Aqaba Amman Water Desalination and Conveyance (AAWDC) Project
Draft HIA Statement

Maria Kitchie, M.A.
Amy Karoll, Ph.D.
Dan Plekhov, Ph.D.
Aaron Gidding, Ph.D.
Lisa Snape, Ph.D.

December 15, 2025

Aqaba Amman Water Desalination and Conveyance (AAWDC) Project

HIA Statement

Prepared by:
Maria Kitchie, M.A.
Amy Karoll, Ph.D
Dan Plekhov, Ph.D
Aaron Gidding, Ph.D
Lisa Snape, Ph.D.

Prepared for:
Eco Consult
Al-Sheikh Hussein Al-Jeser Street
Shmeisani
P.O. Box 941400
Amman, Jordan 11194

Technical Report No.: 25-421

Chronicle Heritage Arabia
6395 Prince Turki Ibn Abdulaziz Al Awal
Al Muhammadiyah District
Riyadh, 12363
Kingdom of Saudi Arabia

December 15, 2025

Report Issue Record

Report Issue Record

Project:	Aqaba-Amman Water Desalination and Conveyance National Project (AAWDCP)
Title:	Updated Environmental and Social Impact Assessment
Chapter:	Chapter X:
Version:	Draft 01

Date	Rev	Author	Checked	Approved
November 2025	01	NF	HJ	NF
December 2025	02	AK	HJ	NF

Executive Summary

Chronicle Heritage Arabia (CH Arabia) has been commissioned by Eco Consult to produce a Heritage Impact Assessment (HIA) for the Aqaba Amman Water Desalination and Conveyance (AAWDC) Project (the Project) where it passes through and close to the Wadi Rum Protected Area (WRPA), in the Aqaba Governorate of the Hashemite Kingdom of Jordan. The Project is for the construction of an underground pipeline through the WRPA's buffer zone, and an Overhead Transmission Line (OHTL) and solar photovoltaic (PV) plant outside and to the northwest of the WRPA buffer zone.

The HIA process consists sequentially of a Screening Report, a Scoping Report and an HIA Statement. This report constitutes the final HIA Statement. An Intangible Cultural Heritage (ICH) report is also being produced concurrently. The findings of the HIA process and the ICH report will be integrated into the Environmental and Social Impact Assessment (ESIA) for the Project.

This HIA Statement has identified, described, and assessed the heritage baseline for the Project Area and Area of Influence (AOI). It is also informed by the results of a new archaeological walkover survey, undertaken to address identified gaps within the heritage baseline. The Outstanding Universal Value (OUV) of the WRPA and the heritage significance of all other relevant non-UNESCO heritage assets were also assessed and discussed.

The HIA Statement then conducts a comprehensive assessment of the impacts of all elements of the Project upon the OUV of the WRPA and Cultural Space of the Bedu in Wadi Rum and the heritage significance of non-UNESCO heritage assets and elements. This included a detailed assessment of the Project's impact upon the setting of heritage assets and the WRPA, the historic landscape character, key historic views, and significant visual receptors. The Statement finds that the Project posed a range of negative impacts to heritage significance. These include **minor-moderate** detrimental impacts upon the OUV of the WRPA, and **slight-large** detrimental impacts upon the heritage significance of other heritage assets.

The HIA Statement then provides a suite of detailed and comprehensive recommendations to avoid, minimise, and otherwise mitigate identified impacts, in line with UNESCO's mitigation hierarchy. Recommendations include:

- The avoidance of identified heritage assets and the reduction of land take through Project design
- The avoidance and minimisation of construction effects (e.g., noise,) through appropriate provisions
- The development and implementation of a Chance Finds Procedure (CFP) and program of archaeological monitoring
- Further investigation into identified sites of low significance that may be lost as a result of the Project
- The maintenance of safe access to cultural heritage sites, areas, and resources
- The integration of all of the above provisions within an Environmental and Social Management System (ESMS) and Cultural Heritage Management Plan (CHMP).

The HIA Statement concludes with an assessment of residual impacts, i.e., those impacts remaining to heritage significance if all recommended mitigation were implemented. The assessment concludes that the mitigation would considerably reduce harm to heritage significance, resulting in a Project which poses **no (i.e., neutral) impacts** to the OUV of UNESCO-

protected areas (the WRPA and the Cultural Space of the Bedu in Wadi Rum) and **slight** impacts to the heritage significance of some other, non-UNESCO heritage assets and elements.

Due to the low magnitude of residual negative impacts associated with the Project, and the absence of any negative impacts at all upon the WRPA and Cultural Space of the Bedu in Wadi Rum, no assessment of alternatives was undertaken within the report. As demonstrated and discussed in detail within the final section of this report, this also means that the Project (supposing all recommended mitigation is implemented) will comply with all relevant heritage legislation and Lenders' standards and requirements.

Contents

Figures

Tables

List of Abbreviations

Abbreviation	Definition
AAR	Abu Alanda Reservoir
AAWDC	Aqaba Amman Water Desalination and Conveyance
ADC	Amman Development Corridor
AFD	Agence Française de Développement
AMR	Al Muntazah Reservoir
AOI	Area of Influence
ASEZA	Aqaba Special Economic Zone Authority
BPS	Booster Pumping Station
C	Celsius
CH Arabia	Chronicle Heritage Arabia
CHMP	Cultural Heritage Management Plan
DESAL	Desalination Plant Facilities
DFC	U.S. International Development Finance Corporation
DoA	Department of Antiquities
EBRD	European Bank for Reconstruction and Development
EDFI	European Development Finance Institutions
EIB	European Investment Bank
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESP	Environmental and Social Policy
GIs	Geographically Indicated Names
GIS	Geographic Information Systems
ha	hectare
HCV	High Conservation Value
HKJNL	Hashemite Kingdom of Jordan Ministry of Culture National Library Department
ICCROM	International Centre for the Study of the Preservation and Restoration of Cultural Property
ICH	Intangible Cultural Heritage
ICHIA	Intangible Cultural Heritage Impact Assessment
ICICH	International Scientific Committee on Intangible Cultural Heritage
ICOMOS	International Council on Monuments and Sites
IFC	International Finance Corporation
IFIs	International financial institutions
IPS	Intake Pumping Station
IUCN	International Union for Conservation of Nature

Abbreviation	Definition
km	kilometre
LESA	Lender Environmental and Social Advisor
m	metre
OHTL	Overhead Transmission Lines
OUV	Outstanding Universal Value
PDTRA	Petra Development and Tourism Region Authority
PPNB	Pre-Pottery Neolithic B
PR	Performance Requirement
PS	Pump Station
PV	Photovoltaic
RE	Renewable Energy
RGT	Regulation Tank
ROW	Right of Way
RSCN	Royal Society for the Conservation of Nature
TEK	Traditional Ecological Knowledge
TK	Traditional Knowledge
WGB	World Bank Group
WRPT	Wadi Rum Protected Area

1 Introduction

Chronicle Heritage Arabia (CH Arabia) has been commissioned by Eco Consult to produce a Heritage Impact Assessment (HIA) for the Aqaba Amman Water Desalination and Conveyance (AAWDC) Project (the Project) where it passes through and close to the Wadi Rum Protected Area (WRPA), in the Aqaba Governorate of the Hashemite Kingdom of Jordan. The HIA process consists sequentially of a Screening Report, a Scoping Report and a HIA Statement. This report constitutes the final HIA Statement. An Intangible Cultural Heritage (ICH) report is also being produced concurrently. The findings of the HIA process and the ICH report will be integrated into the Environmental and Social Impact Assessment (ESIA) for the Project.

1.1 Aims and Objectives

The purpose of an HIA is to assess the impact (whether negative, positive, or neutral) that a project is likely to have on all relevant cultural heritage resources in an area of Outstanding Universal Value (OUV) and to provide recommendations (where relevant) on how to mitigate, avoid, or reduce negative impacts to an acceptable level and comply with all relevant heritage legislation.

In accordance with UNESCO's HIA Toolkit (UNESCO 2022), the HIA Statement should be produced in accordance with the following process:

- Undertake a baseline heritage assessment of the Area of Influence (AOI), defined below;
- Describe the proposed development in detail, including viable alternatives;
- Identify and predict the Project's potential heritage impacts; alternative project designs should be assessed and compared on the same basis;
- Evaluate the magnitude and significance of identified impacts, with reference to OUV ;
- Provide recommendations to mitigate identified impacts and enhance heritage significance.

1.2 Report Terminology

For this report, the following terminology is used:

- **Project Area**: refers to the area designated for development;
- **Area of Influence (AOI)**: comprises the wider 1km heritage data search around the Project Area;
- **WHS buffer zone**: the UNESCO-applied area surrounding World Heritage Sites which has complementary legal and/or customary restrictions placed on its use and development to give an added layer of protection to the site.

1.3 Project Area and AOI

The Project Area is depicted in Figure 1-1 and lies within the Aqaba Governorate of the Hashemite Kingdom of Jordan, approximately 60km northeast of Aqaba. The Project Area is centered on Universal Transverse Mercator (UTM) coordinates 36N 734386 E/3276139 N and comprises the footprint of the proposed works where they run through the buffer zone of the WRPA and near the boundary of the WRPA's buffer zone to the northwest. The HIA is limited to this area because its

purpose is specifically to assess the impact of the works upon the heritage significance of the WRPA. As the Scoping Report demonstrated, assessment of the proposed works showed that they have no potential to detrimentally impact the heritage significance of the WRPA once they exit the WRPA's buffer zone in the east, or once they continue south of the town of Rashidiyah in the west. As such, proposed work areas beyond this were not included within the Project Area for this HIA.

A wider AOI covering 1km around the Project Area was also defined and is the area subject to a heritage data search. This AOI is proportionate to the Project and appropriate for gathering sufficient information to provide context to the heritage resource within the Project Area itself.

The WRPA is a UNESCO Protected Area, designated in 2011, and is home to unique and internationally significant natural and cultural heritage features, both tangible and intangible. The designated area consists of a core area (the area of highest significance and most strictly protected) and a buffer zone, which is still subject to significant constraints to preserve its significance, as well as the setting and integrity of the core area. The WRPA represents Jordan's largest protected area, covering almost one percent of the country's land. It lies in east of the Jordan Rift Valley and south of the central Jordanian plateau, forming an important part of Southern Jordan's Hisma Desert. Most of the WRPA is undeveloped and natural in character, although some established villages and minor infrastructure areas (e.g., village access roads) exist across the buffer zone's northern extent (United Nations Educational, Scientific and Cultural Organization [UNESCO] 2025b).

For the purposes of this report, the WRPA core area and buffer zone are as defined in Figure 1-1 ; however, it is important to note that there are discrepancies concerning the size and shape of the core area and buffer zone in several sources. The core area and buffer zone of the WRPA as currently recognised by UNESCO are those depicted on UNESCO's 2011 inscription map (UNESCO 2025b). This defines the core area of the WRPA as 733.00km^2 and excluding the village of Rum and its associated road (Figure 1-2). The same map defines the WRPA's surrounding buffer zone as 591.66km^2 (Figure 1-3). Protected Planet's website depicts the core area with a slightly different boundary that includes the village of Rum and its road within the designated area (Figure 1-2) (Protected Planet 2025).

The Aqaba Special Economic Zone Authority (ASEZA) manages the WRPA and has different boundaries for the core area. The ASEZA designates the core area of the WRPA as 744.75km^2 (Figure 1-2). ASEZA sources also depict a significantly expanded buffer zone at 1,353.66km^2 (Figure 1-3)(Tetra Tech International Development 2022b). ASEZA has proposed this (over 200 percent) expansion of the WRPA's buffer zone in response to recommendations made by the World Heritage Committee, and intends to submit these new regulations to UNESCO (ASEZA 2024).

This enlarged buffer zone and changed core area have not yet been officially accepted or approved by UNESCO. As such, this report's assessment will use that version of the WRPA's core and buffer zone recognised by UNESCO. While UNESCO does not currently recognise the new buffer zone proposed by ASEZA, it is important to note that this buffer zone may be accepted in the future; this is considered within this report. However, the impact magnitude in this proposal is reduced.

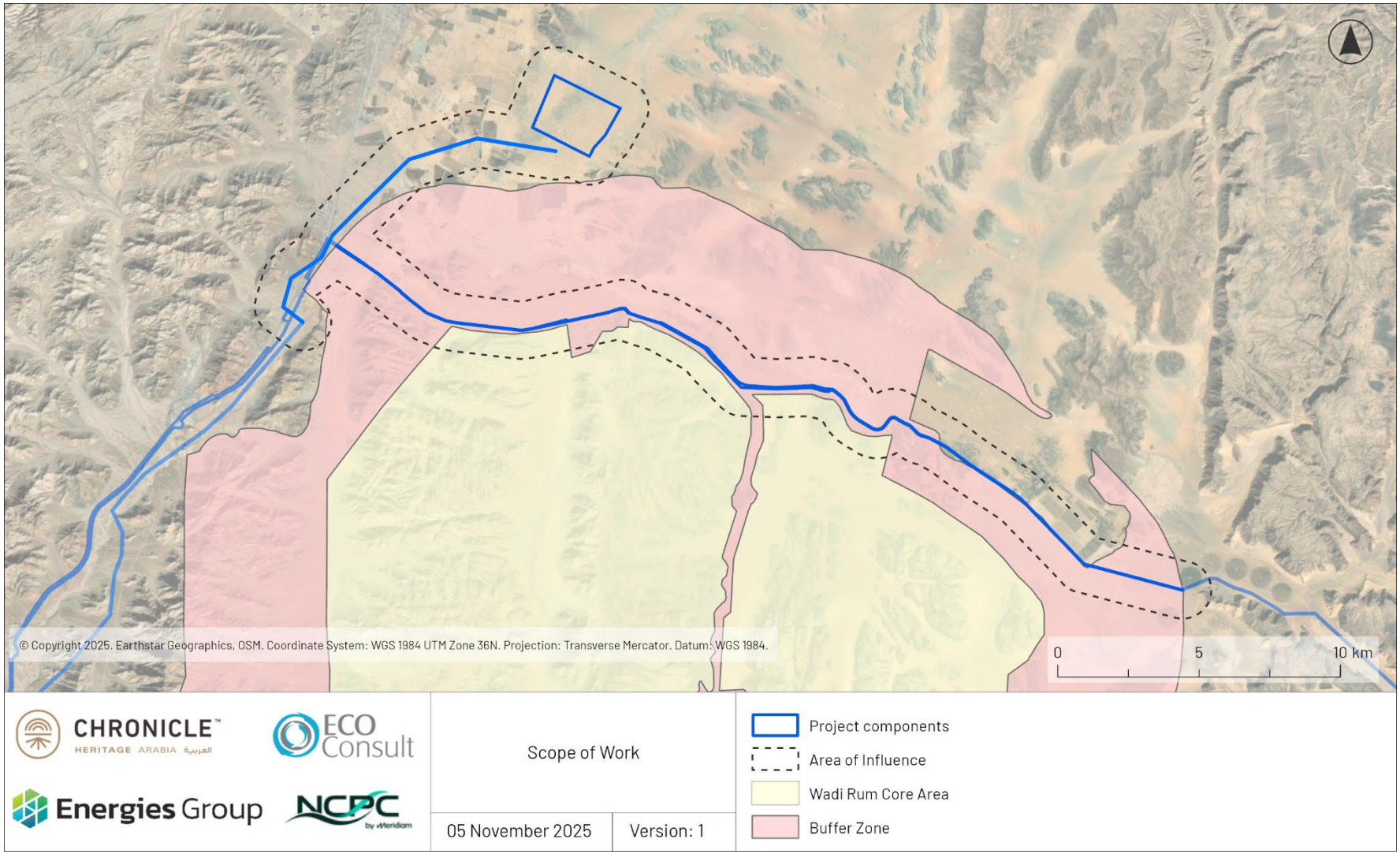

Figure 1-1. Project Area and AOI.

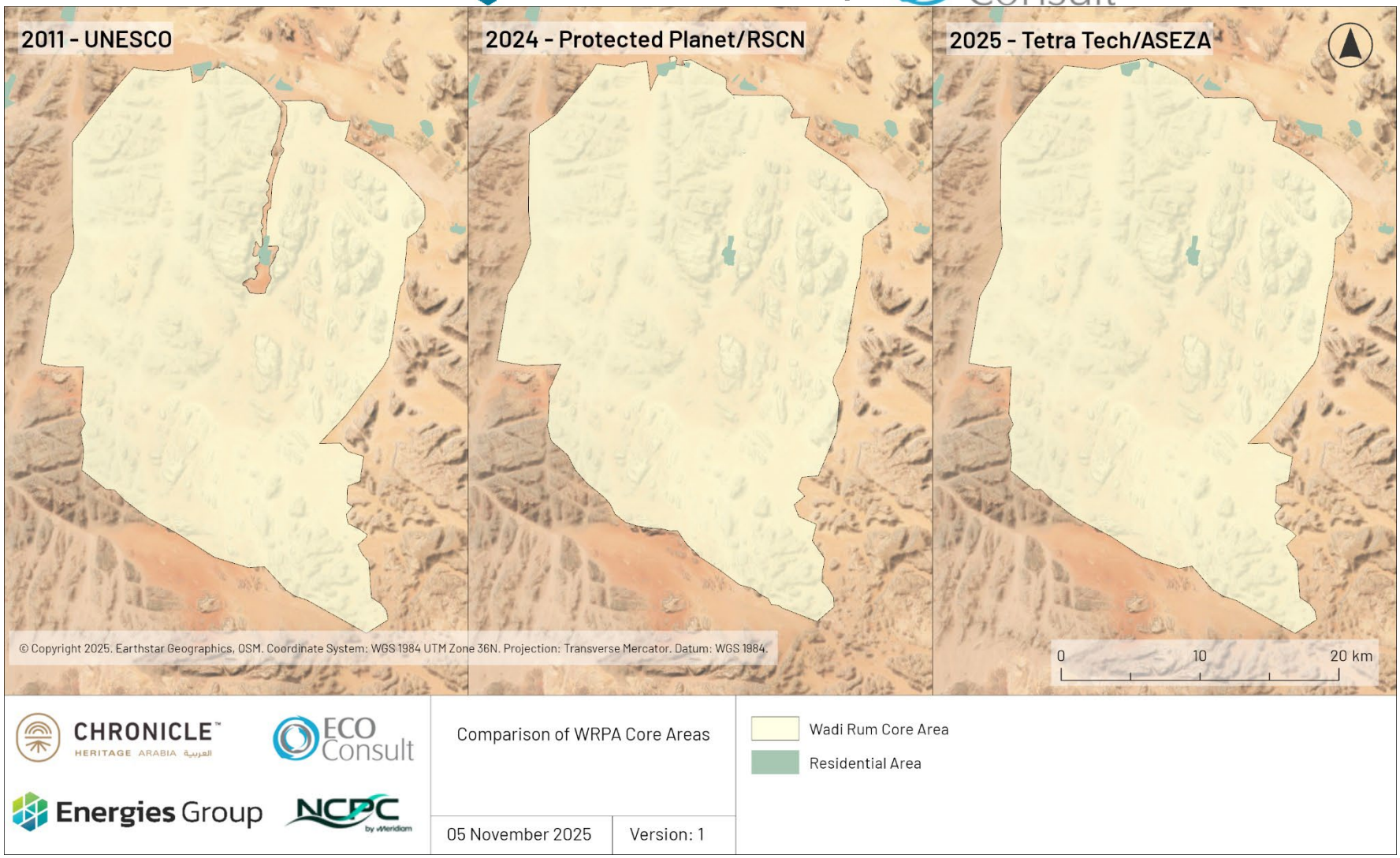

Figure 1-2. WRPA core area source discrepancies.

