset required

Table 29: Marine Environment Residual Impact Summary - Operational Phase Discharges from the Desalination Plant

Critical Habitat: Coral and Teleost fish		
Impact mechanism	**Proposed mitigation**	**Residual impact and offset summary**
Operations phase discharge from the desalination plant: • Seawater quality impacts Impacted area: • Water column impacts not considered significant • 9,076m^2 of seabed habitat with <15%	Avoidance: • Desalination water treatment process controls to neutralise biocide and chlorine to reduce effluent toxicity and suspended solids • Reverse osmosis technology to reduce the increase in effluent temperature • Diffuser design • Management: • ESMMP and supporting ESMS	• Residual impact on critical habitat: • 9,076 m^2 of coral habitat • The residual impact will affect 1.2% of the total coral habitat in the Study Area • Offset summary: • Net Gain required to critical habitat: Reef habitat to support coral and teleost fish

Critical Habitat: Coral and Teleost fish		
Impact mechanism	**Proposed mitigation**	**Residual impact and offset summary**
coral cover impacted by the increase in salinity of 0.82 psu (defined by the 2% threshold)	• Operations and maintenance (O&M) controls and procedures • Comprehensive discharge monitoring, including continuous online monitoring and regular sampling • Environmental monitoring and reporting system to support adaptive management	

Table 30: Marine Environment Residual Impact Summary - Operational Phase Seawater Abstraction

Critical Habitat: Coral, Giant Clam, Seagrass and Teleost Fish		
Impact mechanism	**Proposed mitigation**	**Residual impact and offset summary**
Operations phase abstraction of seawater: • Reduced reproductive/ settlement success Impacted area: • 3,500m^2 of intertidal coral habitat, with 2% coral cover, the lowest within the Study Area	Avoidance: • Abstraction of water from within a lagoon • Fish recovery and return system • Continuous operation of a bubble curtain at the mouth of the lagoon, • Consideration of an additional bubble curtain during periods of intense planktonic larval spawning/reproduction • Management: • ESMMP and supporting ESMS • Settlement monitoring from within the lagoon to confirm effectiveness to support adaptive management	• Residual impact on critical habitat: • 3,500m^2 of intertidal coral habitat • The residual impact will affect 4.2% of the total coral habitat in the Study Area • Offset summary: • Net Gain required to critical habitat: Reef habitat to support coral, giant clam, seagrass and teleost fish

Table 31: Terrestrial Environment Residual Impact Summary: Temporary Construction Impacts, Permanent Habitat Change and Operational Impacts

Natural Habitat: Potential critical habitat and priority biodiversity feature triggering flora, fauna and birds		
Impact mechanism	**Proposed mitigation**	**Residual impact and offset summary**

Construction phase site / ROW preparation (including vegetation removal, topsoil stripping):
• Loss/damage of habitat
• Loss/damage of individual flora, fauna and birds
• Operational phase OHTL impacts
Impacted area:
• 1,534 hectares of natural and degraded habitat
• Flora:
  ○ Potential critical habitat plant species: 4
  ○ Potential priority biodiversity feature species: 1
• Fauna:
  ○ Potential priority biodiversity feature species: 1 mammal, 2 reptile species,
• Birds:
  ○ Potential critical habitat species: 3
  ○ Potential priority biodiversity feature species: 10
	Avoidance:
	• Pre-construction surveys to confirm the presence of important biodiversity values to enable:
	  ○ Planning of seed collection and translocation of all tiggering/important flora and fauna before construction
	  ○ Planning of seasonal breeding bird avoidance measures
	  ○ Installation of bird diverters on OHLT and design of wildlife-friendly pylons
	• Reduce and control project's physical footprint and maximise avoidance through micro-siting of temporary facilities Management:
	• ESMMP and supporting ESMS, including Biodiversity Sensitivities and Constraints Assessment
	• Construction management, focusing on erosion control, wildlife interaction, nesting bird avoidance and reinstatement planning
	• Environmental monitoring and reporting program to support adaptive management during construction, including OHTL post fatality monitoring (PCFM)
	• Restoration:
	• Physical reinstatement of impacted areas and creation of suitable soil/ground conditions
	• Biorestoration via replanting of vegetation or broadcasting of recovered seed
		• Mitigation quantification:
		• Pre-construction avoidance via translocation and seed collection and restoration of the right of way (assuming a 20% residual impact from temporal loss) and restoration of 70% of the renewable energy site will reduce residual impact by 1,166 hectares
		• Residual impact on natural habitat:
		• 368 hectares of natural and degraded habitat
		  ○ A total 162 of hectares of natural and degraded habitat will be permanently lost due to the presence of permanent facilities, via habitat conversion
		  ○ A total of 205 hectares of natural and degraded habitat will be impacted, assuming a 20% residual impact from temporal loss, following reinstatement of the pipeline right of way
		• Offset summary:
		• No net loss required for potential priority biodiversity features: Desert habitat to support flora, fauna and birds