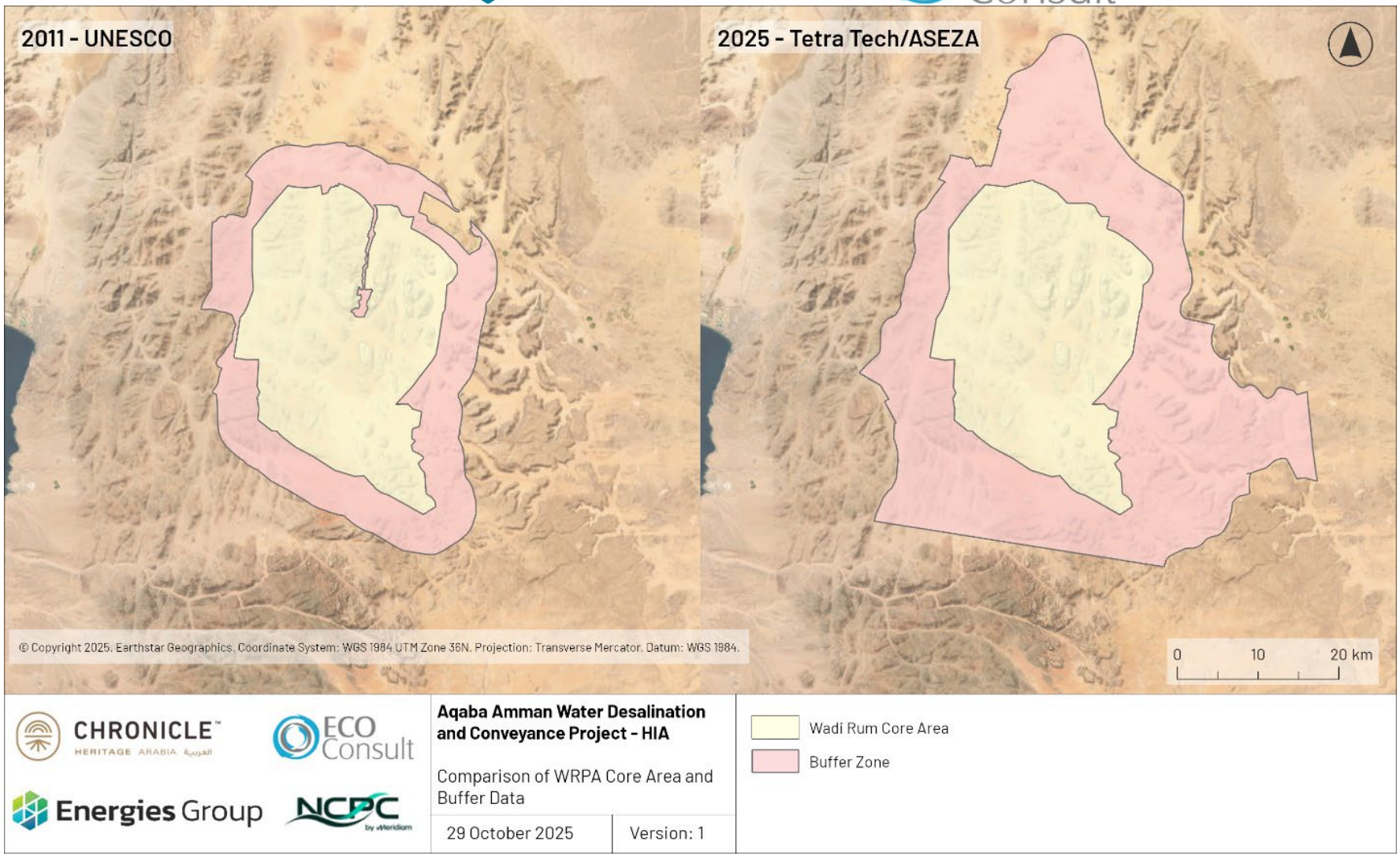

Figure 1-3. WRPA buffer zone source discrepancies.

1.4 Proposed Works

The Project is for the construction of a pipeline and related infrastructure to move desalinated water extracted from the Red Sea near Aqaba to Amman, where it will be used as part of the city's water supply. The Project includes proposals for a desalination plant at Aqaba and a pipeline 1km offshore from Aqaba. The HIA assesses only that part of the Project which passes through and near to the WRPA. This includes approximately 38km of the pipeline where it will run through the WRPA buffer zone as well as part of an overhead transmission line (OHTL) and one solar photovoltaic (PV) installation—which will be constructed to the northwest, outside but close to the boundary of the WRPA buffer zone. Figure 1-4 provides an overview of those aspects of the development that are subject to this HIA.

Figure 1-4 also depicts the line of an indicative re-route that is being considered for the Project. However, this is not discussed further within the report as no information about this possible alternative route has been provided and it is not currently approved.

The larger AAWDC Project was launched by the Ministry of Water and Irrigation (MWI) on February 26, 2020 in response to an ongoing and worsening water crisis within the country. Due to the country's scarce surface and groundwater sources and an increasing demand for safe drinking water, Jordan has one of the lowest levels of water availability per capita in the world. The gap between water supply and demand is also increasing every year and has been significantly exacerbated by the Syrian refugee crisis. In recent decades, the Jordanian government has invested billions of dollars trying to resolve this issue (Tetra Tech International Development 2022b).

The desalination and transport of Red Sea seawater across the country to Amman (proposed by the Project) should generate 300 million cubic meters of drinking water per year. It should also help reduce the country's crucial water resource deficit by providing a safe and reliable water supply for Amman and other Governates along the pipeline route. The Project will involve the construction of various desalination and water conveyance infrastructure between the Aqaba and Amman; however, only those subject to the HIA are described in greater detail below. The information is sourced from the Project's ESIA reports (Tetra Tech International Development 2022b, 2025) and .kmz files provided by the client.

It is important to note that the AZEZA representative for UNESCO has confirmed in a stakeholder meeting 14 October 2025 that they do not have any objections to the Project as it lies entirely outside of the WRPA's core area.

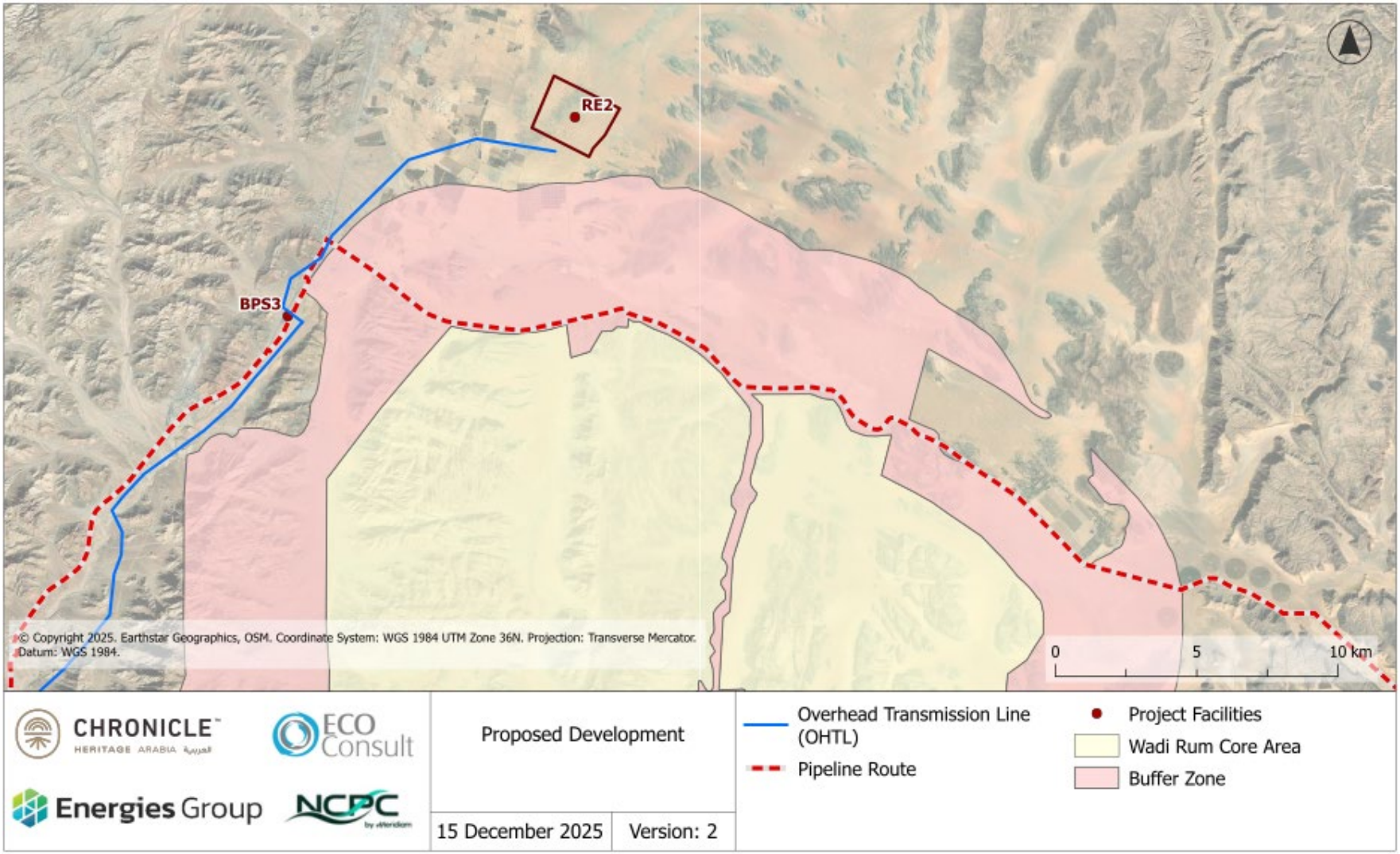

Figure 1-4. Proposed Development.

1.4.1 Conveyance Pipeline

The conveyance pipeline will move freshwater through the WRPA buffer zone. Through the WRPA buffer zone, the diameter of the pipe will be 2,200 to 2,500mm. It will be buried along its length, although no details regarding the width or depth of the required trench have been provided. The pipeline route through the WRPA buffer zone will largely be adjacent to an existing east-west road, although it will diverge from this road in some places (Figure 1-4). It is likely that spoil heaps up to 2m high will be created during the construction phase for the excavation of the pipeline.

1.4.2 Solar Photovoltaic Plant

A solar PV plant (i.e., the Renewable Energy site at al-Quweira) is also proposed: to supply renewable energy in the form of electricity to the Sea Water Reverse Osmosis (SWRO) desalination plant and pump stations within Aqaba Governorate during daylight hours. This plant is proposed to approximately span 500ha and will sit outside and to the northwest of the northern boundary of the WRPA buffer zone (Figure 1-4).

A detailed design drawing of the PV plant (Tetra Tech International Development 2025) indicates that a large array of solar panels will occupy the majority of the 500ha development area. A 2.4ha substation and an "Operations and Maintenance building" will also be constructed in the southwest corner of the development area, while four basecamp and storage areas (each between 1,000–2,500m^2) will be constructed at each corner of the development area. Finally, six weather stations, 18 pyranometers, a network of access roads, water tanks, and a drainage system are also proposed within and across the development area. Based on discussions with the client, it is assumed that the panels within the PV plant will be 2m above ground level once installed.

An existing PV plant, about two-thirds the size of that proposed, already exists to the south of the location proposed for the new PV plant. This existing plant lies almost entirely within the northern buffer zone of the WRPA and sits between the site of the proposed plant and the WRPA proper.

1.4.3 Overhead Transmission Line

Limited information is currently available regarding the construction of the proposed OHTL; however, it is proposed to run on a southwest–northeast orientation between the solar PV plant and the SWRO desalination plant in Aqaba. This HIA assesses its impact where it runs along, and just outside of, the northwestern boundary of the WRPA buffer zone. Two existing OTHLs already run north-south to the northeast of, and partially overlapping with, the WRPA buffer zone; the proposed OHTL would sit beyond these lines at a greater distance from the WRPA itself. The remaining part of the OHTL from Aqaba to the assessment area is located alongside the highway in a valley outside of the WRPA zones of protection, and also shielded from view by high landscape ridges.

According to information provided by the client (ECO Consult 2025), the OHTL between the main substation in Aqaba and the new PV plant will consist of 210 towers over a length of between 63 and 70km. This means that pylons will be constructed between every 300to 333m where the OHTL passes through the Project Area. Where the OHTL passes through the Project Area, it will supply 132 kV of power.

The client has also provided drawings (Electromontaj S.A. 2019d, 2019a, 2019b, 2019c) depicting the design for 132kV pylons. These show four possible design options, all employing steel construction. While the design of each option is similar and typical for a large electrical pylon, the

final height of the pylons may vary depending on the final option chosen. The pylons' final height may thus vary between 45.35m and 58.9m. The size of the base of the pylons would also vary depending on the option chosen. The largest base (i.e., the total area between the pylon legs) would be 17.32 × 17.32m, while the smallest possible base would be 5.58 × 4.43m. No details have been given regarding the below-ground foundations or required excavation footprints for the pylons.

1.4.4 Other Development

It is expected that the development will also involve a number of other construction projects, including access roads, stockpile areas, and workcamps. However, no locations or other details of these have been provided to date and have not been assessed.

1.5 Alternatives

Project alternatives were also assessed within the Project's ESIA report (Tetra Tech International Development 2022b, 2025). These alternatives include a "do nothing" approach (i.e., no project to address the water scarcity); this was determined to be an untenable approach, since it was assessed to lead to a number of significant consequences including health risks for parts of the population; the continued overexploitation and depletion of existing groundwater resources; and adverse effects on livelihood conditions and public health (Tetra Tech International Development 2022b).

Two alternative sites were evaluated for the PV plant: the Wadi Araba Site and the Al-Mudawara Site. However, both were rejected due to security concerns, the site's proximity to the international border and location within a nature reserve (Wadi Araba Site) and the cancellation of an associated pump station at the site (Al-Mudawara). (Tetra Tech International Development 2025)

Other explored alternatives included different infrastructure locations and alternative pipeline routes; however, these mostly concerned alternatives around Amman and the intake area and not within the Project Area. An OHTL route through the WRPA buffer zone was originally proposed but has since been discarded following discussions with ASEZA to avoid considerable predicted impacts upon the OUV of the Protected Area. It is unknown whether any further alternative routes in the vicinity of the WRPA have been assessed or investigated (Tetra Tech International Development 2022b).

1.6 Limitations

The Project is described above in as much detail as possible based on the information received and available within the timeframe of this assignment. However, it is important to note that Project design details are limited at this time. This is in regard to the approved and agreed details of both the proposed infrastructure's physical attributes (e.g., the depth and width of pipeline trenching; the final height and size of the OHTL pylons; the size and depth of excavations required for pylon foundations and the PV Project) and its visual attributes (e.g., the final design and appearance of the OHTL and PV Project). There is also a lack of detail regarding the proposed management and routing of construction vehicle traffic or the potential construction of enabling aspects such as stockpile areas, workcamps, access roads, etc.

This HIA Statement is also based on a limited amount of information regarding the heritage assets in and around the Project Area. This is partly due to the lack of historic data, published investigations in the area, and the lack of a complete heritage inventory. Although a walkover survey of the Project Area was carried out to address this data gap, this survey was non-intrusive and limited to observations and recording of heritage assets surviving on the ground surface.

This HIA assesses impacts against the UNESCO-approved boundaries for the WRPA. It does not review impacts for it ASEZA's proposed boundaries (as discussed within Section 1.3 above) as this has not been submitted or approved by UNESCO.

While reasonable efforts were made to gather accurate, up-to-date and relevant information through the extensive review of both primary and secondary sources, the assessment does not claim to represent a complete or exhaustive characterisation of all cultural heritage information along the Project corridor. Some data may not have been accessible or disclosed, The baseline therefore reflects a "best available information" approach and should be read together with future AAWDC Project documentation which will continue to refine and update heritage information as the Project progresses toward construction.

1.7 International legislation

The Project must adhere to the various legislative and regulatory provisions summarised below.

1.7.1 UNESCO

The Convention Concerning the Protection of World Cultural and Natural Heritage (World Heritage Convention) was adopted by the General Conference of UNESCO on November 16, 1972. The World Heritage Convention sets out the duties of States Parties in identifying potential sites and their role in protecting and preserving them. The World Heritage Convention also defines the kind of sites that can be considered for inclusion in the World Heritage List. By ratifying the World Heritage Convention, each country pledged to conserve World Heritage Sites within their territory and to protect national heritage. The States Parties are encouraged to integrate the protection of cultural and natural heritage into regional planning programs, set up staff and services at sites, undertake scientific and technical conservation research, and adopt measures that ensures heritage activities in the day-to-day life of communities (UNESCO 1972). Furthermore, during the 2003 General Conference of UNESCO in Paris, the committee agreed on the World Heritage Convention to safeguard and raise awareness and appreciation of intangible cultural heritage.

The committee periodically publishes operational guidelines (e.g., UNESCO 2024) to explain the criteria under which OUV is assessed and to describe the required procedures for the protection, conservation, and management of World Heritage Sites.

According to Paragraph 118bis of the *Operational Guidelines for the Implementation of World Heritage Convention*, an HIA is to be carried out as a prerequisite for development projects and activities planned for implementation within or around a World Heritage Site (UNESCO 2024). The HIA should serve to identify development alternatives and potential positive and negative impacts and recommend mitigation measures against degradation or other negative impacts to the cultural or natural heritage within the property or its wider setting, thus ensuring the long-term safeguarding of the OUV and strengthening of heritage resilience (UNESCO 2022).

UNESCO HIA Toolkit

The *Guidance and Toolkit for Impact Assessments in a World Heritage Context* is relevant to the current report (UNESCO 2022). The *Guidance and Toolkit* is a joint publication of UNESCO and the Advisory Bodies to the World Heritage Committee. The World Heritage Committee's three Advisory Bodies are the International Council on Monuments and Sites (ICOMOS), the International Union for Conservation of Nature (IUCN), and the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM). The *Guidance and Toolkit* is informed by and replaces the *Guidance on Heritage Impact Assessments for Cultural World Heritage Properties* previously published by ICOMOS (ICOMOS 2011)

The *Guidance and Toolkit* document aims to guide users with required steps to carry out HIAs for projects of all types and scopes at all World Heritage Sites—cultural, natural, or mixed—using the same adaptable framework. This guidance explains how HIAs can be used to protect the OUV of World Heritage Sites to manage continuity and change by informing good decision making in the context of UNESCO's World Heritage Convention (UNESCO 1972).

1.7.2 International Finance Institutions

As part of their due diligence, the client is also committed to adhering to the regulations of various financial institutions that aim to ensure the ethical treatment of local and Indigenous communities, cultural heritage, and cultural landscapes that will experience potential impacts from the development. Compliance with the standards of these institutions is also required by the development's Lender Environmental and Social Advisors (LESA), IFC and EBRD.

The Lenders' Environmental and Social Standards applicable to this project are detailed in Table 1-1 and Table 1-2 below. Table 1-1 lists the relevant financial institutions and their environmental social policies and standards, before summarising those policies and standards that relate directly to cultural heritage. Table 1-2 summarises those policies and standards that relate to other matters, but which will be highly relevant to cultural heritage and the current Project.

Cultural Heritage Policies

Table 1-1. The Environmental and Social Standards of Relevant Financial Institutions and their Cultural Heritage Policies

Institution	Relevant Policy or Standards	Cultural Heritage Policy	Other Policy Requirements relating to Cultural Heritage
European Bank for Reconstruction and Development (EBRD)	*Environmental and Social Policy* (EBRD 2024)	**Environmental and Social Requirement (ESR) 8** *General Requirements* Applies to all forms of tangible and intangible cultural heritage. Requires the developer to identify and assess any potential impacts to cultural heritage at an early stage of environmental and social assessment (required by ESR1). This should inform the adoption of a mitigation hierarchy which identifies and implements measures to (in order of preference) avoid, minimise, mitigate, or offset adverse impacts. The development and implementation of these measures should be integrated as part of the Environmental and Social Management System (ESMS) (required by ESR1) and a Cultural Heritage Management Plan (CHMP) for the project and in accordance with good international practice. This process should also involve the involvement of cultural heritage experts and meaningful consultation with all key stakeholders. The developer is also required to ensure that: ▪ Appropriate provisions for managing chance finds are in place; ▪ That any previous access to cultural heritage is safe and sustained or alternatively provided for; ▪ That the awareness, appreciation, and enhancement of cultural heritage is undertaken; and ▪ That the development complies with specific requirements and constraints surrounding the use, including the commercial use, of cultural resources and the equitable sharing of benefits from its use. *Specific Requirements* ESR 8 also provides specific requirements for the treatment of different types of cultural heritage (archaeological sites, built heritage, cultural landscapes with natural features, moveable cultural heritage, and underwater cultural heritage), details of which can be found in the document. ESR8 also contains specific requirements regarding projects that have the potential to adversely impact cultural heritage that is legally protected and/or	**Environmental and Social Exclusion List** In addition to the ESRs, the EBRD's Environmental and Social Exclusion List defines projects that the Bank will not knowingly finance, directly or indirectly. These include Exclusion (m): "any projects that impact UNESCO Natural and Mixed World Heritage Sites" (EBRD 2024: 27). **Annex B** Annex B of the Policy defines this Project as a Category A project, i.e., one that could result in potentially significant environmental or social impacts. This is because it involves the construction of a pipeline with a length of more than 40km. The Policy requires that all Category A projects are subject to an ESIA.

Institution	Relevant Policy or Standards	Cultural Heritage Policy	Other Policy Requirements relating to Cultural Heritage
		internationally recognised (such as the WRPA). In such cases, the developer should seek to avoid such impacts, wherever viable. If impacts to legally protected or internationally recognised cultural heritage cannot be avoided and no alternatives are feasible, the developer will proceed with the development only if the project: ▪ Meets local, national, and international requirements pertaining to the cultural heritage concerned; ▪ Demonstrates that the proposed development is legally permitted through an assessment of project-related impacts on the protected area; ▪ Complies with the provisions of relevant government management plans through the preparation and implementation of a cultural heritage impact assessment and associated management plan; ▪ Consults protected area regulators, relevant authorities, local communities and other stakeholders on the proposed project; ▪ Explores opportunities and implements programs to promote the conservation mandate of the protected area and contributes to the socioeconomic development of local communities, in accordance with the management plan of the protected area (EBRD 2024: 93).	
International Finance Corporation (IFC)	Performance Standards (IFC 2012)	**Performance Standard (PS) 8** *General Requirements* The IFC's PS8 is largely comparable, and specifies the same general requirements, as the EBRD's ESR8 (see above). There are nevertheless some differences between the IFC's PS8 and the EBRD's ESR8: PS8 applies to all forms of tangible cultural heritage but only to instances of intangible cultural heritage that are proposed to be used for commercial purposes. PS8 does not require the development and implementation of a CHMP; instead, it requires that the development and implementation of mitigation measures be integrated as part of the ESMS. *Specific Requirements*	N/A

Institution	Relevant Policy or Standards	Cultural Heritage Policy	Other Policy Requirements relating to Cultural Heritage
		PS8 also provides specific requirements for different types of cultural heritage (replicable, non-replicable, and critical cultural heritage). Critical cultural heritage includes that which is legally protected and would include the WRPA. PS8 states that the developer should not remove, significantly alter, or damage any critical cultural heritage. In exceptional circumstances, where such impacts are unavoidable, the developer must use a process of Informed Consultation and Participation (ICP) of the Affected Communities which uses a good faith negotiation process, retains external experts, and results in a documented outcome. PS8 also specifies additional constraints and requirements for projects that will take place within a legally protected area or a legally defined buffer zone. To qualify for financing, any development in these areas must: ▪ Comply with national and local cultural heritage regulations or the protected area's management plans ▪ Consult the area's sponsors and managers, local communities, and other key stakeholders on the proposed project; and ▪ Implement additional programs, as appropriate to promote and enhance the conservations aims of the protected area (IFC 2012: 3).	
European Investment Bank (EIB)	Environmental and Social Standards (EIB 2022)	**Standard 10** *General Requirements* The EIB's Standard 10 is largely comparable, and specifies the same general requirements, as the EBRD's ESR8 (see above). Standard 10 applies to both all forms of cultural heritage, both tangible and intangible, as well as any natural heritage that is recognised by local communities or peoples as part of their history or traditions (EIB 2022). *Specific Requirements* Standard 10 also specifies additional constraints and requirements for projects that will take place within a legally protected area or a legally defined buffer zone. For such projects, Standard 10 requires developers to meet the following additional requirements: ▪ Ensure compliance with international, national, and/or local cultural heritage regulations or the protected area's management plans;	N/A

Institution	Relevant Policy or Standards	Cultural Heritage Policy	Other Policy Requirements relating to Cultural Heritage
		▪ Conduct meaningful consultation with the protected area's sponsors and managers, local communities, and other key stakeholders on the proposed project; ▪ Implement additional programs, as appropriate, to reduce the project's impacts, including visual impacts, and to promote and enhance the conservation aims of the protected area (EIB 2022: 80).	
World Bank Group (WBG)	Environmental and Social Framework (The World Bank Group [WBG] 2017)	**Environmental and Social Standard (ESS) 8** *General Requirements* The WBG's ESS8 is largely comparable, and specifies the same general requirements, as the EBRD's ESR8 (see above). There are nevertheless some differences between the WBG's ESS8 and the EBRD's ESR8: The WBG's ESS8 applies to all forms of tangible cultural heritage but only applies to aspects of intangible cultural heritage if a Project will have a material impact upon that aspect of if the project intends to use it for commercial purposes. *Specific Requirements* ESS8 specifies additional constraints and requirements for projects that will take place within a legally protected area or a legally defined buffer zone (WBG 2017). To qualify for financing, any development in these areas must: ▪ Comply with national and local cultural heritage regulations and the protected area's management plans ▪ Consult the area's sponsors and managers, project-affected parties (both individuals and communities) and other interested parties on the proposed project; and ▪ Implement additional programs, as appropriate, to promote and enhance the conservations aims of the protected area (WBG 2017: 87).	N/A

Institution	Relevant Policy or Standards	Cultural Heritage Policy	Other Policy Requirements relating to Cultural Heritage
Environmental, Health, and Safety (EHS) Guidelines (IFC and WBG	*General Guidelines* (IFC and WBG 2007a) *Industry Sector Guidelines*	The EHS Guidelines constitute a series of technical reference documents that contain examples of Good International Industry Practice (GIIP) with regards to the environment, health, and safety. They are applied to a project when one or more members of the World Bank Group are involved in financing that project. The General EHS Guidelines (IFC and WBG 2007a) apply to all projects. There are also Industry Sector EHS guidelines relevant to specific industries. Those relevant to this project include the EHS Guidelines for Electric Power Transmission and Distribution (IFC and WBG 2007b) and the EHS Guidelines for Water and Sanitation (IFC and WBG 2007c). Although the General Guidelines do provide guidance on how to minimise development impacts that could have an impact upon cultural heritage (e.g., noise and vibrations), they do not deal with cultural heritage specifically. While all aspects of the guidelines should thus be fully complied with, they are not discussed in further detail here.	N/A
National Environmental, Social, Health, and Safety (EHS) Guidelines (Jordan)	N/A	Jordan has also established national Environmental, Social, Health and Safety (ESHS) guidelines. While a single comprehensive document detailing these guidelines does not appear to exist, Jordan does make a commitment to many existing international guidelines, including the EHS Guidelines specified by the IFC and WBG (see above). It additionally specifies some of its own national policies and strategies concerning health, safety, and the environment. All guidelines relating specifically to cultural heritage and adopted by Jordan have already been discussed within the sections above.	N/A
Development Finance Corporation (DFC)	*Environmental and Social Policy and Procedures* (DFC 2024)	The DFC does not specify its own standards but rather adopts the Performance Standards of the IFC and the EHS Guidelines of the IFC and WBG (see above). When the DFC is co-financing a project in which a multilateral development bank (such as the EBRD) is involved, the DFC may also apply the standards of that respective bank.	**Categorical Prohibitions** The DFC's Categorical Prohibitions define specific types of Projects that are not eligible for DFC financing. Categorical Prohibitions 7 and 8 (DFC 2024: A) prohibit the DFC from financing any Project that has any impact on a

Institution	Relevant Policy or Standards	Cultural Heritage Policy	Other Policy Requirements relating to Cultural Heritage
			World Heritage Site, or any area on the United Nations List of National Parks and Protected Areas, respectively. These prohibitions apply "unless it can be demonstrated through an environmental and social assessment that the Project (i) will not result in the degradation of the protected area; and (ii) will produce positive environmental and social benefits" (DFC 2024: 30).
European Union (EU)	Various	The EU also defines substantive environmental standards as required by the EBRD. While many are relevant to the Project (e.g. the Industrial Emissions Directive), few deal directly or solely with cultural heritage. Some are nevertheless still highly relevant to the protection of cultural heritage. These include the Environmental Impact Assessment (EIA) Directive (2011/92/EU as amended by 2014/52/EU) which requires that major building or development projects be assessed for their impact on the environment before the project can start, to include assessment of impacts on cultural heritage (European Commission 2025). The EU has published some guidance dealing directly with cultural heritage; for example, the European Framework for Action on Cultural Heritage (European Commission 2019). However, rather than dealing with development impacts on cultural heritage, most focus on the development of strategies to protect cultural heritage from the threat of climate change or integrating sustainable practices into the restoration and management of cultural heritage to reduce environmental degradation (European Commission 2019).	N/A

Institution	Relevant Policy or Standards	Cultural Heritage Policy	Other Policy Requirements relating to Cultural Heritage
PROPARCO (the financing arm of the Agence Française de Développement [AFD Group]).	*Environmental and Social Framework* (Agence Française de Développement (AFD) Group 2018)	The AFD Group does not have its own specific environmental and social standards but rather adopts the standards of the WBG and IFC (see above).	**Exclusion List** The AFD Group's Exclusion List specifies developments which will not be funded by PROPACRO or the AFD Group. The Exclusion List within the 2018 framework (AFD Group 2018) was revised in 2022 (Republique Francaise and AFD Group 2022) and now includes the following two exclusion relevant to the Project: Exclusion 13 excludes any developments or operations which would result in an "irreversible alteration or significance displacement of a critical element of cultural heritage" (Republique Francaise and AFD Group 2022: 4). Exclusion 17 excludes any development or project which would take place within a natural and mixed site on the UNESCO World Heritage List or within a legally protected area (IUCN categories).

Institution	Relevant Policy or Standards	Cultural Heritage Policy	Other Policy Requirements relating to Cultural Heritage
The Association of European Development Finance Institutions (EDFI).	*Principles for Responsible Financing of Sustainable Development* (European Development Finance Institutions [EDFI] 2019)	The EDFI does not set specific standards of its own but confirms that the primary set of standards that it requires its investee companies to comply with are the IFC Performance Standards and the IFC and WGB's EHS Guidelines (see above).	**Harmonised Exclusion List** The members of the EDFI have also mutually agreed on a Harmonised Exclusion List which lists types of projects which the EDFI will not finance. Exclusion 4 is relevant to cultural heritage as it prohibits financing any projects that will result in the "destruction of High Conservation Value (HCV) areas" (EDFI 2011: 1). Within this list, the term destruction is defined as the "elimination or severe diminution of the integrity of an area caused by a major, long-term change in land or water use" (EDFI 2011: 1). HCV areas, meanwhile, are defined as areas that contain biological, ecological, social, or cultural values of outstanding significance or critical importance (HCV Network 2025). The WRPA qualified as a HCV area.

Institution	Relevant Policy or Standards	Cultural Heritage Policy	Other Policy Requirements relating to Cultural Heritage
IFC/EBRD	Worker Accommodation Guidance Note 2009	This is not applicable to cultural heritage.	

Table 1-2: Other Relevant Policies of the Financial Institutions

Institution	Risk and Impact Assessment Policy	Land Acquisition Policy	Stakeholder Engagement Policy
European Bank for Reconstruction and Development (EBRD)	**ESR1** This policy recognises the importance of, and requires: an integrated assessment to identify all environmental and social risks and impacts of a project; and an Environmental and Social Management System (ESMS) to mitigate, manage, monitor, and report environmental and social performance throughout the life of the project. Both the required assessment and ESMS should be commensurate to the nature and scale of the project and its level of environmental and social impacts. Both processes should also involve meaningful communication and consultation between the developer, workers, affected communities and, where relevant, other stakeholders (EBRD 2024).	**ESR5** This policy relates to any land acquisitions which will either physically displace people or economically displace them by restricting their use of land or their access to assets and resources. The ESR refers specifically to such land acquisitions in which the affected persons or communities do not have the right to refuse these actions. This policy requires that the developer identifies and assesses potential physical and/or economic displacements at an early stage of the environmental and social assessment required by ESR1. If identified, the developer should consider feasible alternative project designs and sites to avoid or minimise land acquisition. Where displacement cannot be avoided by design, it should be minimised and	**ESR10** This policy requires the design and implementation of a Stakeholder Engagement Plan (SEP), initiated at an early project stage and continuing throughout the project cycle. Further details may be found in the document although it should be noted that there are specific requirements for stakeholder engagement on Category A projects (EBRD 2024).

Institution	Risk and Impact Assessment Policy	Land Acquisition Policy	Stakeholder Engagement Policy
		appropriate mitigation measures carefully planned and implemented. This process should include meaningful consultation with affected persons and pay particular attention to gender impacts and effects on vulnerable people. Although mitigation should be a last-case choice, recommendations on suitable mitigation are provided within the document (EBRD 2024).	
International Finance Corporation (IFC)	**PS1** The IFC's PS1 is comparable, and specifies the same general requirements, as the EBRD's ESR1 (see above).	**PS5** The IFC's PS5 is comparable, and specifies the same general requirements, as the EBRD's ESR5 (see above). In addition, this policy also requires that avoidance, minimisation, or mitigation of identified impacts are managed through the developer's ESMS. Recommendations on suitable mitigation are provided within the document (IFC 2012).	N/A
European Investment Bank (EIB)	**Standard 1** The EIB's Standard 1 is comparable, and specifies the same general requirements, as the EBRD's ESR1 (see above). In addition, this standard requires that the assessment of environmental and social impacts and risks is carried out in the form of an EIA or ESIA for some Projects. The requirement for an EIA or	**Standard 6** The EIB's Standard 6 is comparable, and specifies the same general requirements, as the EBRD's ESR5 (see above). Recommendations on suitable mitigation, including compensation, are provided within the document (EIB 2022).	**Standard 2** The EIB's Standard 2 is comparable, and specifies the same general requirements, as the EBRD's ESR10 (see above).

Institution	Risk and Impact Assessment Policy	Land Acquisition Policy	Stakeholder Engagement Policy
	ESIA will be made by the EIB in accordance with the considerations listed in Annex I and II of the EIB's Environmental and Social Standards document (EIB 2022).		
World Bank Group (WBG)	The WBG's ESS1 is comparable, and specifies the same general requirements, as the EBRD's ESR1 (see above). The major difference is that the WBG requires the production of an Environmental and Social Commitment Plan (ESCP) rather than an ESMS; although the general purpose and scope of these two systems are the same (WBG 2017).	The WBG's ESS5 is comparable, and specifies the same general requirements, as the EBRD's ESR5 (see above). Recommendations on suitable mitigation, including compensation, are provided within the document (WBG 2017).	The WBG's ESS10 is largely comparable, and specifies the same general requirements, as the EBRD's ESR10 (see above).
Environmental, Health, and Safety (EHS) Guidelines (IFC and WBG	N/A – see Table 1-1 for a summary of these guidelines.		
National Environmental, Social, Health, and Safety (EHS) Guidelines (Jordan)	N/A – see Table 1-1 for a summary of these guidelines.		
Development Finance Corporation (DFC)	N/A – see Table 1-1 for a summary of these guidelines.		

Institution	Risk and Impact Assessment Policy	Land Acquisition Policy	Stakeholder Engagement Policy
European Union (EU)	N/A – see Table 1-1 for a summary of these guidelines.		
PROPARCO	N/A – see Table 1-1 for a summary of these guidelines.		
The Association of European Development Finance Institutions (EDFI).	N/A – see Table 1-1 for a summary of these guidelines.		

1.8 National Legislation

The Project must adhere to the various legislative and regulatory provisions summarised below.

1.8.1 Antiquities Law No. 23

In 2004, the Jordanian Ministry of Tourism and Department of Antiquities developed the Law of Antiquities No. 23 (General Department of Antiquities 2024) to amend and replace the 1988 Law of Antiquities No. 21. The Law of Antiquities No. 23 sets out the responsibilities, actions, and prohibitions deemed necessary to protect and conserve Jordan's cultural heritage, including archaeological heritage.

The law specifically prohibits any destruction, disfiguration, transformation, removal, or damage to antiquities or their features (Article 9) or any antiquities trading (General Department of Antiquities 2024). Articles 26 through 28 set out the penalties associated with the violation of these provisions. This law also acknowledges how developments can damage cultural heritage and seeks to address this risk by prohibiting heavy or dangerous industries within 1km of antique sites. The law also prohibits the construction of any new structures (including buildings and walls) within 5–25m of antiquities (or greater if deemed necessary by the Minister of Tourism and Antiquities) (General Department of Antiquities 2024).

1.8.2 Protection of Architectural and Urban Heritage Law No. 5

In 2005, the Jordanian Ministry of Tourism and Department of Antiquities also developed the Protection of Architectural and Urban Heritage Law No. 5 (General Department of Antiquities 2005). This law outlines the responsible parties and procedures for identifying, documenting, and protecting Jordan's architectural and urban heritage, including significant buildings and historic districts. It also defines penalties for the unauthorised alteration or destruction of such assets and promotes public participation in built heritage conservation.

1.8.3 Regulations for Archaeological Projects in Jordan

The Regulations for Archaeological Projects in Jordan (2015) set out the procedures and standards for conducting archaeological work in Jordan, including excavation, survey, and documentation. They define the permitting process administered by the Department of Antiquities and establish requirements for managing and protecting archaeological materials encountered during project activities. The regulations also recognise both tangible and intangible heritage values, ensuring that archaeological projects consider associated cultural practices and knowledge linked to sites.

1.9 Local Legislation

The Project must adhere to the various legislative and regulatory provisions summarised below.

1.9.1 The Aqaba Special Economic Zone Authority

ASEZA is a government entity established in 2001 to govern the Aqaba Special Economic Zone (ASEZ), an area of 37,500ha around the city of Aqaba. ASEZA was established to attract and facilitate investment in the area (including within the tourism, utilities, infrastructure, and services sectors) and deliver social, economic, and environmental benefits to the population. ASEZA is in charge of economic permitting and has sole jurisdiction over environmental regulation within the

ASEZ (Tetra Tech International Development 2022b). ASEZA has developed various regulations to facilitate this process, some of which are specifically concerned with the protection of heritage.

Regulation No. 24 for the Development of the Wadi Rum Protected Area (ASEZA)

In 2001, ASEZA developed Regulation No. 24 for the development of the WRPA (ASEZA 2001), which was issued in accordance with Articles (11) and (56) of the ASEZ Law No. 32 (2000). The regulation requires ASEZA to develop the area in a sustainable fashion which includes the promotion of tourism, the development of basic services, the improvement of life conditions for inhabitants, and the preservation of its natural, cultural, and heritage environment and unique landscapes. The regulation includes the facilitation of access to, and provision of necessary information about, historical places within the ASEZA. The Wadi Rum Area Committee was developed to administer ASEZA developments and improvements, including establishing policy for its administration; drafting technical instructions; and enforcing legislation (ASEZA 2001).

Regulatory Provisions for the Wadi Rum Protected Area Buffer Zone (ASEZA)

ASEZA has also developed a suite of regulatory provisions concerning work and activities within the buffer zone of the WRPA (ASEZA n.d.a) to protect the special significance of this area and its natural, cultural, and social assets in a balanced and complementary manner. The regulatory provisions aim to do this through the regulation of all new developments, construction, and other activities within the buffer zone (Article 3); this includes all new (temporary or permanent) work and activities as well as the expansion or alteration of any existing structures or sites (Article 7). The ASEZA board of commissioners is the entity responsible for enforcing the provisions and for granting construction, occupancy, activity, and work permits in line with the regulations (Article 4).

The provisions include several general regulations relevant to all areas of the buffer zone. Of particular importance to heritage are the provisions within Article 13,which specifically forbid "any construction and/or activities within archaeological sites and [their] surroundings" and "any activity that is incompatible with the culture and heritage of the area or any other way that would cause its destruction" (ASEZA n.d.a: 10, 13). Article 13 also prohibits any mining, quarries, crushers, sand and gravel plants, or industry plants of any kind within the buffer zone. Article 13 also makes specific provisions regarding the undertaking of agricultural and pastoral activities; landscaping; and the construction of roads, paths, and infrastructure within the buffer zone. Of particular relevance to this Project is the requirement that "infrastructure facilities and services shall be underground so that they cannot be seen" (ASEZA n.d.a: 11). Also relevant are the provisions regarding the management of construction and other activities; these include a specific prohibition on noise levels exceeding 45dB or vibrations lasting more than three minutes if they are strong enough to be felt by humans.