9.3 Cumulative Impact Assessment

Cumulative impacts result from the successive, incremental and/or combined effects of a project or activity, when added to other past, existing, planned and/or reasonably anticipated future ones. They have the potential to occur when projects (and their effects) occur in close spatial or temporal proximity

The ESIA followed a rapid Cumulative Impact Assessment (RCIA) approach in accordance with international best practice to identify the potential for cumulative impacts to Valued Environmental and Social Components (VEC). These are defined within IFC Good Practice Handbook (2013) as *"environmental and social attributes that are considered to be important in assessing risks; they may be:*

- Physical features, habitats, wildlife populations (e.g., biodiversity),
- Ecosystem services,
- Natural processes (e.g., water and nutrient cycles, microclimate),
- Social conditions (e.g., health, economics), or
- Cultural aspects (e.g., traditional spiritual ceremonies)."

The RCIA assessment first established the spatial and temporal boundaries of the assessment and identified the VECs to be considered within the assessment i.e. those VECs:

- Considered as important and/or sensitive in the ESIA
- Identified as important and of scientific concern by international and/or national experts and the scientific community
- Considered to be important or sensitive by stakeholders consulted by the Project

This was informed through the stakeholders consulted during the development of the ESIA including the national scientific community, regulatory bodies and Project Affected Communities (PAC). The determination of the VECs was also informed by the identification of cumulative sources, comprising existing and new third party development activities with the potential to generate overlapping impacts that result in additive or in combination effects with Project impacts. A review of sources was undertaken and those with no or limited potential for temporal and geographic impact scoped out. The activities scoped into the assessment included:

- Existing third-party intake and outfalls and ongoing development activities associated with the Floating Storage and Regasification Unit (FSRU) within the vicinity of the planned Project intake and outfall infrastructure facilities
- Current third-party activities associated with the phosphate mining facilities operated by Jordan Phosphate Mines Company, located between Hasa and Al-Abiad (south of Qatraneh) to the immediate east of Highway 15 within 500m to 1km of the planned Project conveyance pipeline route

With respect to third-party intake and outfalls the assessment focused on the Aqaba Thermal Plant intake and outfall given its proximity to the Project intake and outfall locations. Using assumed parameters and the same rapid plume dispersion modelling approach adopted to assess the Project intake and outfall it was shown that the discharge from the third-party Aqaba Thermal Plant would not significantly interact with the Project effluent discharge, with the main effect being a slight increase in the water temperature at the AAWDC Project intake. This was considered to result in a minor impact on water density at the outfall, which, in turn, will only slightly affect the outfall plume behaviour. To confirm this, the existing

discharge was incorporated into the modelling completed for the Project outfall for the cases considered (which included a number of different intake configurations), and it was shown that the buoyant nature of the effluent resulted in the highest recirculation under the westerly wind modelling scenario. This is because the buoyant plume reaches the surface and is more susceptible to wind forces acting in the area. Overall, the modelling concluded there was no predicted interaction between the AADWC Project discharge and the existing Thermal Power Plant discharge.

This result, in combination with the modelling outcomes for the AADWC Project route and non-routine effluent discharge, indicated no significant cumulative impacts on the marine environment and the associated VECs were anticipated. This will be confirmed through the ongoing monitoring programmes already in place and through the planned mitigation for the AADWC Project, as presented in the ESIA, with respect to the Project intake and outfall infrastructure design, construction, and operation.