The regulations also provide certain allowances for the local community in Article 11, including those related to the construction within existing residential areas; setting up traditional tents in natural areas; grazing; hosting tourists; and carrying out handicrafts, heritage, and traditional industries (ASEZA n.d.a).

Finally, the regulations refer to the strategic plan for land use planning in the WRPA buffer zone (ASEZA n.d.b) (Figure 1-5), which defines different "land use areas" within the buffer zone and lists a number of specific provisions to be adhered to within each area. The land use areas include four main character areas (Borda, Sabet, Marsad, and Kharzah) as well as the existing Disi Agricultural Area and a social corridor that connects existing settlements across the northern extent of the buffer zone (Figure 1-5). The Project would mainly extend through the social corridor but would also

extend through the Disi Agricultural Area. The strategic plan allows for low development within the social corridor (except within regulated urban settlement) and medium development within the Disi Agricultural Area, although this is limited to existing agricultural use (ASEZA n.d.a).

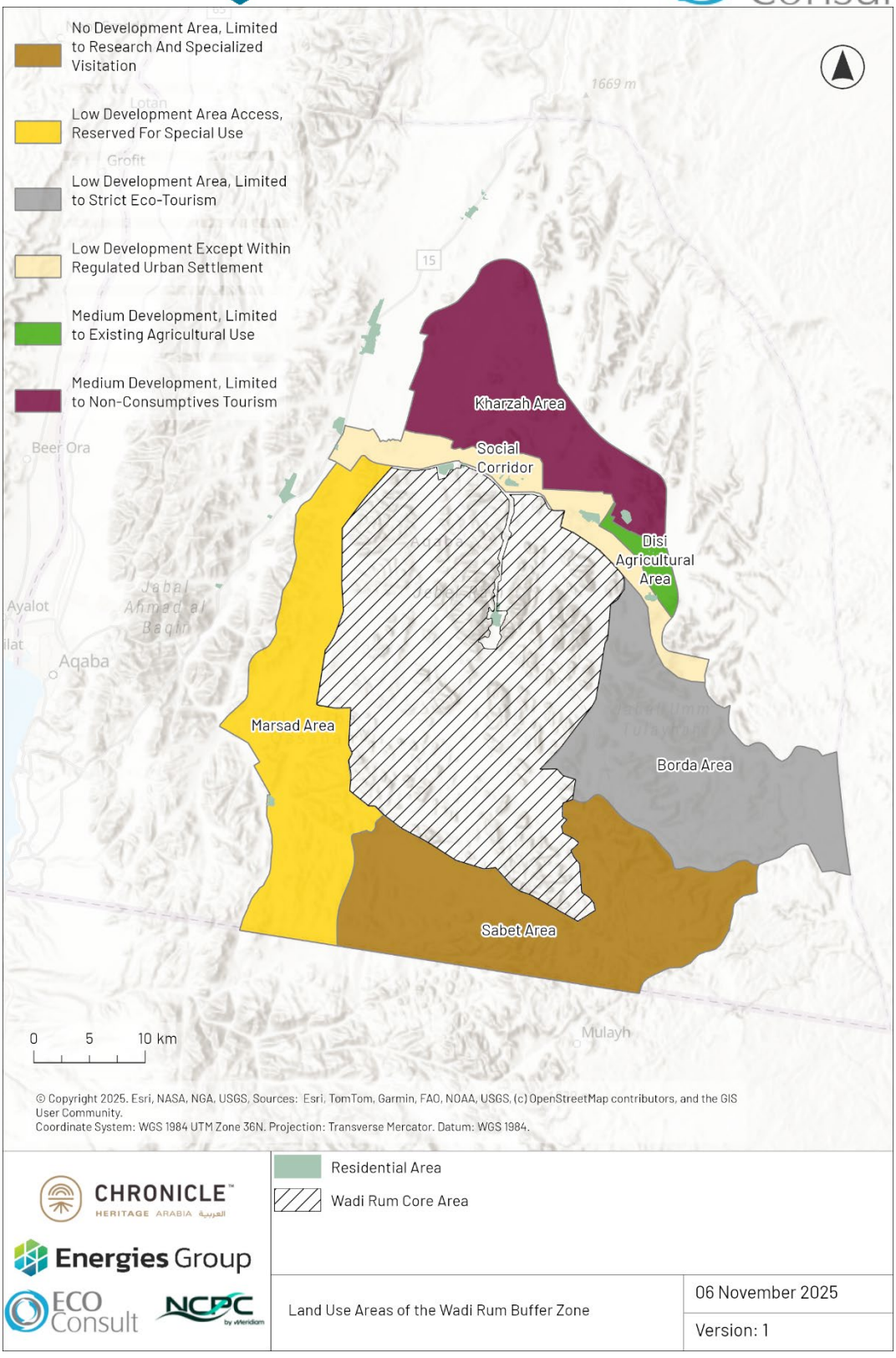

Figure 1-5. Established land use areas of the WRPA buffer zone, as defined by ASEZA.

2 Data Sources and Methodology

2.1 Existing Data

Chronicle Heritage Arabia performed a desktop review of readily available historical, archaeological, and cultural heritage information pertinent to the AOI with support and consultation with experts from the Department of Antiquities (DoA). Identified and consulted information sources pertinent to this HIA Statement are included in Table 2-1.

Table 2-1. Sources of Information

Source	Type	Description
Eco Consult	Various	Shapefiles, documents, drawing, and other correspondence detailing the proposed works and assessment undertaken so far
DoA	Consultation	CH Arabia consulted with the DoA throughout the HIA process and they provided local experts for the walkover survey
ASEZA	Consultation	CH Arabia consulted with ASEZA throughout the HIA process and met with their UNESCO representative
UNESCO	UNESCO World Heritage Site	Descriptions and assessment of the Outstanding Universal Value (OUV) of the WRPA and the Cultural Space of the Bedu in Wadi Rum
UNESCO	UNESCO World Heritage Site	WRPA Sate of Conservation reports and 2003 Management Plan.
MEGAJordan	Online GIS	Online GIS repository of site data, published by the Department of Antiquities and the Getty Institute
Google Earth	Satellite imagery	Information on topography and geology of the AOI.
USAID	HIA	Previous HIA undertaken in 2025 to assess the Disi-Aqaba Pipline.
Various	Research papers, journal articles, books	Various sources found online and as hard copies

2.1.1 USAID HIA

One of the data sources used to inform the HIA (as noted in Table 2-1) was a Heritage Impact Assessment (HIA) prepared in 2025 under USAID's *Building Water Infrastructure Activity* for the proposed Disi–Aqaba Water Transmission Pipeline (United States Agency International Development [USAID] 2025). The assessment was undertaken by CDM International Inc. (CDM Smith) as Task WA-14 and submitted to USAID/Jordan in July 2025. The study examined the potential impacts of a 68km transmission pipeline designed to increase water supply to Aqaba by approximately 12,000,000 m^3 per year from the Disi Aquifer. The study is highly important to this HIA as the proposed Disi-Aqaba Pipeline (never constructed) runs along almost exactly the same alignment as the pipeline proposed by this Project. It was approved in principle by AZEZA.

The Disi Pipeline HIA was implemented in accordance with the *UNESCO–ICCROM–ICOMOS–IUCN Guidance and Toolkit for Impact Assessments in a World Heritage Context* (2022). The assessment was structured as a standalone study aligned with the Environmental and Social Impact Assessment (ESIA). The methodology included a literature review, review of the 2019–2023 *Integrated Management Plan for WRPA*, delineation of a 250m study corridor, systematic field

investigations, community consultations, and stakeholder engagement with the DoA, ASEZA, and local Bedouin communities.

The Disi Pipeline HIA concluded that no registered archaeological sites fall within the proposed pipeline footprint. Five unregistered archaeological features, consisting of cisterns, milestones, and structural remnants from the Nabataean, Roman, and Byzantine periods, were documented outside of the pipeline footprint but within the defined 250 m study corridor. Meanwhile, a further nine sites were identified outside the study corridor but within the wider general area. No direct impacts to known sites were identified, although potential indirect impacts from construction activities were acknowledged (USAID 2025).

An assessment of the findings of this HIA, and its limitations, is provided in Table 2-2.

Table 2-2. Findings and Limitations of Previous HIA

Aspect / Theme	Findings or Limitations in 2025 HIA
Scope of Assessment	Focused primarily on archaeological and natural attributes; limited treatment of intangible heritage and living cultural practices.
Methodological Framework	Followed 2022 UNESCO Guidance but applied heritage criteria mainly as an adjunct to the ESIA.
Field Verification	Limited on-site verification; reliance on existing inventories and secondary data.
Community Participation	Consultation limited to single stakeholder workshops; no structured community engagement.
Institutional Coordination	Coordination between ASEZA, DoA, and WRPA Management Unit was informal.
Cumulative Impact Assessment	Identified but not quantified; no integrated evaluation of concurrent projects.
Monitoring Framework	Recommended generic monitoring without performance indicators or assigned responsibilities.
Mitigation Planning	Standard avoidance and chance-find procedures; minimal linkage to management planning.
Legal and Policy Alignment	Based on 2019–2023 IMP and pre-amendment ASEZA frameworks.
Reporting and Documentation	Narrative presentation without tabulated sensitivity or significance matrix.
Scope of Assessment	Focused primarily on archaeological and natural attributes; limited treatment of intangible heritage and living cultural practices.
Methodological Framework	Followed 2022 UNESCO Guidance but applied heritage criteria mainly as an adjunct to the ESIA.
Field Verification	Limited on-site verification; reliance on existing inventories and secondary data.
Community Participation	Consultation limited to single stakeholder workshops; no structured community engagement.
Institutional Coordination	Coordination between ASEZA, DoA, and WRPA Management Unit was informal.

2.2 Walkover Survey

As described in detail within the Scoping Report, the data available for the Study Area's heritage resource displayed considerable data gaps. As such, the existing data is considered unlikely to represent the full heritage resource of the AOI or the Project Area and there is potential for further heritage assets (both above and below ground) to exist within the Project Area that have not yet been identified or recorded.

Given this identified data gap, the Scoping Report recommended that an archaeological walkover survey was conducted across the Project Area for the OHTL, Solar PV and Pipeline. The survey was also used as an opportunity to understand, assess, and record the historic landscape character of Wadi Rum and its surrounds and identify any important historic views and significant visual receptors that could be impacted by the Project.

This survey was conducted by CH Arabia in conjunction with a local representative team of experts assigned by DoA between 28 September and November 4 2025. The aims of the survey and its methodology, and the methodology used to achieve those aims, are described below:

Aim 1: Identify, assess, characterise, and record any visible surface features, sites, cultural heritage assets, or other locations of cultural heritage significance that exist within and around the Project Area. These might include previously recorded assets and/or newly identified assets.

This aim was achieved by walking across all parts of the Project Area to search for surface sites, features, or finds. Where identified, these assets were mapped and recorded using Survey 123, which allows for the integration of accurate Global Positioning System (GPS) location mapping, photographs, and written descriptions.

Aim 2: Record, assess, and characterise the historic landscape character and any key historic views or significant visual receptors that could be impacted by the Project.

This was achieved by walking across the Project Area and taking photographs at regular intervals to record a representative sample of views from the Project Area towards the WRPA and its buffer. The GPS coordinates of all photographs were recorded using Survey 123. Written descriptions and assessments of these views and the general historic landscape character were also recorded. All accessible areas of the Project Area were visited; however, some areas along the route of the proposed OHTL were inaccessible due to the nature of the ground and/or the presence of private land.

The survey team also visited the WRPA core area. This visit was preceded and informed by a meeting with the Director for the Department of Antiquities and the Main Inspector for the WRPA, to optimise the utility of the visit. These individuals advised on the best paths to take through the WRPA and accompanied the survey team in the field. The chosen routes were those most often used by guides, visitors, and tourists today. During the visit, photographs were taken at regular intervals and from suitable locations to record a representative sample of views from the WRPA towards the Project Area. The GPS coordinates of all photographs were recorded using Survey 123. Written descriptions and assessments of these views and the general historic landscape character were also recorded.

2.3 HIA Methodology

The UNESCO HIA Toolkit (UNESCO 2022) sets out the methodology that should be used to undertake a HIA Statment for Projects that have the potential to impact a UNESCO site. Most importantly, it requires that UNESCO World Heritage Sites and Protected Areas are assessed

according to their OUV, integrity, and authenticity rather than general heritage values used for non-UNESCO sites.

2.3.1 Assessing the Significance of World Heritage Sites

OUV is a set of criteria that is used to define and assess both designated and tentative World Heritage Sites and Protected Areas, as defined by the 1972 UNESCO World Heritage Convention. To be included on the World Heritage List, properties must meet at least one of ten criteria of Outstanding Universal Value (Table 2-3) as well as UNESCO's stated requirements for authenticity, integrity, and protection and management (Table 2-4). This HIA Statement will use these criteria and requirements to assess the significance and impacts of the Project upon the significance of the WRPA.

Table 2-3. The Ten Criteria of Outstanding Universal Value

OUV Criteria	Explanation
i	The property should represent a masterpiece of human creative genius.
ii	The property should exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning, or landscape design.
iii	The property should bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living, or which has disappeared.
iv	The property should be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history.
v	The property should be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change.
vi	The property should be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance. (The Committee considers that this criterion should preferably be used in conjunction with other criteria).
vii	The property should contain superlative natural phenomena or areas of exceptional beauty and aesthetic importance.
viii	The property should be an outstanding example representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features.
ix	The property should be an outstanding example representing significant on-going ecological and biological processes in the evolution and development of terrestrial, freshwater, coastal, and marine ecosystems and communities of plants and animals; and/or
x	The property should contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of Outstanding Universal Value from the point of view of science or conservation.

Note: OUV = Outstanding Universal Value.
Source: UNESCO (2022: Box 3.1).

Table 2-4. The Requirements for Authenticity, Integrity, and Protection and Management

Requirement Type	Explanation of Requirement
Authenticity	**Authenticity** applies to cultural heritage, and refers to the degree to which knowledge and understanding of the property's heritage values are understood and believed to be credible: whether their cultural values are truthfully and credibly expressed through attributes including form and design; materials and substance; use and function; traditions, techniques and management systems; location and setting; language and other forms of intangible heritage; spirit and feeling; and other internal and external factors.
Integrity	**Integrity** is a measure of the wholeness and intactness of the natural and/or cultural heritage and its attributes: the extent to which the property includes all elements necessary to express its Outstanding Universal Value; whether it is of adequate size to ensure the complete representation of the features and processes which convey the property's significance; and whether it has been protected from adverse effects of development and/or neglect.
Protection and Management	**Protection and Management** relates to how a property's Outstanding Universal Value, including its integrity and/or authenticity, are sustained and enhanced over time.

Source: UNESCO (2022: Box 3.2).

2.3.2 Undertaking a Heritage Impact Assessment

As previously discussed, the UNESCO HIA Toolkit (UNESCO 2022) notes that the purpose of an HIA is to assess the impact that a project is likely to have on all relevant cultural heritage resources and to provide recommendations (where relevant) on how to mitigate, avoid, or reduce negative impacts to an acceptable level, in accordance with all relevant heritage legislation.

The UNESCO HIA toolkit provides helpful recommendations on how to carry out this process and suggests the assessment is undertaken using a series of steps, which are detailed below.

Step 1: Assess Significance

The World Heritage Site's Statement of OUV (as defined by UNESCO) should be analyzed to identify the property's particular values and attributes. Heritage or conservation values are defined as the reason why a World Heritage property is considered exceptional, interesting, different, or special. Its attributes are defined as those (tangible or intangible) elements of the property that convey and contribute to those values. It is recommended that the results of this assessment are tabulated for ease of reference.

Step 2: Assess Impact

The elements of the Project that have the potential to cause an impact should be listed. The likely impact of each of these elements should then be assessed with regard to each of the property's identified attributes. The quality of the impact (whether it is positive, negative, or neutral) should also be assessed. It is recommended that the results of this assessment are also tabulated for ease of reference.

An HIA Statement should also assess the characteristics of any identified impacts, including their reversibility (reversible/irreversible); longevity (temporary/permanent); degree of change (none/negligible/some/large); and, finally, the magnitude of that impact (neutral/minor/moderate/large). In accordance with UNESCO's HIA Toolkit (UNESCO 2022), the

magnitude of an impact upon an attribute of a World Heritage Site or Protected Area should be assessed in accordance with Table 2-5.

Table 2-5. Heritage Impact Assessment for UNESCO World Heritage Properties

Attributes That Convey OUV	Degree of Change (Either Adverse or Beneficial)			
	None	Negligible Change	Some Change	Large Change
	Magnitude of Impact (Either Adverse or Beneficial)			
	Neutral	Minor	Moderate	Major

Note: OUV = Outstanding Universal Value.

The HIA Statement should then undertake a comprehensive and accurate assessment of the characteristics and magnitude of identified impacts. This assessment may be limited if there are gaps within the baseline data; however, it will be as accurate and thorough as possible and based on the sum of the information available for both the area's heritage resource and the details of the project design.

Step 3: Recommend Mitigation

Where negative impacts are identified, appropriate measures should be recommended to mitigate those impacts. These recommendations should be used by the developer to revise and refine the Project design, to ensure the protection and preservation of heritage significance and compliance with all relevant heritage legislation and guidance.

The recommendation of mitigation should be conducted in accordance with UNESCO's mitigation hierarchy (UNESCO 2022) (Figure 2-1) which sets out the preference that should be given to different mitigation measures. It requires that preference always be given to measures that avoid impacts altogether. Only if avoidance is not viable should measures be recommended which (in decreasing preference) minimise, rectify, reduce, and finally offset that impact.

While this hierarchy can be used to guide the recommendation of impact mitigation at any heritage site, it is important to note that the hierarchy applies slightly differently to World Heritage Sites and Protected Areas, given their international and irreplaceable significance. While the full range of mitigation measures may be applied to other heritage sites, the HIA Toolkit requires that mitigation of impacts to the OUV of World Heritage Sites and Protected Areas is limited to the two most preferable mitigation measures (avoidance or minimisation), wherever possible. It is also important to note that the OUV of a World Heritage Site or Protected Area is considered irreplaceable and thus cannot be offset. As such, mitigation measures that propose to offset impacts are not permissible in a World Heritage context.

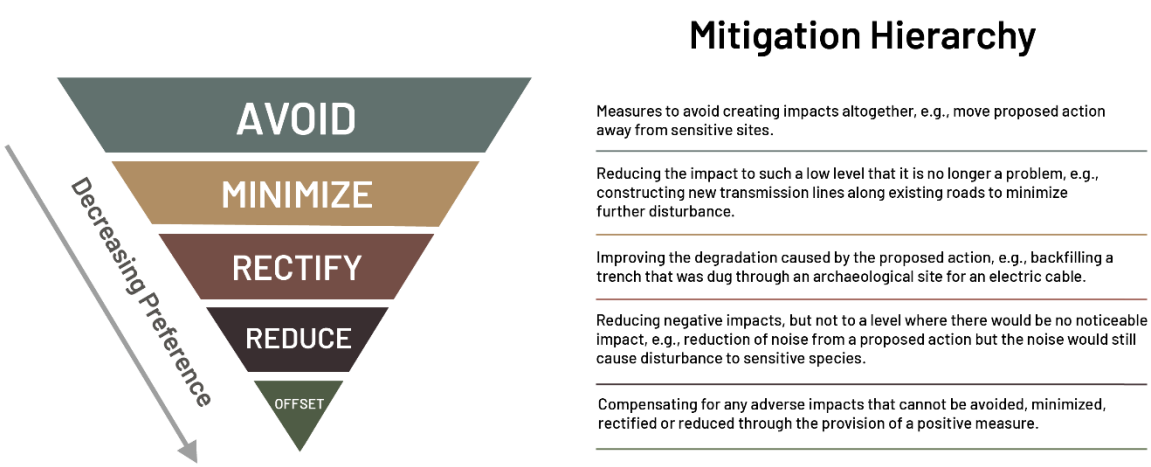

Figure 2-1. The mitigation hierarchy after UNESCO (2022: toolkit Paragraph 6.10).

Step 4: Evaluate Residual Impacts

The final stage of the HIA Statement is to assess whether any residual negative impacts–impacts that will still negatively affect heritage significance even after mitigation has taken place–remain. Those impacts should be identified, described, and evaluated. If significant residual negative impacts on the OUV of a World Heritage Site or Protected area cannot be avoided, the HIA should recommend that the Project is not taken forward.

2.3.3 Assessment Criteria for other Heritage Sites

The proposed work will take place outside the WRPA core area and partially outside its buffer zone. As such, the Project may also have an impact upon heritage assets that are not protected by the UNESCO designation. Impacts to these heritage assets will nevertheless be assessed in accordance with the UNESCO methodology and guidance described above. This is to ensure consistency across the assessment. This will also ensure that, if the enlarged buffer zone of the WRPA (as proposed by ASEZA) is approved by UNESCO, the assessment will still apply.

The only difference between the assessment methodology for non-UNESCO and UNESCO sites will be the matrices that are used to assess heritage significance and impacts (Steps 1 and 2). For non-UNESCO sites, the heritage significance and impact assessment matrices shown in Table 2-6 and Table 2-7 will be used. The use of two different heritage impact assessment matrices reflects the difference in heritage significance between UNESCO and non-UNESCO sites.

Table 2-6. Cultural Heritage Site Significance

	Low Importance	Moderate Importance	Major Importance
Site Type			
Archaeological Site	Limited information value and/or cultural significance based on	Moderate informational value and/or cultural significance based on	High informational value and/or cultural significance based on

	Low Importance	Moderate Importance	Major Importance
	content and condition of site.	content and condition of site.	content and condition of site.
Historic Monument	Limited visual, commemorative or art historical interest based on architectural style or degree of preservation.	Moderate visual, commemorative or art historical interest based on architectural style or degree of preservation.	High visual, commemorative or art historical interest based on architectural style or degree of preservation.
Site with Intangible Heritage Value	Limited cultural or religious significance to site users based on user criteria.	Moderate cultural or religious significance to site users based on user criteria.	High cultural or religious significance to site users based on user criteria.

Table 2-7. Heritage Impact Assessment Matrix for non-UNESCO sites

Significance of Heritage Asset	Magnitude of Impact (either adverse or beneficial)				
	No Change	Negligible Change	Minor Change	Moderate Change	Major Change
Exceptional* (Category A)	Neutral	Slight	Moderate/Large	Large/Very Large	Very Large
Considerable (Category A)	Neutral	Slight	Moderate/Slight	Moderate/Large	Large/Very Large
Some (Category B)	Neutral	Neutral/Slight	Slight	Moderate	Moderate/Large
Low (Category C)	Neutral	Neutral/Slight	Neutral/Slight	Slight	Moderate/Slight

*Excluding UNESCO World Heritage Properties

2.4 Stakeholder Engagement

Stakeholder engagement has been undertaken (see Social ESIA chapter) where there were only two issues raised. One issue concerned the visual impact of the OHTL; the second issue concerned the project's potential impact upon an endurance horse racing event held every November under the patronage of the Royal Equestrian Federation at Al-Shakeriyah. The visual impact of the OHTL has been addressed in Section 5 of this report. The construction program will avoid any activities associated with the horse racing event.

Additionally, the ASEZA representative for UNESCO requested that a CFP is implemented and that all ground breaking activities are monitored by archaeologists for chance finds.

3 Heritage Baseline

3.1 Environmental Background

The Project Area occupies a hyper-arid desert margin defined by sandstone cliffs and granite outcrops transitioning into sandy and gravel plains of the Hisma Basin (Avni 2017; Jobling & Tangri 1991). The topography features sandstone mountains in the Project Area, Jabal Ramm is located between 1,112 and 1,199 meters above sea level (m asl). and Jabal Umm-Ishrin, which is located

between 1,017–1,266 m asl (Cordova et al. 2014). Soils are shallow over bedrock, frequently fractured sandstone with alluvial infills in seasonal wadis (Alhejoj & Salameh 2023; Bender 1975). Topography alternates between steep ridges and undulating plains shaped by millions of years of erosion, forming natural arches, inselbergs, bridges, and deep, narrow gorges (Goudie et al. 2002; Jawabreh et al. 2025).

3.1.1 Climatic Setting

The climate is characterised as arid desert cold (BWk) according to the Köppen-Geiger climate classification (Beck et al. 2018). The region has annual temperatures of 20-40°C, with summer temperatures reaching 45°C, and with mild winter temperatures reaching a minimum 2°C in January (Jawabreh et al. 2025). Rainfall is minimal, and ranges between 30 and 50mm per year, which mainly occurs between November to March and April to May (Tarawneh & Kadıoğlu 2003). Rain events are generally intense but briefly producing flash flooding in wadis, sustained soil moisture is uncommon (Armon et al. 2018; Tarawneh & Kadıoğlu 2003). High diurnal temperature variation is typical (Freiwan & Kadioglu 2008; United Nations Development Programme [UNDP] 2020)

3.1.2 Geological Setting

This area lies within a transitional zone between the Precambrian crystalline basement rocks of the Arabian Shield (granite, gneiss, metamorphic rocks) and the sedimentary formations of the Hisma Basin (Brown et al. 1989; Al-Homoud et al. 1995). Geological mapping indicates that the Shield underlies much of the higher elevation outcrops and ridges near the western edge, whereas to the east and north the stratigraphy transitions into sandstones, limestones, and alluvial deposits associated with the Hisma sedimentary basin (Al-Homoud et al. 1995, 1996; Jawabreh et al. 2025; Wilkinson 2003).

The geology of the Project Area consists of the oldest rocks in Jordan, which belong to the Aqaba Complex, which consists of plutonic granitoids, metasediments, metavolcanics, and plutonic dikes (Bender 1975; Abdelhamid 1990). Overlying the granite rocks are the Ram Group sandstones, which are of Cambro-Ordovician age (Abdelhamid 1990), and are subdivided into four sedimentary formations:

- Salib Arkosic Formation
- Umm Ishrin Formation
- Disi Sandstone
- Umm Sahm Sandstone Formation.

The Umm Ishrin Sandstones are characterised by their high iron content and are resistant to weathering, forming steep vertical cliffs that characterise the Wadi Rum sandstone landscape (Jawabreh et al. 2025). The sandstone sequence thickens to the east due to the dipping direction of the underlying Aqaba Complex. The permeable sandstones of the basal Salib Formation overlying the impermeable granites of the Aqaba Complex create an underground aquifer system (Mahasneh no date). This geological structure allows groundwater to flow eastward, emerging as natural freshwater springs along mountain slopes (Cordova et al. 2014, 15).

Small wadis flow across alluvial fans into endorheic basins, forming temporary shallow water bodies known locally as *qa'*, which contain fine sediments dating to between 10,000 to 2,500 years ago (Cordova et al. 2014, 22). Low-lying areas form lacustrine deposits formed in depressions where rainfall collected, influenced by basin topography and localised precipitation. The foothills are

covered by scree deposits from the steep-faced cliffs, along with remnants of alluvial fan deposits and sand ramps (Cordova et al. 2014, 16). Aeolian features such as barkhan dunes, climbing dunes, and echo dunes are found, and are present in the Khur al-Ajram Valley, located to the south of Wadi Rum (Cordova et al. 2014, 16).

The geological setting of the AOI is discussed in more detail within the ESIA.

3.1.3 Hydrology and Vegetation

Hydrological features are limited to ephemeral wadis, occasional springs or seepage zones, and cliff base runoff (Alhejoj & Salameh 2023; Wilkinson 2003). During the Late Pleistocene, a palaeoriver ran north to south between the sandstone mountains fed by several wadi tributaries draining from Jabal Ramm (Cordova et al. 2014, 26). In the early Holocene, the Wadi Rum area had several smaller wadi systems and springs surrounded by denser vegetation (Cordova et al. 2014, 26). As the climate dried from the middle to late Holocene, aeolian processes predominated, forming areas of mobile sands and areas of extensive *qa'* deposits (Cordova et al. 2014, 26).

Vegetation in Wadi Rum is sparse but highly adapted to the harsh arid conditions. Dominant plant life forms are short shrubs and xerophytic bushes, including *Haloxylon persicum, Retama raetam, Anabasis articulata, Tamarix spp.,* and annual herbaceous species where moisture allows (von Löwenstern et al. 2000; Taifour et al. 2022). Vegetation is primarily concentrated in microhabitats, like wadi bottoms, spring margins, and run-off catchment zones (Al-Eisawi 2005, 2012).

Faunal presence is adapted to the arid environment. Mammals are mostly crepuscular or nocturnal (Amr 2012). Reptiles and small birds exploit cliff faces and shrub patches (Anderson 2001; Modrý et al. 2004; Pola et al. 2020). The environmental constraints effectively limit human habitation to transient, pastoral activity (Jones et al. 2016). The geology, substrate, plant cover, and sparse water availability combine to produce a harsh environment in which cultural heritage sites tend to cluster around springs, comparably stable substrates, and accessible rock faces.

This unique geological and environment has influenced heritage preservation and use in the area of Wadi Rum (Rech et al. 2017). For example, the natural sandstone outcrops serve as primary surfaces for rock art and inscriptions, offering durable, elevated storage for petroglyphs. Sedimentary areas of the Hisma Basin provide sites for seasonal settlement, grazing, and movement, given their flatter terrain and availability of water during episodic rainfall (Jawabreh et al. 2025). The contrast in substrate hardness, soil cover, and topography also affects visibility of heritage features, erosion risk, and accessibility..

3.2 Archaeological and Historic Background

3.2.1 Early Prehistoric, Chalcolithic, and Bronze Age

During the Lower Paleolithic there is limited evidence for human occupation in Jordan. Surveys in the al-Jafr basin, which is along the path of the Project, have identified a number of sites in the vicinity of a paleolake that would have provided a rich lacustrine environment for human occupation (Quintero & Wilke 1998). Finds in the area include Acheulian hand axes that connect the area to other sites with similar materials in the broader Levantine area (Rollefson et al. 2005). During the subsequent Middle Paleolithic, there is more evidence for the continued occupation of lacustrine zones in eastern Jordan (Kadowaki et al. 2021; Cordova et al. 2013). Well documented sites in the Jebel Qalkha area highlight that populations in that time likely engaged in transhumant behavior that included activities in the Hisma Basin, the Ma'an plateau and the Wadi Araba (Henry

1995; Kadowaki & Henry 2019), including areas that will be traversed by the Project. During the Upper Paleolithic site locations are noted across a wide geographic area that includes many sites in eastern, arid areas within Jordan (Henry 1995). In Jordan surveys have identified Upper Paleolithic sites in the area or Azraq, Wadi Hasa and Jebel Qalkha (Coinman 1997). The sites now include what are thought to have been lacrustrian environments, but also desert, marsh and steppe. The principal stone tool tradition of this period, Ahmarian, is predominantly blade oriented and likely reflects the ecological variability of habitation areas utilised during this period. Into the Epipaleolithic there is more variety in tool traditions that exist contemporaneously both inter- and intra-regionally (Olszewski 2001). That variability in reduction sequencing suggests that there are different culturally determined practices that develop during this time and are reflected in the choices of raw material sourcing as well. Towards the end of the Epipaleolithic, with the onset of the warmer and more humid Bølling-Allerød interstadial, a large core area of Early Natufian settlement has been evident beyond the Medditerranean zone to include Eastern Arid areas that will be impacted by the Project and also included more sites in the highlands that were likely occupied year round (Henry 1995; Richter et al. 2017). This was a result of an increased reliance on the production of foodstuffs from cereals and the progression towards formal agriculture.

The end of the Paleolithic and the start of the Neolithic is marked by end of the dry Younger Dryas leading into the wetter start to the Holocene period (Stein et al. 2025). That environmental shift is thought to have have facilitated the development of more permanent settlements that relied more heavily on agricultural production as a mode of subsistence. In Jordan, the overall range of sites contracts during the first stage of the Neolithic, the Pre-Pottery Neolithic A, where only a few settlements are known from the period: el-Hemmeh, WF16 and Zahrat adh Dhra 2 (Finlayson et al. 2024). During this period there is evidence for new forms of free-standing architecture and the start of the exploitation of domesticated animal resources (Finlayson et al. 2014). The increased reliance on both horticultural and agricultural products also led to an greater investment in settlement construction, which required significantly more maintenance and planning.

The subsequent Pre-Pottery Neolithic B (PPNB) is marked by the appearance of larger settlements spread over a larger area that include features of intra-site ranking. In Jordan important PPNB sites include Ayn Ghazal, Basta, Baj'a and Beidha (Rollefson 2001). At smaller sites like Ayn Abu Nukhayla, in Wadi Rum, very close to the Project route, there is clear evidence for differentiation of space for both household and community activities related to the processing of agricultural materials (Portillo et al. 2009). The changes the structure of domestic space are also noted in other aspects of daily life, including the advent of complex systems of exchange and highly symbolic behavior (Ibáñez et al. 2016; Simmons & Najjar 2006; Rollefson 2001, 1992). Additionally, forms of settlement appear in the arid periphery that distinguishes that area from less arid regions in the western part of the country. Long term research, especially in the Jafr Basin, which will be passed by the Project, has produced enough data to support alternative chronological systems for the arid peripheries beginning in the PPNB (Rosen 2025; Fujii 2013). At these arid sites transhumant pastoralism was likely practiced, along with intensive hunting and limited horticulture (Fujii 2013; Abu Azizeh et al. 2021; Nadel et al. 2024). Over the course of the Neolithic burial monuments become the primary archaeological remains from populations living in these arid areas as the range of movement of pastoralists increases (Rollefson 2011). The larger sites traditionally associated with the PPNB settlement pattern are eventually abandoned in favor of resettlement at other sites in new locations and at a smaller scale compared to the sites of the PPNB (Rowan & Golden 2009). The period that follows, the Pottery Neolithic, is generally not well documented except for isolated sites primarily in the northern Jordan Valley (Rollefson 2001).

In Jordan the majority of settlement during the Chalcolithic has been noted in the Jordan Valley. The most important site in the cluster of sites within the valley is Teleilat Ghassul, for which the Ghassulian lithic tradition is named (Bourke 2002). A key debate for this period is whether there is evidence for social stratification between sites with the primary mechanism for determining that being access to exotic resources or technology (Rowan & Golden 2009). The most prominent of these models is the control of copper production by sites in the Beer Sheva valley using copper extracted from the Faynan region in Jordan (Levy 1998). There is also evidence for nascent copper production outside of that framework at the end of the Chalcolithic in the region of Aqaba, 8km from the path of the project, at the sites Tall Hujayrat al-Ghuzlan and Tall al-Magass (Klimscha 2010). In the eastern desert areas of Jordan, including areas traversed by the Project, there is a continued progression towards true pastoral nomadism with new forms of burials cairns appearing on the landscape (Fujii 2013). This is evident in the Wadi Hisma region where there is evidence for connections to Sinai and the Negev in the form of a Timnian lithic tradition as distinct from the Ghassulian that dominates the main areas of settlement during the Chalcolithic (Henry 1995). Further to the east, in the more arid area, a second, distinct form of desert kite is more common and likely used by a population of mobile hunter-gathers (Nadel et al. 2024). The transition from the Chalcolithic into the Bronze Age is marked clearly in some regions with the abandonment of sites very well defined and only noted as a gradual change in other regions esepcially the more arid areas (Rowan & Golden 2009). Many of the larger sites, like Teleilat Ghassul, are gradually abandoned and smaller peripheral sites, like aforementioned Tall Hujayrat al-Ghuzlan and Tall al-Magass are continuously occupied into the start of the Bronze Age.

The key distinction between the settlements of the Chalcolithic period and the Bronze Age is the development of more clearly defined urbanised characteristics at Bronze Age sites. During the earliest period of the Bronze Age there is a small Egyptian colonial incursion into the southwestern Levantine region which likely would have been an important point of contact for economic activity for the Timnian pastoral populations in the southern Arid periphery (Yekutieli 2005). Around the time that the Egyptian incursion receded agglomerated settlements began to appear throughout the region, concentrated in areas with greater rainfall (Chesson 2018). In Jordan, major sites from this period include Bab edh-Dhra, Tell Iktanu, Tell el-Hammam, and Khirbet al-Batrawy (Rast et al. 2003; Prag 1991; Nigro 2012, 2015). In general, thse sites have evidence for fortifications with elements of urban planning. Additionally, some have structures that have been described as “palaces” where elite goods like copper were likely being used as symbols of power (Nigro 2015). The major source of copper during this period being the region of Faynan in southern Jordan, where operations were likely facilitated by transhumant pastoralists (Gidding 2023). The copper trade was likely part of a larger trade network that involved pastoralists based in the arid eastern periphery including the Jafr Basin, which will be traversed by the Project, and also included specialised lithics and ground stone during the terminal phase of the Timnian (Fujii 2011, 2013; Abadi & Rosen 2008). This trade network collapses around the time of the 42,000 BP event (a period of climatic shifts culminating in cultural change and extinction events) leading to another period of relatively small scale settlement (Kaniewski et al. 2018).

New and better-defined forms of urbanism arise during the subsequent Middle and Late Bronze Ages. During this period of time the evidence for occupation in the arid periphery generally disappears and does not return until the start of the Iron Age. The location of settlement in the region moves primarily towards the Jordan Valley with access to long distance exchange routes based around the Mediterranean being very important. One of the most important sites for this trade was Pella which became a “gateway” community that connected various parts of the region (Knapp 1993).This is supported by the presence of people from the larger Western Asia region in burials within the site (Stantis et al. 2022). In general during the later part of the Bronze Age the

focus of settlement appears to be part of a developing Mediterranean exchange network with Egypt being the most important partner for Levantine sites (Cohen 2017). During this period there were multiple incursions by Egyptian pharaohs that were interested in the exploiting resources from the city-states that had formed along the Levantine Corridor, largely ignoring the arid periphery (Strange 2004). As a result Egyptian artefacts are commonly found in palatial centers of the larger cities of the time including Pella and Tall as Sa'diyya (Strange 2001). The major documented exception to the ignorance of the arid periphery was under the rule of Ramsses III, at the end of the Late Bronze Age, who led an incursion through southern Jordan en route to sites in Northwest Saudi Arabia likely to take advantage of copper resources in that area (Sperveslage & Eichmann 2012). The Bronze Age Mediterranean koine collapsed around 1150 BCE and in the subsequent Iron Age, a number of smaller, locally ruled kingdoms replaced the large polities that dominated the end of the Bronze Age.

3.2.2 Iron Age, Hellenistic and Nabataean Periods

Following the collapse of the Late Bronze Age Mediterranean koine, three kingdoms eventually emerge within Jordan: Ammon, Moab, and Edom. Preceding the formation of those kingdoms in approximately the ninth century BCE, much of the settlement during the Iron Age is characterised by small domestic residences with large fortifications, but lacking much evidence for strong centralised authority (Porter 2013). Most of the early Iron Age settlements appear to be discontinuous from settlements of the Bronze Age and primarily located above the Wadi Hasa (Herr 2013). One exception for this is located in the area of the Wadi Faynan where a large copper industry developed with likely antecedants in the pastoral groups that occupied the arid periphery through the Bronze Age (Levy et al. 2008; Liss et al. 2020). During the ninth Century BCE more concrete evidence for the development of the three main kingdoms of Jordan appears, but in many places the evidence is fragmentary due to the Iron Age occupations being covered by later ones. Key features include fortifications, monumental buildings and gates (Porter 2018). The northern most kingdom was Ammon with the notable sites of Safut, Amman, Sahab, Tall al-Umayri, Tall Jawa, Hesban, Madaba, and Jalul (Younker 2013). Moab was located around the Wadi Mujib and included the sites of Dhiban, Tell Madaba, Khirbat al-Mukkhayat, and Hesban (Steiner 2013; Porter 2018). Edom was located in the southern arid periphery and the most important sites include Tawilan, Busayra, and Umm al-Biyara (Bienkowski 2013). Additionally, there is the enigmatic Red Sea port site of Tell el-Kheleifeh, near modern day Aqaba, which is assumed to have been connected to the Edomite kingdom although determining a political affiliation is difficult (Pratico 1985; Bienkowski 2013). During the seventh century BCE the Assyrian Empire asserted control over much of Jordan with many sites showing Assyrian influence in the spatial organisation of palaces (Strange 2004). Towards the end of the ninth Century the Babylonians briefly controlled the region before the Persians defeated the Babylonians and took control of administering the former Babylonian Empire. Through that turbulence the general settlement pattern of the region tends to favor the coast, with less evidence for large occupations within Jordan (Lehmann 2013). Nevertheless, there is evidence for continuity of settlement at some of the previous administrative centers, including Tall Saidiyya, Tall al-Umayri, Tall Jalul, Drayat and Busayra (Bienkowski 2001). The Persian period ended with the conquest of Alexander the Great, and new Hellenistic cities appeared in the north highlighting discontinuity of settlement between the Iron Age and the subsequent periods.