With respect to the phosphate mining activities, the assessment focused on dust generation as both a nuisance and a health issue. This was raised as a major concern during the Project stakeholder consultation and is acknowledged as a key concern, particularly during dry seasons. JPMC, who operate the mines, have reported on a number of initiatives identified to look at approaches and technology to control dust from their activities in collaboration with Royal Scientific Society (RSS) including ongoing PM_{10} and $PM_{2.5}$ air monitoring programmes, regular watering of internal roads and operational zones to reduce dust dispersion, application of dust suppressants in high-traffic areas, and the establishment, upkeep of vegetation buffers where feasible and reviews of preventive maintenance programs for mining equipment to minimise dust emissions caused by mechanical faults.

The cumulative impact of dust generated by both third-party mining activities and the Project construction activities, particularly associated with the Conveyance Pipeline installation between Hasa and Qatraneh, will occur over the duration of the Project construction activities and will be temporary, as the pipeline is installed along the route. Mitigation to minimise the potential for dust impacts from the Project is presented in ESIA, and will include a dust monitoring program, the identification and implementation of dust management practices, and ongoing consultation with potentially affected sensitive receptors. To further mitigate dust impacts, it is recommended that consultation be undertaken with the mining facilities to collaborate and coordinate efforts around both practical measures to control dust and consultation undertaken with the affected communities, such as to leverage the local and regional experience already held by the mining facilities and respond proactively to the community concerns. Given the relatively short duration of the Project activities and the identified control measures, it is considered that cumulative impacts will not be significant and will be adequately mitigated.

With respect to cumulative impacts resulting to the national water and wastewater infrastructure, it is acknowledged that while the new desalinated water resource from the Project will substantially improve national water security and supply reliability, it will also create major technical, operational, and institutional challenges, particularly for the middle and northern governorates, where most of the water will ultimately be consumed. To manage these risks, the NCP Infrastructure Readiness Program initiative has been developed, led by the Ministry of Water and Irrigation (MWI) and the Water Authority of Jordan (WAJ). The Program aims to ensure that the national water and wastewater systems are hydraulically, operationally, and institutionally prepared to receive and distribute the 300 MCM/year of desalinated water from the AAWDCP without overloading existing infrastructure. The program covers 11 bulk water projects across Jordan, with a combined investment cost of approximately USD 840 million. It spans both water transmission and wastewater readiness components. The implementation of the programme is designed to ensure the full benefit of the AAWDC Project is realised, optimise water reuse, and strengthen resilience under the National Water Strategy.

9.4 Transboundary Impact Assessment

Transboundary impacts are those that extend to multiple countries beyond the host country of the project but are not global in nature.

To generate a transboundary impact, Project activities would need to have the potential to cross national land and sea borders. Those countries whose land territories border Jordan include Saudi Arabia to the south and Palestine to the north-west. These countries also have a maritime border[5] with Jordan within the Red Sea along with Egypt to the west.

The closest Project activities to the international boundaries are those associated with the intake and outfall infrastructure (including the Intake Pumping Station (IPS)), which are located approximately 1.5km from the land and sea border with Saudi Arabia, approximately 7.5km and 11km from the maritime borders with Egypt and Palestine, respectively. The Desalination Plant and Booster Pumping Station 1 (BPS1), located within the Aqaba Industrial Zone, are approximately 2km from the Saudi Arabia border, with the remaining Conveyance Pipeline Above Ground Installations (AGIs) and the Conveyance Pipeline itself more than 10 km from the Saudi Arabia border. The Project facilities and associated construction works are located at a significant distance from the north-west land border of Jordan (more than 30km away).

A review of those impacts assessed within Chapter 9 of the ESIA was undertaken to determine which impacts to consider in the context of potential transboundary impacts. The impacts excluded based on potential for transboundary impacts are presented in Table 32. Those impacts where there is potential for transboundary impacts are discussed further in the sections below.