Following the conquest, in 332 BCE, and death of Alexander the Great, in 323 BCE, northern Jordan fell under the control of the Ptolemaic Dynasty in Egypt. However, the area was contested by the rival Seleucid Dynasty, and the six "Syrian Wars" were contested between 274 and 168 BCE, after

which the Seleucid Dynasty was able to extend control as far south as modern Amman. However, the Seleucid Dynasty weakened shortly afterwards which created a power vacuum that was filled by other political entities: the Hasmoneans and the Nabateans. The political instability is one likely factor for a general lack of data regarding settlement in Jordan in association with Hellenistic rule. Additionally, the cities that would form the Decapolis administrative district were remodeled during later Roman rule and very little of their Hellenistic layers remain. There are written references to Gadara (Umm Qays), Gerasa (Jerash), and Philadelphia (Amman) suggesting the presence of administrators managing small scale fortified settlements during this time (Berlin 2003). However, the absence of evidence for extensive settlement in the hinterlands suggests that there was an overall decline in population during this period.

In contrast, in southern Jordan the evidence suggests that what eventually becomes identified as Nabatean civilisation is in its nascent stage. The first mention of the Nabataeans is by Diodorus Siculus, describing an attempt by Antigonos Monopthalmus to conquer the Nabateans in 312 BCE. Recent excavations in Petra have focused on examining the occupation during the period of Ptolemaic rule and has identified pre-Hellenistic material (Graf et al. 2022). The excavations in Petra identified Early Hellenistic foundations for architectural features and coins linking the site to third-century BCE occupations in northwest Saudi Arabia and imitations of Athenian bronze tetradrachms. This suggests that from its establishment, Petra was an important trading center connecting distant regions. However, the material culture that archaeologists have historically associated with the establishment of Nabatean identity is not widely noted until the first century BCE when it is assumed that the Nabateans began to establish more permanent infrastructure to maintain their control over trade networks (Schmid 2008). The initial lack of strongly identifiably Nabatean material culture might be a reflection of how Nabatean political authority evolved, developing as a series of tribal alliances held together by a dynasty centered at Petra (Graf 2004). This is echoed by the epigraphic evidence in important hinterland areas such as the Hisma desert. There Hawāra (Humayma) was established, potentially as an necessary agricultural support for the important port of Ayla (Oleson 2010; Twaissi 2007). In the surrounding area there are thousands of inscriptions in Hismaic that denote servitude to Nabatean rulers and deities. Many of the wadis where these inscriptions have been noted in survey are adjacent to the planned route of the Project. Alongside those inscriptions, but in fewer numbers are comparable Nabatean Aramaic inscriptions indicating Hismaic speaking tribes fit into the larger Nabatean political framework (Corbett 2012). While there is no convincing evidence that the Nabateans were descendants of the previous Edomite state that occupied the same region, they do appear to have adopted or co-opted some local traditions. The integration of local traditions was likely a key factor that enabled their ability to control the hinterland areas.

During the first century BCE Nabatean rulers expanded their authority through the construction of caravanserais and forts protecting major trading routes that likely traversed the area of the Project. Important components of those construction projects included the development of cisterns and aqueduct systems to support the settlements (Graf 1983; Oleson 1997). A secondary component was the integration of Arab tribes into Nabatean cultic practices through the placement of shrines in locations that were already connected to Arabian deities. For instance, the temple complex at Wadi Ramm, just south of the Project, was built over a previous temple complex dedicated to the Arabian goddess Allāt (Tholbecq 1998). In other instances it has been hypothesised that Nabatean shrines exhibit cultic practices autochthonous to the region as part of long-standing religious practices for the pastoralists of Jordan's arid periphery (Tebes 2020). At other temples, like the one at Hawāra (Humayma), the Nabateans appeared to have worshipped local or Nabatean gods, potentially contemporaneously (Corbett 2012). During the first century BCE and first century CE the Nabateans were able to maintain nominal independence from the Roman

Republic and Empire despite increased Roman interest in the region. However, in 106 CE the Romans took control of the Nabatean Kingdom with the only contemporary account citing that the Roman governor of Syria subdued the Nabateans (Kennedy 2004). The Romans had already begun to establish Bostra in southern Syria, as a new trading center and Bostra was designated as the provincial capital of Roman Arabia.

3.2.3 Roman and Byzantine Periods

During the initial period of Roman control of Jordan much of the area experienced an expansion of settlement as a result of general prosperity. Once Jordan was fully under Roman control the cities of the Decapolis such as Gadara (Umm Qays), Gerasa (Jerash), and Philadelphia (Amman) began to thrive and expand though major construction projects (Freeman 2001). One of the first major projects to be completed was the construction of the *Via Nova Traiana* as a new road connecting Bostra to Aila near modern day Aqaba, near the southern end of the Project area. This roadway effectively bypassed Petra, beginning the decline of the city. At the same time, the Romans co-opted the preexisting network of forts and defensive stations along roadways that had previously been used by the Nabateans to protect trade routes (Corbett 2012). This is reflected at sites like the shrine at Hawāra (Humayma). There Roman soldiers deliberately disrupted its traditional use only to rebuild the shrine incorporating both Roman and local traditional elements (Reeves 2019), as well as a large fort. Other sites along the *Via Nova Traiana* that had small Nabatean origins were greatly expanded after the extension of Roman control (Al-Muheisen & Villeneuve 2005). Further to the east, the Roman army invested significant resources establishing and maintaining camps in the arid zone of Jordan in connection with trade routes to Arabia (Fradley et al. 2023). The Romans also reopened the copper mines in Faynan, likely using slaves to process the raw material with the support of a strong military presence (Hauptmann 2007; Kennedy 2004). This was the most intense phase of copper production recorded in the Faynan area; excavations at Aila, near the southern end of the planned Project area, suggest that much of it was being exported through that port (Parker 1997). The extraction of raw material was so great that there is evidence for copper production also occurring in the area of the port itself. A large earthquake in 323 CE disrupted many settlements and required large rebuilding projects but also marks the beginning of a period of decline into the fourth century CE.

The start of the Byzantine period is marked not by local political changes but by changes in the broader organisation of the Roman Empire. In 324 CE Constantine I moved the capital of the Roman Empire to Constantinople and ended the persecution of Christians. Over time the transition to a Christiane state brought more attention to the broader Levantine region due to its connection with Christian history. The important Hellenistic cities again saw a revival and expansion with church building being a key component (Watson 2001). Further afield, in mining area of Faynan, Eusebius notes the mines as a site of martyrdom for Christians who had been sent to work as slaves. In the rural areas to the north, near the modern border with Syria many sites exhibit signs of relative prosperity through the construction of churches with finely crafted mosaics (Rose et al. 2007). Other sites, including Umm al-Jimal, Umm el-Rasas, and Rihab, were located along important trading routes and also appear to have functioned as important sites of hospitality for pilgrims visiting the area (Al-Shorman et al. 2017). The increase of settlement in the hinterland during the Byzantine Period was supported by favorable climatic conditions, which saw an increase in mean annual precipitation during the Byzantine Period (Izdebski et al. 2016). However, in the southern peripheral areas there appears to be a general decline in population density compared to the previous periods (Watson 2001). This is connected to changes in the organisation of trade as noted by the continued decline of Petra as a major urban center and an increase in

smaller agricultural settlements in the hinterland (Kouki 2009). While churches were constructed at the site Petra's overall footprint is considerably smaller compared to its height at the end of the Nabatean Period and various natural disasters, especially earthquakes, are suspected to facilitated the city's decline (Jones 2021). Over time Byzantine control of the region weakened and threats from Persia and eventually northern Arabia led to the end of Byzantine control of the region.

3.2.4 Early Islamic to Ottoman Periods

Byzantine control over Jordan ended after the Muslim conquest succeeded in 636 CE. The first major caliphate of the Islamic period was the Umayyad Empire, the capital of which was Damascus. One of the key features of Umayyad rule was the establishment of *qusur* or "desert palaces" in the remote areas of Jordan. These structures were built to establish control over key trade routes that extend from northern Jordan southwards, creating three arteries for transit, distinct from the routes established in previous periods (King 1987). The two most important routes followed the Wadi Sirhan to the southeast and the other closely follows the route of the future Hejaz Railway with important stops at Humayma and Aqaba (Ayla). The *qusur* were carefully placed in order to take advantage of perennial water sources and to better monitor and control transhumance through the area (Alhasanat et al. 2012). A powerful earthquake in 747 CE caused widespread destruction; it has even been argued that this event was a contributing factor for the end of the Umayyad Empire in 750 CE. The historical narrative suggests that the Abbasids launched their campaign to overthrow the Umayyads from Humayma, although did not make any efforts to invest in their former home (Schick 2007). Instead, the Abbasids established their capital in Baghdad, which may have marginalised Jordan during their reign. This view has been contested, however, based on archaeological evidence at a number of sites in Jordan, including Gadara (Umm Qays), Gerasa (Jerash), and Philadelphia (Amman), that show continuity of occupation (Whitcomb 1992). While the *qusur* were abandoned, the local economy seems to have been reoriented to focus on the Jordan and Araba valleys and agricultural production.

The Fatimids of Egypt briefly succeeded the Abbasids in 969 CE. With the move of the imperial capital to Cairo, Red Sea trade became more important and thus so did the port city of Ayla (Walmsley 2001). However, beginning 1096 CE the Crusader invasions began and set up a kingdom centred around Jerusalem. In Jordan the Crusaders established a series of castles, most notably at Kerak and Shobak. However, the period is relatively poorly understood archaeologically due to a paucity of data. This issue is amplified by the lack of ceramic material that is tied to a narrow chronological period and the ubiquity of Hand-Made Geometrically Painted Ware, which lacks tight chronological control (Walmsley 2001). The crusaders were defeated in 1187 CE by the Ayyubid Caliphate who were followed by the Mamluks. During the period of Ayyubid and Mamluk rule there were considerable efforts to rebuild the region. Unlike in previous periods, the old Hellenic Decapolis cities no longer featured as civic or political centers and the rulers instead chose to build upon the established fortresses at Kerak and Shobak (Milwright 2006). The government utilised that military infrastructure to support trade and pilgrimage through the region on routes that would cross the planned route of the Project. Especially during the Ayyubid period the archaeological evidence supports a sense prosperity through the expansion of rural production with the support of the government (Jones 2018). This placed Jordan as an important center for agricultural production of cash crops like indigo and sugar until the end of Mamluk Caliphate. The emphasis of Ayyubid and later Mamluk control on the maintenance of primarily military installations highlights a progressive change of the settlement pattern from larger urban settlements to a predominantly agricultural or rural settlement pattern.

The Ottoman Empire took control of modern Jordan following their expansion southwards between 1516 and 1517. The main interest of the Ottomans in the region of Jordan was the maintenance of the Hajj route (McQuitty 2001). Instead of utilising the infrastructure of the Mamluks, the Ottomans set up a new hajj route with their own unique design of fortress to the east of the main trade routes used by the Ayyubid and Mamluk rulers (Petersen 2008). A total of ten fortresses were built within the borders of modern Jordan utilising a unique square design some of which are located along the planned route of the Project. Examples include Qasr al-Dab'a, Qasr Qatraneh, and Qal'at Hasa. Archaeologically, the data for the Ottoman Period is relatively sparse but the general trends highlight a transition towards more household level production and fewer imported wares within stratigraphically defined assemblages (McQuitty 2001). This suggests the decreased importance of Jordan as a component of long-distance exchange networks. Later, in 1908, the Ottomans constructed the Hijaz Railway to connect Damascus to Makkah. The path of the railway also was moved west from the initial hajj route established with the square fortresses. Initially built to facilitate pilgrimage, it later also became an important conduit to move Ottoman armies and supplies during the First World War. As result the railway was a frequent target of attack by the Arab tribes fighting with the British against the Ottomans.

3.2.5 Modern and Contemporary Periods

Following the defeat of the Ottomans during World War I the British set the borders of modern Jordan and assigned Abdullah I Emir of Transjordan. Transjordan officially attained independence in 1946 with Abdullah the first King of the Hashemite Kingdom of Transjordan. One of the unique elements to the formation of the Jordanian state was its integration of Bedouin tribal interests directly into the central government (Alon 2006). As a result, the interests of the Bedouin tribes have played an important role in the organisation of Jordanian society and politics ever since and formed an important part of Jordan's national narrative. The Bedouin themselves generally see themselves as connected to the land that they inhabit and the cultural traditions that stretch back thousands of years and are evident in the landscape (Abu Hamdan & Mason 2025). That connection to the land had led to modern Bedouin traditions integrating elements of antiquity into modern day practice.

A key component of the landscape includes the tens of thousands of inscriptions and rock art that decorate the arid periphery. It has been documented that Bedouin directly interact with ancient rock art as a part of establishing territorial rights and concepts of land tenure (Eisenberg-Degen et al. 2016). The rock art and other markings recall past travelers, events and traditions common in the common narrative of Jordan's arid periphery. This is illustrated by the reuse of cairns that include various types of inscriptions and mark the landscape, in some cases over thousands of years (Kennedy 2012). One concrete example includes a motif that depicts past events with connections to continued traditional cultural expressions are the depictions of musicians with Safaitic inscriptions (al-Manaser 2018). These indicate a tradition of continued expression of ancient rituals into modern Bedouin customs that continue to be practiced (Alghazawi & Al-Manaser 2024). These continued interaction with the past highlights how modern Jordanian society continues to directly engage with the thousands of years of heritage remains present within the country.

3.3 Historic Land Regression

No available historic cartographic sources were identified for the AOI. However, map regression satellite imagery, freely available from Google Earth, was consulted to determine how the AOI has changed over time. The imagery was also used to identify any historic land use patterns or areas of

cultural significance that might be relevant to the assessment. Given the difficulty associated with depicting the full range of available historic satellite imagery across the wide-reaching Project Area, the satellite images are not reproduced here; nevertheless, a description of the developments they demonstrate across the years is provided below.

The earliest available satellite imagery for the area is from 1984 and demonstrates that the area of the WRPA, as designated in 2011, appeared much as it exists today—largely undeveloped and natural in character. By 1984, within the wider surrounding area, Highway 47 already exists and can be seen running north-south outside and to the west of the WRPA. The east-west road across the WRPA's northern buffer zone also already exists by 1984, although it was likely more informal at the time and has since been improved and possibly enlarged.

A small settlement was also already in existence at Disi by 1984, accompanied by an associated agricultural area to the east which is characterised by large rectangular fields and/or plantations. Otherwise, the area around the WRPA presents as a largely undeveloped area of natural desert and rocky outcrops in 1984. Considering the large size and regular, rectangular shape of these agricultural areas, it is likely this activity is modern in origin; there is nothing in particular to suggest that the use of this area for agriculture has more ancient origins. The founding date of the village of Disi is uncertain.

By 1986, agricultural exploitation to the east of Disi has expanded. This expansion include the introduction of a number of large, circular agricultural fields to the east of those already in existence. These fields intrude minimally into the eastern end of the WRPA's buffer zone. Such circular fields require, and are reflective of, the use of modern irrigation methods. Between 1986 and the current day, one then witnesses the gradual growth of Disi village and further proliferation of agricultural areas to the east, as well as the development of a festival or event ground to the southeast of Disi village. Various tourist camps also appear across the landscape, within and around the WRPA, although these are difficult to discern within the satellite imagery, given their small size.

Development within and around the west of the WRPA buffer zone appears slightly later. The first agricultural areas in and around the west of the WRPA buffer zone can be seen to appear by 1986, with no clear indication for the exploitation of this area for agriculture before this date. These new agricultural areas present as relatively small, rectangular fields and/or plantations. These agricultural areas proliferate gradually between 1986 and the present day. The first clear evidence for settlement at Rashidyah (at the very western end of the Project Area) appears in 2004, while the existing PV plant within the northern WRPA buffer zone was constructed in 2017. The satellite imagery is not sufficiently clear to determine when the railway and associated train station, that now runs through the WRPA's northern buffer zone, was established. However, this has been determined from other sources and is described within 3.4.3 of this report.

To conclude, the available satellite imagery indicates that the WRPA and its surrounding area have historically been predominantly characterised by natural processes and devoid of any large-scale cultural developments. This situation is likely to have changed only relatively recently with the introduction of the PV plant (in 2017), the modernisation of Highway 47 (unknown date), and the introduction of several OHTLs (unknown date, as they cannot be discerned on the satellite imagery). Although Disi village, some roads, and agricultural activity have been present across and around the north of the WRPA's buffer zone since at least 1984, there is no good evidence to indicate that these land uses have any historical pedigree or were present before the modern period. While Wadi Rum retains great cultural and heritage significance (as discussed further below), no distinct areas of cultural significance are identifiable from the satellite imagery alone.

3.4 Known Heritage Assets

3.4.1 Wadi Rum Protected Area

WRPA is a UNESCO World Heritage site combining remarkable geological landscapes with a rich cultural legacy extending over some 12,000 years for its in inclusion in the OUV. Among its most significant heritage assets are the vast numbers of rock inscriptions and petroglyphs, cultic and temple remains, and associated sites of human settlement and spiritual significance. These assets illuminate the evolving relationship among pastoralism, sacred practice, script and art, and human movement across desert terrain.

The UNESCO technical documentation notes that, although many of these assets are known and catalogued, there is no comprehensive, up-to-date conservation database covering all inscriptions, petroglyphs, and archaeological sites. Some key monuments (e.g., the Nabatean temple) are in only fair condition and lack regular maintenance. The landscapes and visual settings of many rock-art sites are vulnerable to erosion, vandalism, and infrastructure or tourism pressure. Key important sites in the WRPA are summarised in .

Table 3-1. Summary of Important Sites in the WRPA.

Site Name / Description	Period / Attribution	Protection Status	Excavation Status	Notes
Temple of Allat (Nabataean Temple, "Aramava")	Nabataean (built ca. 9 BCE–40 CE), with later Roman usage; cultic / sanctuary function.	Within WRPA, listed as protected under national antiquities law and World Heritage Centre (WHC) World Heritage inscription. Condition "fair"; not under immediate threat according to 2014 State of Conservation report.	Partial excavation / survey; some archaeological work documented (including structural recordings, inscriptions, and room complex). Not fully excavated.	Important cultic site; visual prominence; linked to springs and water features (Ain esh-Shellaleh).
Khazali Canyon (Khazali Siq)	Multi-period: Stone Age petroglyphs, Thamudic / Nabataean / later inscriptions; human/animal motifs.	Within WRPA, protected under national laws (Antiquities Law No. 23) and protected area regulations). Condition described as good but with "some concerns" (visitor pressure, erosion).	Documentation and survey work have been done; rock art recording by CB-RAER; limited conservation. Not large-scale excavation.	One of the most accessible petroglyph-rich canyons; popular with tourists; risk of wear.
Alameleh Inscription / Rock Art Clusters	Thamudic / Nabataean / Pre-Islamic inscriptions and petroglyph iconography.	Under WRPA protection, national antiquities laws apply; documentation less complete.	Survey / recording has been done (recent attention); conservation status less clear; little excavation.	Represents non-monumental rock art clusters; culturally important for symbolic

Site Name / Description	Period / Attribution	Protection Status	Excavation Status	Notes
				mapping and local heritage.
Wadi Rum Protections / Ensemble (Rock Art & Inscriptions Overall)	Multiple periods: Prehistoric, Thamudic, Nabataean, Islamic.	Listed UNESCO World Heritage; national antiquities law; zoning under ASEZA/WRPA.	Largely non-excavated; survey, documentation, photo and epigraphic recording work has been ongoing; some local conservation/training programs.	Represents the cumulative heritage significance; key baseline for impact assessment; pressure from tourism, erosion, and development.

Protection and Management

Although it was not designated as a Protected Area by UNESCO until 2011, Wadi Rum has been protected and managed for its cultural and natural significance since 1978. It was first officially designated as an archaeological site under Jordanian Law No. 21 of the Department of Antiquities in 1988 and has since also been established as a Protected Area under Cabinet Decision No. 27/11/3226 and a Special Regulation Area under the administration of the ASEZ (UNESCO 2025b).

The primary plan currently guiding the WRPA's management is the area's strategic plan for land use planning (ASEZA n.d.b), as discussed in Section 1.9.1 and administered by the ASEZA. This authority also has a newly revised and integrated management plan dated to 2019–2023, an effective management staff for the area, and financial resources (IUCN 2020).

The IUCN provided an assessment of the conservation status of World Heritage Sites and Protected Areas and has assessed the conservation status of the WRPA as "good with some concerns," which is the second highest of four possible evaluation categories. This status is particularly helped by the area's low population density, a lack of development impacts, and—until recently—a remote and relatively inaccessible character (IUCN 2020).

The current management plan is also assessed as "good," providing a strong legal and governance framework for the area and generally managing the conservation of the area's natural and cultural elements in a balanced and sustainable manner. The management plan's development and the area's ongoing management has also included local community involvement, with efforts made to maintain traditional Bedouin livelihoods and ensure tourism is benefitting local Bedouin communities (e.g., through employing Bedouin as park staff and through Bedouin involvement in ecotourism) (IUCN 2020; UNESCO 2025b).

However, there are growing concerns associated with the protection and management of the WRPA. The expanding tourism industry is considered the greatest risk factor of the WRPA. Current impacts associated with tourism that are envisioned to worsen with time include the following:

- Poorly regulated off-road driving by tour operators
- Construction of illegal campsites
- Resource damage by self-guided tourists
- Increased tourist infrastructure

- Tourist (and local waste) management issues

Other impacts, concerns, and risk factors include the following:

- Further encroachment of the village of Wadi Rum
- The effects of climate change on sensitive high-altitude fauna and flora
- Increasing local conflicts over scarce resources (particularly tourism-related resources)
- Increased levels of local poverty
- Groundwater exploitation and firewood collection (IUCN 2020; UNESCO 2025b).

The management of the WRPA (and its management plan) will need to be refined and revised going forward to address these issues. Current tourism and visitor management practices will need to be developed, particularly as the tourist industry is projected to grow. Other recommended actions include the undertaking of a comprehensive survey and inventory of the area's natural and cultural resources and a conservation and interpretation program (UNESCO 2025b). ASEZA has also recommended the following actions within their most recent state of conservation report (ASEZA 2024).

- Finalise the ongoing revision of the area's buffer zone to properly reflect and capture the significance of the wider region
- Take actions to enhance the participation of local communities and stakeholders in decision making
- Regularly monitor management actions (e.g., the introduction and enforcement of new regulations to control desert camps) to evaluate progress

3.4.2 Cultural Space of the Bedu in Petra and Wadi Rum

The Project Area also lies in an area that, in 2008, UNESCO inscribed upon its Representative List of the Intangible Cultural Heritage of Humanity. This list highlights cultural areas, practices, and aspects across the world that are considered of global importance for the intangible cultural beliefs, practices, traditions, and values that they preserve and exhibit.

The Petra and Wadi Rum areas were inscribed on this list as they have been highly important places for both settled and nomadic Bedouin communities for millennia. The following description of the Cultural Space of the Bedu in Petra and Wadi Rum is informed by UNESCO (2025a). In these areas, according to UNESCO, the Bedouin continue to practice many aspects of their traditional lifestyle, including pastoral techniques and skills; a complex social and moral code (transmitted orally); and a rich local mythology (expressed as poetry, folktales, and songs).

According to UNESCO, the Bedouin communities of the area also have extensive knowledge and a highly integrated relationship with their natural environment, including a complex and specific knowledge of the local fauna and flora. Other traditional Bedouin skills and knowledge preserved in the area include camel husbandry and weaving (the two pillars of Bedouin culture), traditional medicine, tent-making, tracking, and climbing. Finally, the continued coexistence and complementary relationship of both settled and nomadic Bedouin communities in the area also attest to their interaction with the particular environmental background and the unique social developments of the community.

While of great importance, the intangible heritage of this area is nevertheless degrading and at severe risk of further loss from various factors; these include general factors such as globalisation

and modernisation, as well as the impacts of desert tourism and the demand for an "authentic Bedouin culture," which is not always discerning of the authenticity of the true Bedouin experience. However, the greatest factor appears to be the movement of many Bedouin to more sedentary "modern" lifestyles, rendered more attractive by the increasing availability of modern housing, education, healthcare, and sanitation. These factors have severely impacted the integrity and authenticity of the Bedouin lifestyle in the WRPA and actions will need to address this ongoing impact (Tarawneh 2009; UNESCO 2025a).

Protection and Management

The management strategy for the preservation and enhancement of the livelihood, traditions, and practices of the Bedouin in the WRPA are considered components of the area's current management plan (2019–2023). However, as highlighted within the management plan, there are many issues still facing the Bedouin, including competition for scarce resources, increasing poverty, and damage to their traditional landscape. The involvement of the Bedouin within the management of the WRPA is also still a matter to be addressed and ameliorated, as highlighted by the ASEZA's most recent state of conservation report (2024).

UNESCO (2025b) also records that an action plan was implemented for the Cultural space of the Bedu in Petra and Wadi Rum from 2006 to 2009 by the Jordanian Hashemite Fund for Human Development. The aim of the action plan was to protect the main features of the Bedouin's traditional lifestyle in the area, specifically the collection and oral transmission of heritage and the transmission and adaptation of knowledge and skills related to camels and weaving.

3.4.3 Known Heritage Assets

MEGAJordan Data

A total of six undesignated heritage assets were previously identified and recorded within the AOI. These are listed and summarized in Table 3-2 and their locations are shown within Figure 3-1. All six sites are recorded in the MEGAJordan database; however, two (sites WR-14_19 and WR-14_22) were originally identified by the Wadi Ramm Project (2014 season)(Farès & Norris 2017). The remaining four were identified during the USAID survey for the proposed Disi pipeline (USAID 2025). Where no information is provided about a site within Table 3-2, it is because this information was not available within either the MEGAJordan database or other available sources.

A search for religious infrastructure within the AOI was also carried out and located six mosques within the AOI. Figure 3-2 depicts the location of these mosques. Although these provide some cultural context, they are not discussed further within this HIA Statement as all mosques identified were exclusively modern. However, they are considered within the ICH report.

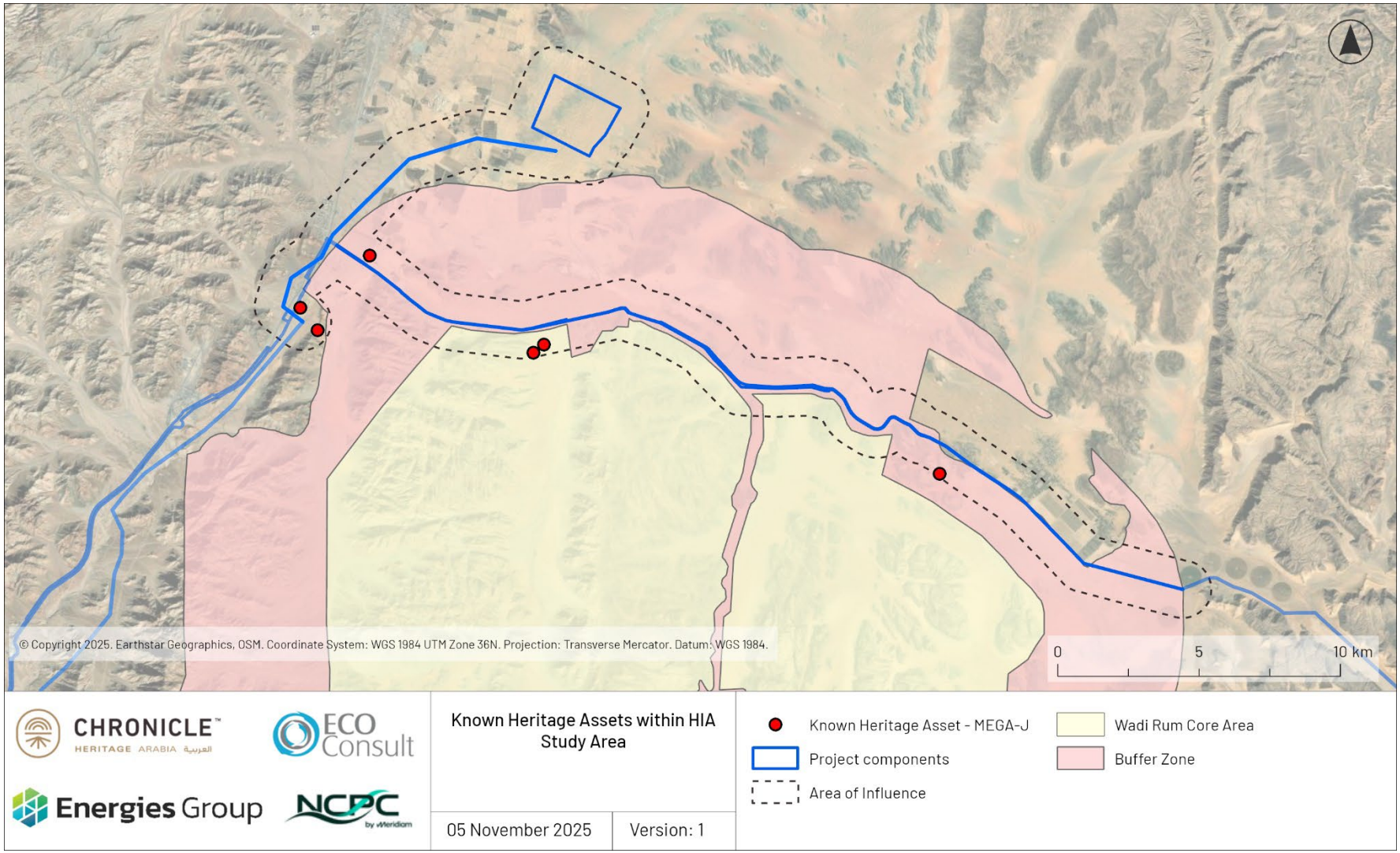

Figure 3-1. Previously Known Heritage Assets within the AOI.

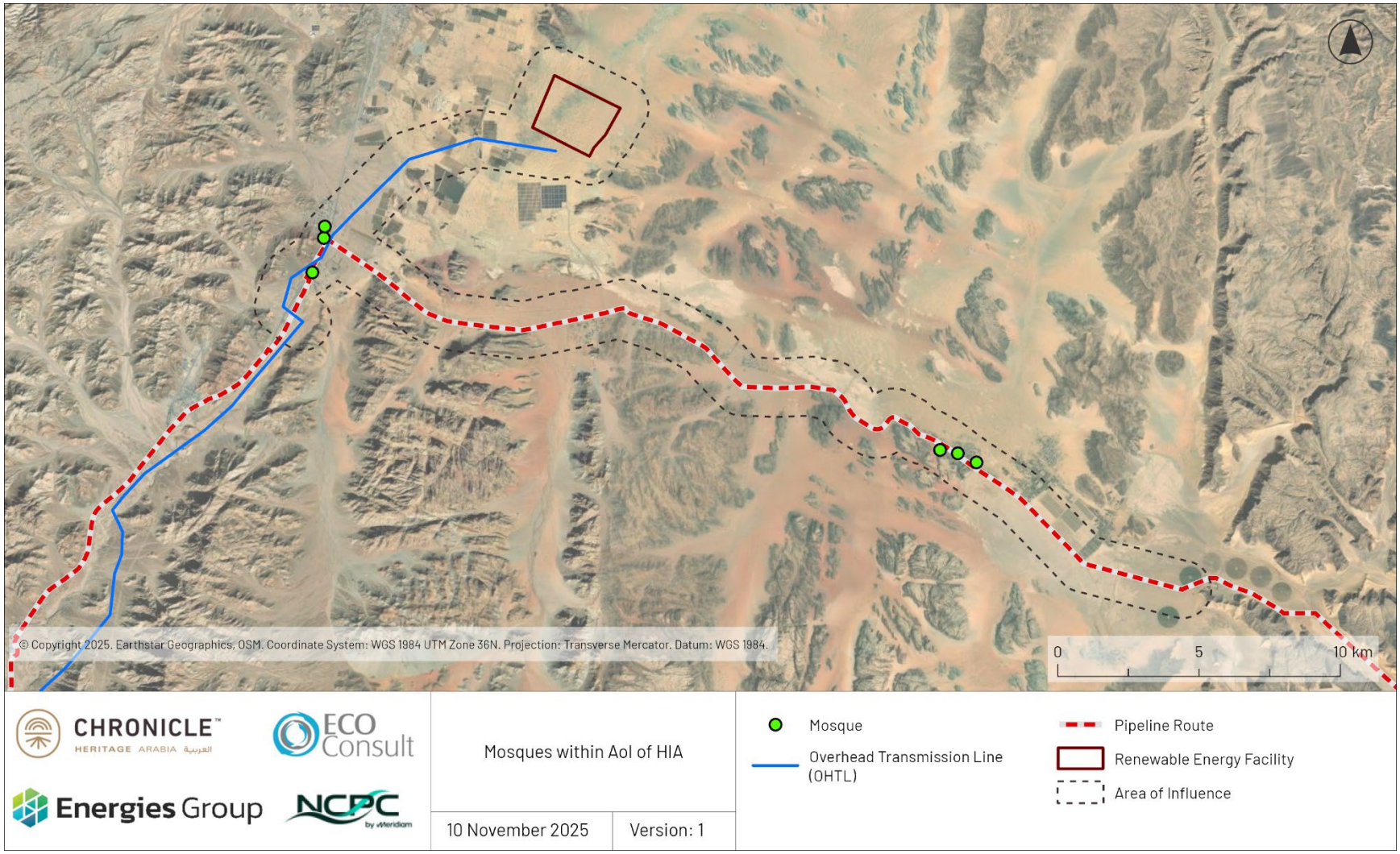

Figure 3-2. Location of Religious Infrastructure within the AOI.

Table 3-2. Known Heritage Assets

Site Name / Description	Period / Attribution	Condition and Protection Status	Excavation Status	Notes
NN/MA`AN DESERT SURVEY SITE 8	-	-	-	-
NN/RAIKES SITE A2	Unspecified/ Unknown	Washed Away; Not Protected	Not Excavated	-
MERSED	Nabataean, Roman	Good Condition; Not Protected	Not Excavated	Remains of a watch tower on top of a high mountain, possibly constructed during the building of the Via Nova Triana (Roman Road); associated sherd and flint surface scatter
NN/RAS AN-NAQB HIGHWAY SURVEY MILESTONE	Roman (early)	Relocated; Not Protected	Relocated	Latin inscribed milestone located near the road to Wadi Rum; removed by DoA for preservation; currently stored at Al-Mureigha Military School.
WR-14_19	Unspecified	-	-	Multicomponent site comprising three cairns and rock art featuring camel, ibex, dogs, and wasm.
WR-14_22	Unspecified	-	-	Rock art site featuring ibex, oryx, dogs, and wasm.

Wadi Ramm Project

The 2014 season of the Wadi Ramm Project involved the survey of Wadi Ramman, a distinct north-south wadi that lies within the northern end of the WRPA core zone and which had previously been only poorly investigated. The northern end of the wadi intersects with the AOI for the Project. The survey identified a total of 22 different sites including two within the Project AOI: sites WR-14_19 and WR-14_22.

The 2014 preliminary report describes site WR-14_22 as a rock art site featuring ibex, oryx, dogs, and *wusum*. Site WR-14_19 (Figure 3-3 and Figure 3-4) is described as a site with three cairns constructed from large blocks and small stones, as well as rock art featuring camel, ibex, dogs, and *wusum*. While the majority of cairns identified during the survey were found along the bases of jabals (rock outcrops), the cairns at site WR-14_19 (and site WR-14_18 just to the south and outside the AOI) were located on top of the stone cliffs (Farès & Norris 2017).

Figure 3-3: Cairns at site WR-14_19 as revisited by CH Arabia.

Figure 3-4: Rock art identified at site WR-14_19 by CH Arabia.

USAID Survey

The field survey undertaken for the USAID HIA for the proposed Disi pipeline identified a total of fourteen heritage sites, four of which also lie within the AOI for this Project. These are NN/Ma'an Desert Survey Site 8, NN/Raikes Site A2, Mersed, and the NN/Ras An-Naqb Highway Survey Milestone. All information recorded for these sites is already summarised in Table 3-2.

Aqaba Railway

The Aqaba Railway runs east-west through the northern buffer zone of the WRPA. An associated train station (Wadi Rum station) is also present along the line within the eastern half of the WRPA's northern buffer zone. The line has been disused since 2018. Although not identified within the MEGAJordan database as a heritage asset, it is considered to hold heritage significance and is therefore included and discussed within this report. The following information was gathered from discussions with local residents and a number of online sources (Nabataea.Net 2020; Jordan Tourism Board 2025; The Jordan Heritage Revival Company (JHRC) 2025).

The Aqaba Railway represents a late continuation of the Ottoman Hejaz Railway system. The original Hejaz line was completed in 1908 by the Ottoman Empire and served to enable religious pilgrimage and imperial administration by connecting Damascus and Medina. That section of the Hejaz line south of Ma'an fell into disuse following the First World War.

In 1975, the Jordanian government constructed a new industrial heavy freight railway (the Aqaba Railway) from Ma'an to Aqaba to replace and continue the Hejaz line; part of the alignment of the Aqaba Railway follows the historic route of the Hejaz line (although not within the AOI). The Aqaba Railway was built to standard gauge and was used by steam locomotives, soon replaced by diesel trains. It served in particular to transport phosphate rock from inland mines to export terminals on the Red Sea. The Aqaba Railway Corporation (ARC) was established in 1979 to operate and maintain the line and played an important role in Jordan's extractive economy for nearly forty years. Although the line and station fell out of use in 2018, it remains largely intact.

Considering its association and intersection with the remains of the Hejaz Railway (albeit outside the AOI), the Aqaba Railway is considered a unique example of industrial heritage linked to both Ottoman and modern Jordanian infrastructure. It represents a transitional link between twentieth-century imperial infrastructure and late twentieth-century industrial development. Meanwhile, its alignment and surviving structures comprise valuable material evidence of Jordan's shift from colonial-era transport systems to modern state-managed extractive logistics. The railway line and Wadi Rum station have also played a role in the tourist experience of Wadi Rum as they were occasionally used in the recent past for heritage or ceremonial runs of preserved steam locomotives.

3.4.4 Newly Identified Heritage Assets

The walkover survey conducted by CH Arabia (see Section 2.2) identified four previously unidentified sites and three previously unidentified isolated features. These are summarised in Table 3-2 and their locations are depicted in Figure 3-5. All four sites and one feature were found within the proposed location of the new PV plant. The remaining two features were found within the footprint of the proposed pipeline. Their distribution across these areas does not appear to follow any particular pattern, although sites AHS003, AHS004, and feature AHF003 were found in close proximity to each other. The survey also identified a range of artefacts associated with these sites; these were counted, analyzed, and recorded but not removed.

The identified sites, features, and artefacts are discussed in more detail below. Overall, they form a small body of site and feature types that are commonly found across the local area and wider region. They are indicative of (likely ephemeral, short-term) occupation within the area as well as some small-scale metalworking activity (which could in itself be indicative of a longer-term presence or settlement within the area) and some lithic production. Although most of the identified assets cannot be definitively dated, it is likely that most were formed during the prehistoric era, although some show some evidence for likely Nabataean and/or Roman reuse. Domestic shelter AHF005 is a modern feature.

Table 3-3. Newly identified heritage assets within the Project Area.