Table 32: Impacts Excluded in the Context of Transboundary Impacts

Activity	Type of impact	Potential for transboundary impacts and reasoning
Marine Environment		
Construction: Seabed (benthic) disturbance, including anchoring	Water quality, turbidity and light penetration changes Marine biodiversity impacts	No – existing controls in place, refer to ESIA Chapter 9
Construction: Vessel operation (introduction of invasive species through ballast water, waste and drainage)		
Operations: Abstraction of seawater	Marine biodiversity impacts	
Terrestrial Environment (Biodiversity and Physical Impacts)		
Construction: Earthworks including topsoil and vegetation removal, sub-surface works, spoil movement and new	Terrestrial biodiversity impacts Changes to soils, surface water and groundwater	No – impact is limited to the footprint of the activities and the immediate surroundings

[5] Typically defined with respect to the border of the country's Exclusive Economic Zone (EEZ) as specified under the 1982 United Nations Convention on the Law of the Sea. Jordan claims a 12-nautical-mile territorial sea, but given the limited GoA width, its effective waters are constrained by median lines with adjacent states.

Activity	Type of impact	Potential for transboundary impacts and reasoning
access roads (all Project components) Construction and Operation of temporary facilities (camps and yards)	availability, flow and quality	
Construction and Operation: Permanent presence of IPS, Desalination Plant, Renewable Facility and Conveyance AGIs	Terrestrial biodiversity impacts	No – impact limited to the footprint of the Project Facilities
Construction and Operation: Permanent presence of OHTLs *(Associated Facility)*		No – impact limited to Project Area of Influence
Terrestrial Environment (Infrastructure, Waste and Resource Use)		
Construction: Use of materials, including aggregates, concrete, steel and equipment supply	Decrease in resource availability / Interruption to existing supply chains	No – demand to be assessed and management plans to be developed (see ESIA Chapter 9). No wider regional impacts anticipated
Construction: Use of national infrastructure and services including water, sewage, power and road network	Decrease in / interruptions to services and infrastructure	
Construction: Generation of wastes		
Operations: Power Supply		No – operational power to be provided from the Project RE facility supplemented with power from the national grid. No power to be provided from sources outside of Jordan.
Terrestrial Environment (Air Quality, Dust and Noise)		
Construction: Use of Construction Plant and Equipment and Offsite Traffic	Change to air quality Noise disturbance	No – changes will be temporary, localised and mitigated through controls (refer to ESIA Chapter 9). No wider regional impacts anticipated.
Construction: Earthworks and soil movements	Dust	
Social		
Resettlement, Land, Asset and Livelihoods	Physical displacement Economic displacement and loss of livelihoods	No – potential impacts mitigated through development and implementation of Resettlement Policy Framework (RPF) and Project Resettlement Action Plan (RAP) (see ESIA Chapter 9). Wider regional impacts not anticipated.
Community Health and Safety During Construction	Health and safety risk	No – potential impacts to be mitigated through management plans (see ESIA

Activity	Type of impact	Potential for transboundary impacts and reasoning
Labour Management	Labour conditions and worker rights and Influx	Chapter 9). Wider regional impacts not anticipated.
Local Employment and Local Content	Employment, economic flows	No – labour and procurement process to be designed to maximise local content (see ESIA Chapter 9). Wider regional impacts not anticipated.
Gender-Based Violence, Harassment and Sexual Exploitation and Abuse (GBVH/SEAH)	Labour conditions and worker rights	No – potential impacts mitigated through GBVH/SEAH Code of Conduct and Prevention & Response Action Plans (see ESIA Chapter 9). Wider regional impacts not anticipated.
Cultural Heritage		
Intangible and tangible cultural heritage	Impact or loss of craft, traditions, practices or physical resources	No – potential impacts to be mitigated through management plans (see ESIA Chapter 9). Wider regional impacts not anticipated.

9.4.1 Underwater Sound (Construction)

Temporary and short-duration underwater sound is anticipated to be generated by activities to install the outfall infrastructure, primarily use of an excavator mounted peckers/hammers for the breaking of rock to enable trenching.

The modelling (see ESIA Chapter 9) predicted no potential for mortality or injury at distances greater than 76m, but potential for disturbance and behavioural changes in fish up to 684m and in cetaceans within 500m. Mitigation to reduce impacts include incorporating specific measures relating to underwater sound management into the Marine Construction Works Management Plan (see ESIA Chapter 9).

In a transboundary context, the extent of the underwater sound impacts from the Project activities are not predicted to reach Jordan's marine borders and no transboundary impacts from underwater sound associated with construction are anticipated.

9.4.2 Spills From Vessels (Construction)

Vessels associated with the construction and installation of the intake and outfall infrastructure will operate in the vicinity of the works for the duration of the activities. To mitigate potential impacts in the event of a spill relating to Project activities in the marine environment, mitigation measures have been identified as described in ESIA Chapter 9. These include compliance with applicable international and Jordanian maritime regulations and the development of emergency and spill response plans for Project marine activities, aligned with the requirements and capacity of the competent authority. In addition, the Project will complete a spill risk assessment, supported by engagement with third-party asset owners/operators and competent authorities, to identify hazards and risks and document relevant safeguards.

The development of these plans, in combination with the existing plans and procedures held by third parties, is considered to adequately mitigate the potential for transboundary impacts from accidental spills associated with the Project.

9.4.3 Routine and Non-Routine Desalination Plant Discharges (Operations)

Operational discharges from the desalination plant will comprise routine discharge of effluent comprising primarily brine from the reverse osmosis process and non-routine discharges, which include treated and neutralised Cleaning-In-Place (CIP) effluent that will be co-mingled with the desalination effluent discharge before discharge. The assessment of the discharges, which included modelling, is presented in ESIA Chapter 9 and was based on the application of a 100m mixing zone and criteria to be met at its edge. This included a conservative requirement for the discharge to meet a salinity criterion of no more than 2% increase above ambient concentrations at the edge of the mixing zone and industry standard criteria of no more 5% increase for other components present in the discharge.

It was concluded that impacts from the routine and non-routine effluent discharges were predicted to be moderate and not significant. While a limited range was predicted for changes in water quality i.e. no significant changes beyond 100m of the discharge, receptor sensitivity was classified as high given presence of Critical Habitat and Priority Biodiversity Feature triggering species of fish, turtles and cetaceans and seagrass and coral habitat. Receptors were considered to be of moderate vulnerability and resilience of the receptors (specifically the seagrass and coral habitats which cannot move away from the plume as opposed to mobile marine species such as fish, turtles and cetaceans) and, with mitigation in place, impacts of no more than moderate adverse significance were predicted.

Given the distance to the Jordanian maritime borders from the Project outfall (at more than 1.5km away) and the relatively localised effects predicted, the potential for transboundary impacts resulting from the desalination plant discharges is considered insignificant.

9.4.4 Abstraction of Seawater (Operations)

The Project design is based on a seawater intake flow rate of 21.8 m3/s via the new Project intake channel. This abstraction will occur continuously throughout the operational phase of the Project.

The potential for effects on receptors in the water column as presented in ESIA Chapter 9 focused on coral larvae, seagrass that pollinate through the water column (which includes most species in the Gulf of Aqaba), and bivalves (specifically the giant clam) that trigger critical habitat. Entrainment control measures included in the design to prevent the entrainment of larger marine life include bubble curtains and a fish recovery and return system.

Effects would be limited to the Study Area and would be further minimised through the implementation of mitigation measures including optimisation of the intake entrainment avoidance design measures and implementation of the Project Biodiversity Management Plan which will include measures to achieve not net loss or net gain for all critical habitat species and habitats.

The effect of the abstraction beyond the Jordanian maritime border is expected to be insignificant, given the distance from the abstraction location, the localised impacts predicted and the mitigation proposed. No transboundary impacts of significance are anticipated.

9.4.5 Supply of Potable Water (Operations)

The most significant long-term positive impact of the Project is its expected contribution to addressing the substantial shortfall between water supply and demand in Jordan. As detailed in ESIA Chapter 4, the

water supplied by the Project will not only deliver freshwater into the Jordanian network but also help restore the overexploited and degraded groundwater sources. Additionally, it will reduce reliance on purchasing water from international sources and diminish dependence on transboundary agreements. These agreements cover both surface water and groundwater resources shared with neighbouring countries, which many nations have rights to extract from. This includes the Jordan River, now degraded due to overdevelopment and pollution; the Yarmouk River on the Jordan-Syria border, impacted by dams and overexploitation; and the Disi aquifer beneath Jordan and Saudi Arabia, utilised by both countries.

The realisation of the AADWC Project will thus enhance Jordan's water security, provide a dependable supply, and help reduce dependency on natural transboundary resources, potentially contributing to their recovery.

10 Climate Risk Vulnerability Assessment

The Climate Risk Vulnerability Assessment (CRVA) has been conducted reflecting the following:

- Project design changes since 2022, that were known at the time of the CVRA, including the addition of the Renewable Energy facility and relocation of the Desalination Plant
- Update to the climate risk assessment methodology
- Updates to regional and country climate change risk profiles in the published literature
- Latest climate change projections.

10.1 Methodology

The CVRA aimed to follow the recognised methodology of the 'risk propeller' comprising climate hazard, exposure and vulnerability.

The following literature sources were used to establish the list of commonly physical and transition climate-related hazards:

- Recommendations of Taskforce on Climate Related Financial Disclosures (TCFD) 2017
- Special Report by Intergovernmental Panel on Climate Change (IPCC) on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation, 2012
- IPPC 6th Assessment Report on Climate Change: Impacts, Adaptation and Vulnerability, 2022
- United Nations Environment Programme (UNEP) Climate Risk Landscape Report, 2023
- Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-Economic Vulnerability in the Arab Region (RICCAR) Arab Climate Change Assessment Report 2017
- Weathering Risk 2022 Climate Risk Profile Jordan
- World Bank Group Country Climate and Development Report: Jordan, 2022

For this CVRA, the following sources, based on IPCC RCPs, have been used for climate projections at the regional and country levels:

- RCP 4.5 and RCP 8.5 projections from the 2017 Arab Climate Change Assessment Report by the Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-Economic Vulnerability in the Arab Region (RICCAR) (RICCAR, 2017)
- RCP 2.6 and RCP 6.0 projections from the 2017 Weathering Risk Climate Risk Profile: Jordan

The scenarios were selected with the key principle so that the differences between scenarios are sufficiently significant to capture the impacts and uncertainties of the key risks to the Project. This CVRA presents climate change analysis for the IPCC defined the near future (2016-2035), and the intermediate future (2046-2065). The far future period (2081 to 2100) is excluded, as the design life of the permanent Project facilities is 30 years from the start of planned operations in 2030.

Transition risks are considered for both near-term (up to 2030) and long-term (beyond 2030) outlooks with consideration of current climate commitments and projected policy changes.

10.2 Physical Climate Risks

The acute and chronic physical climate risks screened in include:

- Extreme heat and increases in mean annual surface temperatures, solar radiation and humidity
- Extreme precipitation and associated flood events, including coastal and fluvial flood risk
- Geotechnical hazards including landslides or mudslides, and soil erosion
- Increases in extreme wind events and dust storm intensity and frequency
- Decrease in mean annual precipitation / droughts
- Changes in seawater characteristics (temperature, pH and salinity)
- Relative sea level change and coastal erosion

Whilst climate hazards and exposure of the Project's permanent facilities could be evaluated, vulnerability, which entails understanding the safeguards accounted for in the design, could not be ascertained due to the early stages of the Project and the limited engineering information available. The CRVA includes actions that will be completed prior to completion of detailed design to ensure adequate contingencies and tolerances are built into the design for resilience of the Project facilities to physical climate hazards.

Upon completion of the detailed design, this CRVA will be revisited to finalise the vulnerability assessment and determine physical climate risk levels.

10.3 Transition Climate Risks

The climate related transition risks screened in include:

- Policy and regulation: Jordan’s climate policy commitments and international climate policy drivers
- Market and Finance: energy prices, subsidies and carbon cost
- Technology and Supply Chain: Renewable Energy Technology and Grid Integration

Exposure to the transition risks is rated as medium: in the near term (up to 2030) the Project is seen as both a climate adaptation (water security) and a mitigation measure (via its RE component), with potential changes to climate policy taking place in the long-term (after 2030).

Vulnerability level is rated as medium since safeguards under design, agreement and management system are being actively explored.

Given the medium exposure and medium vulnerability for climate-related transition hazards, there current risk levels are considered medium. Once these safeguards under design, agreements and management system are implemented and vulnerability levels are reduced, the risk levels are expected to reduce to low.