Site/Feature	Function	Date	Assessed Significance
AHS002	Possible settlement	Possible Prehistoric with potential Roman reuse	Low
AHS003	Possible prehistoric settlement	Possible Prehistoric with potential Nabataean or Roman reuse	Low
AHS004	Possible prehistoric settlement	Possible Prehistoric with potential Nabataean or Roman reuse	Low
AHS005	Possible prehistoric settlement	Possible Chalcolithic or Bronze Age	Low
AHF003	Unknown	Probable Late Iron Age	Low
AHF004	Lithic Knapping Site	Possibly Middle Paleolithic or later	Low
AHF005	Domestic Building/Enclosed Shelter	Modern	Low

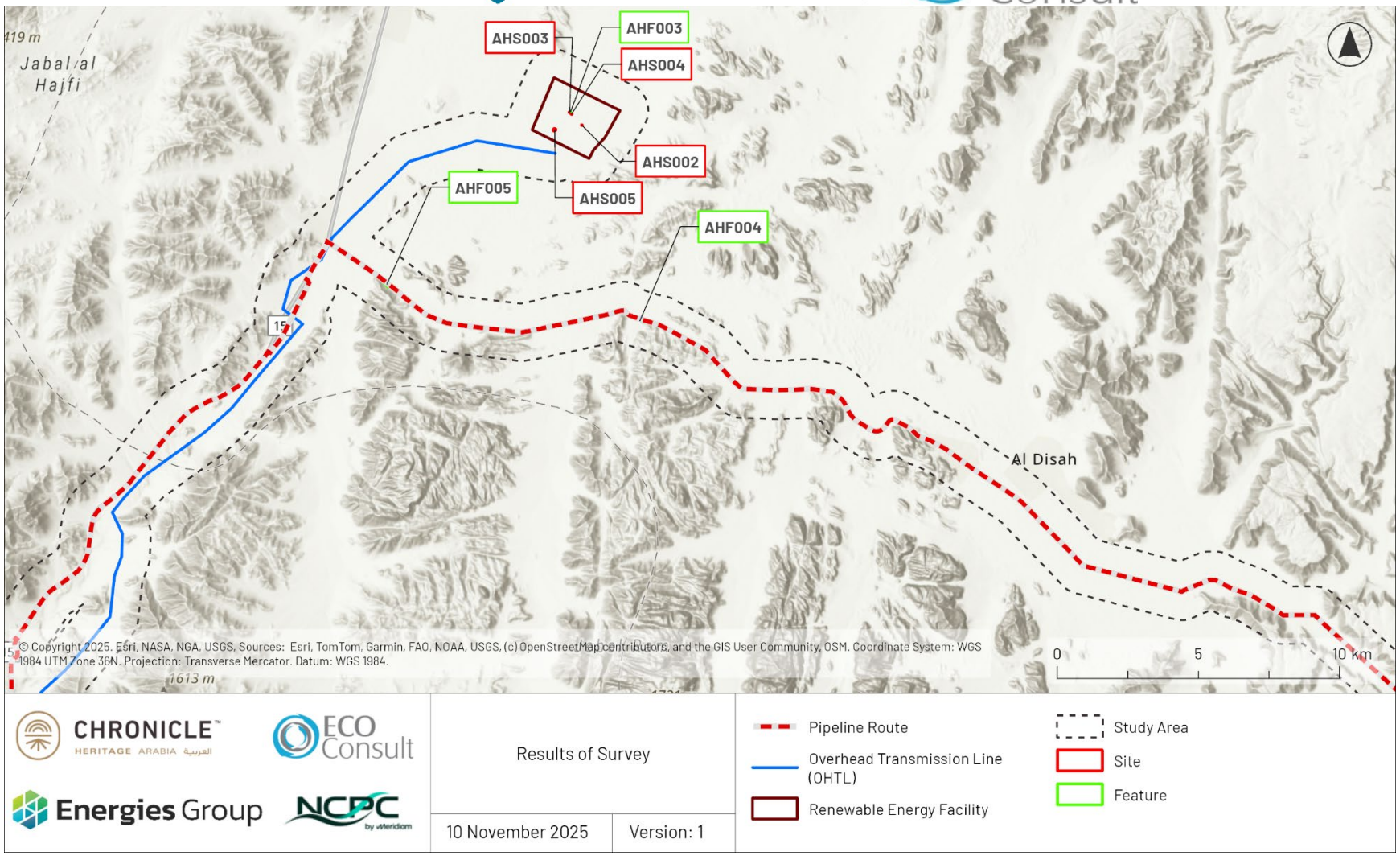

Figure 3-5. Location of Heritage Assets Identified during the CH Arabia Survey

AHS002

Site AHS002 comprises the remains of a possible prehistoric settlement or occupation area (Figure 3-6). The site is characterised by a scatter of pottery sherds, lithic artefacts, and fragments of slag. The site, as defined by the surviving artefact scatter, is 95.7m long (northwest-southeast) × 26.4m wide (northeast-southwest). The site is in poor condition as it is located in an open deserted area and has been exposed to the effects of wind and water erosion. This has likely led to the loss of some artefacts and the displacement of others from their original place of deposition.

The survey team identified a total of seven lithics at the site, none of which are diagnostic. These consisted of:

- Two grind stones (possibly partial saddle grind stones)
- One oval saddle grind stone (Figure 3-7)
- One hand grinder
- One very pale brown chert core
- Two very pale brown chert flakes

The survey team also identified a total of 55 ceramic sherds at the site, none of which are definitively diagnostic. As noted below, however, two reddish brown body sherds may be of possible Roman date. The sherds identified consisted of:

- Two dark grey body sherds with grit temper
- Two reddish brown body sherds of possible Roman date
- Two dark reddish grey body sherds
- One light reddish brown body sherd
- Six dark grey to dark reddish brown body sherds with chaff temper
- One interior shoulder body sherd with a dark grey exterior and reddish brown interior
- Two interior body sherds with dark grey exteriors and reddish brown interiors
- Three highly burnt pottery sherds
- A concentration of 19 brownish grey body sherds
- A concentration of 17 body sherds of various colours

Finally, the survey team also identified three pieces of potential slag (undiagnostic) at site AHS002.

Although the DoA will make the final decision regarding the significance of sites, CH Arabia recommends that this site should be considered of **low** heritage significance. This assessment is based upon the site's degree of disturbance, its lack of features or definitively diagnostic artefacts, the commonality of its site type within the local area, and thus its limited potential to contribute to an understanding of the area's historic development. This recommendation will, however, require assessment and formal confirmation from the DoA. The site does retain an intact and undisturbed historic setting.

Figure 3-6. View showing site AHS002 and its intact historic setting, looking west.

Figure 3-7. An oval saddle grind stone found within site AHS002, plan view.

AHS003

Site AHS003 comprises the remains of another possible prehistoric settlement or occupation area (Figure 3-8). The site is characterised by a scatter of pottery sherds and lithic artefacts. The site is 55.4m long (northwest-southeast) × 29.5m wide (northeast-southwest). The site is in poor condition given its long-term exposure to the effects of wind and water erosion. This has likely led to the loss of some artefacts and the displacement of others from their original place of deposition.

The survey team identified over 14 lithics at the site, none of which are diagnostic. These consisted of:

- Seven grey chert flakes
- One mottled grey and brown chert flake
- One mottled grey and brown chert flake with retouched edge
- One possible chert scraper with retouched edge
- Three grey chert chunks
- One oval saddle grind stone
- Lithic debitage of various colours.

The survey team also identified a total of 15 ceramic sherds at the site, none of which are definitively diagnostic. As noted below, however, one light reddish brown body sherd is possibly an example of Nabatean Common Ware or Roman in date. The sherds identified consisted of:

- Seven dark grey body sherds with grit temper and a darker interior
- Two light reddish grey body sherds with very coarse grit temper
- One light reddish brown body sherd, wheel made with a partial light grey slip on its exterior face; possibly Nabatean Common Ware or Roman in date
- One light reddish brown body sherd
- One dark reddish grey body sherd
- Three highly burnt body sherds (
- Figure 3-9)

CH Arabia recommends that the site should be considered of **low** heritage significance. This assessment is based upon the site's degree of disturbance, its lack of features or definitively diagnostic artefacts, the commonality of its site type within the local area, and thus its limited potential to contribute to an understanding of the area's historic development. This recommendation will, however, require assessment and formal confirmation from the DoA. The site does retain an intact and undisturbed historic setting.

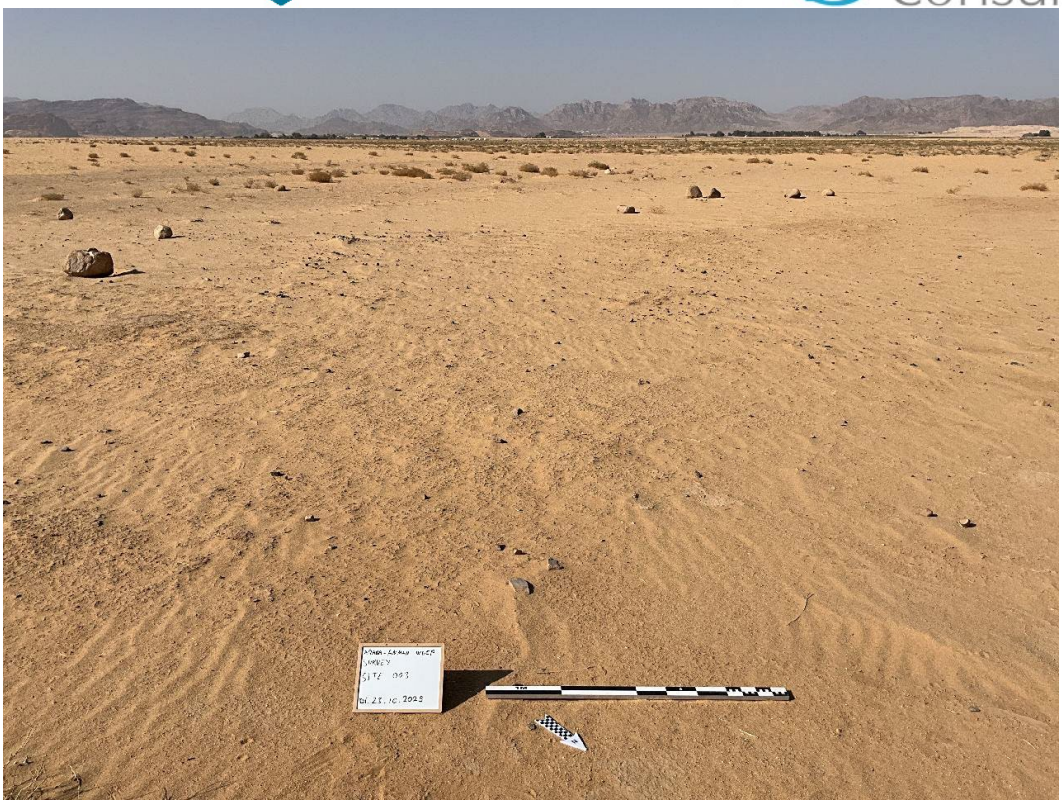

Figure 3-8. View showing site AHS003 and its intact historic setting, looking southwest.

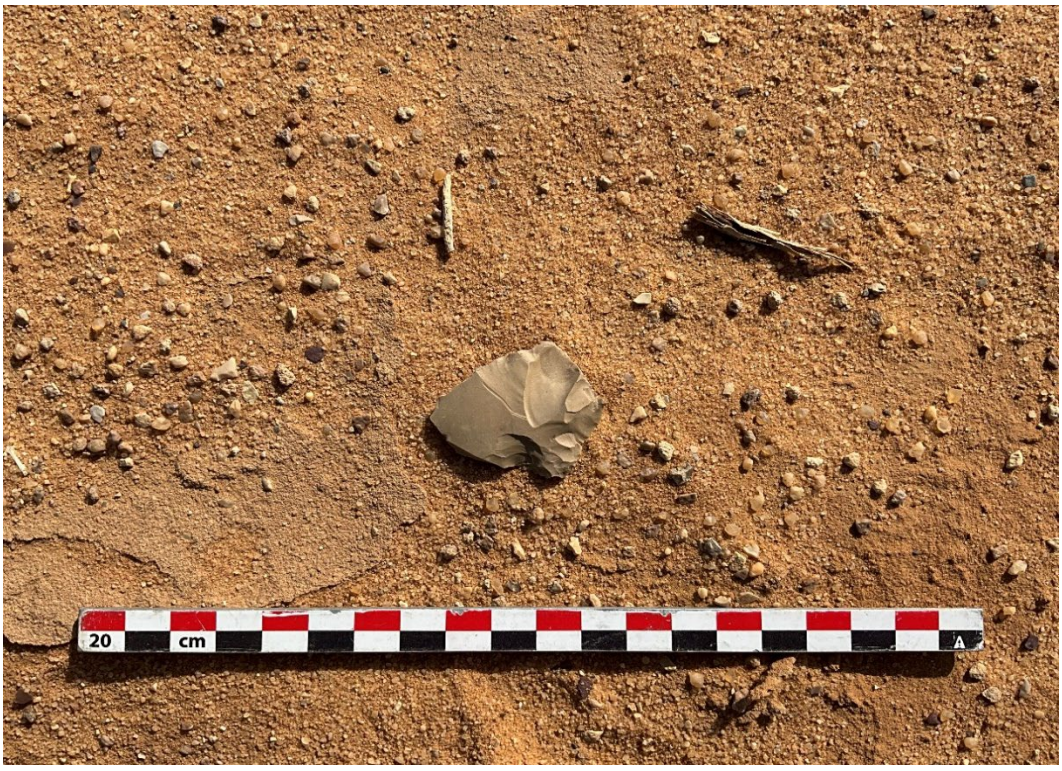

Figure 3-9. A grey chert flake found within site AHS003, plan view.

AHS004

Site AHS004 comprises the remains of another possible prehistoric settlement or occupation, characterised by a scatter of lithic artefacts and pottery sherds (Figure 3-11). The site is 53.7m long (northwest-southeast) × 25.2m wide (northeast-southwest). The site is in poor condition given its long-term exposure to the effects of wind and water erosion. This has likely led to the loss of some artefacts and the displacement of others from their original place of deposition.

The survey team identified over 13 lithics at the site, none of which are diagnostic. These consisted of:

- Four sandstone fragments, probably from grind stones
- One outer edge of a saddle grind stone
- Five grey chert flakes
- One grey chert core
- Two grey chert chunks
- Various lithic scatter fragments

The survey team also identified a total of 23 ceramic sherds at the site, one of which is diagnostic. The diagnostic sherd is a poorly fired, light reddish grey rim sherd with very coarse grit temper which is likely to be a fragment from a Roman cooking pot (Figure 3-10). As noted below, a light reddish brown body sherd may also be an example of Nabatean Common Ware or Roman in date; however, this interpretation remains tentative.

Figure 3-10. The fragment of probable Roman cooking pot in site AHS004, plan view.

The sherds identified consisted of:

- Five dark grey body sherds with grit temper
- One light greyish red body sherd
- Eight reddish brown body sherds with a darker interior
- Seven reddish brown body sherds, one or two with possible shoulders
- One poorly fired light reddish grey rim sherd with very coarse grit temper, most likely a fragment of a Roman cooking pot (Figure 3-10).
- One light reddish brown body sherd, wheel made, with a partial light grey slip on its interior face; possibly Nabatean Common Ware or Roman in date.

CH Arabia recommends that the site should be considered of **low** heritage significance. This assessment is based upon the site's degree of disturbance, its lack of features, the commonality of its site type within the local area, the limited number of diagnostic artefacts it contains, and thus its limited potential to contribute to an understanding of the area's historic development. This recommendation will, however, require assessment and formal confirmation from the DoA. The site does retain an intact and undisturbed historic setting.

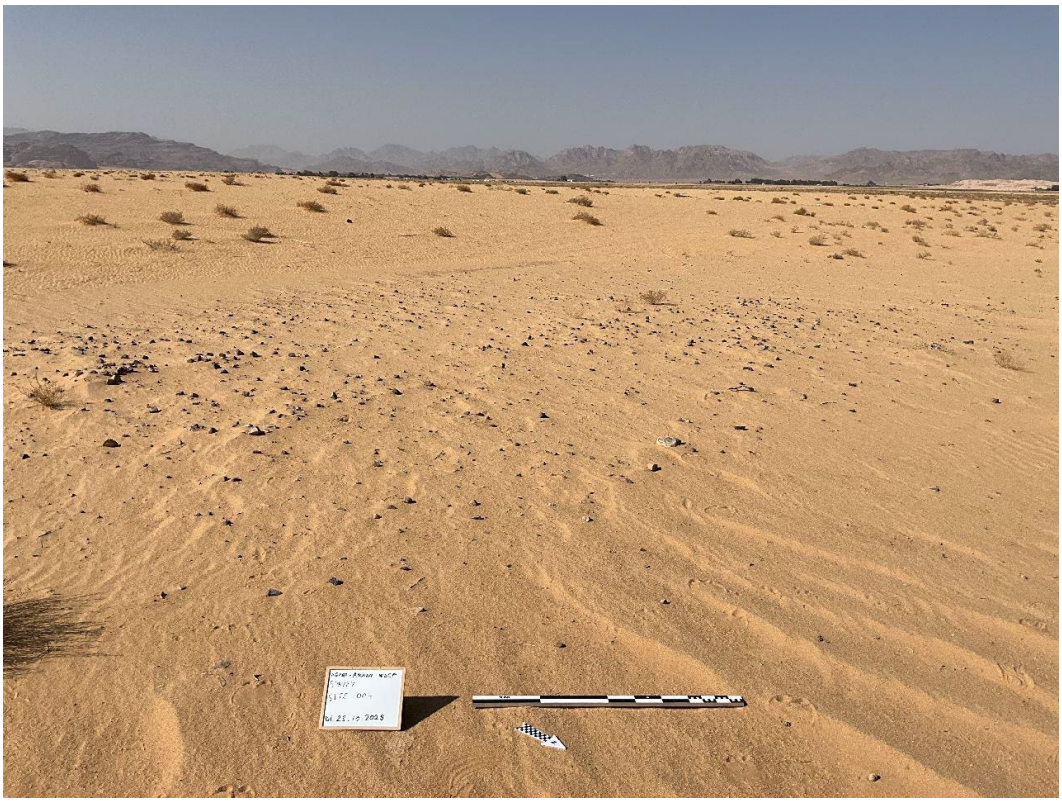

Figure 3-11. View showing site AHS004 and its intact historic setting, looking southwest.

AHS005

Site AHS005 comprises the remains of another possible prehistoric settlement or occupation, characterised by a scatter of lithic artefacts and one pottery sherd (Figure 3-13). The site is 101.6m long (northeast-southwest) × 85.2m wide (northwest-southeast). The site is in poor condition given its long-term exposure to the effects of wind and water erosion. This has likely led to the loss of some artefacts and the displacement of others from their original place of deposition.

The survey team identified eight lithics at the site, one of which may be diagnostic. The possible diagnostic lithic is a possible mottled grey sickle blade (Figure 3-12). If this interpretation is correct, these tools are typically Chalcolithic or Bronze Age in date.

Figure 3-12. The possible sickle blade at site AHS005, plan view.

The remaining lithics are undiagnostic and consist of:

- One possible grey chert scraper with retouched edge
- Three grey chert flakes
- Two hammerstones
- Three grey chert chunks
- One retouched grey chert flake
- One possible saddle grind stone fragment
- One ground stone

The survey team also identified one ceramic sherd at the site: a dark grey body sherd.

CH Arabia recommends that the site should be considered of **low** heritage significance. This assessment is based upon the site's degree of disturbance, its lack of features, the commonality of its site type within the local area, the limited number of diagnostic artefacts it contains, and thus its limited potential to contribute to an understanding of the area's historic development. This recommendation will, however, require assessment and formal confirmation from the DoA. The site does retain an intact and undisturbed historic setting.

Figure 3-13. View showing site AHS005 and its intact historic setting, looking east.

AHF003

Feature AHF003 is an isolated feature identified just 20m northeast of site AHS003 (Figure 3-14). This feature presents as an oval-shaped structure of mounded sand, constructed on an east-west orientation. The feature is 5.3m long (east-west) × 3.9m wide (north-south) × between 1 and 1.2m high. The surface of the mound is covered with a dense scatter of shattered black rock fragments, slag, and small fragments of metalworking debris (Figure 3-15 and Figure 3-16). Expert review of the material interprets it as the product of small-scale metallurgic working, specifically copper-smelting activities.

The feature is in poor condition as a result of heavy water and wind action. No artefacts or stratified finds were observed on the surface, although there is a moderate potential for isolated but associated subsurface features to survive in the vicinity, e.g., furnace bases or pits. The feature has been tentatively dated to the Early Islamic Period based on its similarity to the nearby site Khirbat al Mana'iyya that contained similar metallurgical residues (Jones et al. 2017).

Figure 3-14. View showing feature AHF003 and its intact historic setting, looking east.

Figure 3-15. View showing AHF003 with upper layer of burnt rock fragments, looking south.

Figure 3-16. Metalworking slag across Feature AHF003, looking northeast.

CH Arabia recommends that the site should be considered of **low** heritage significance. A low significance is recommended as the site is of a type that is locally representative but not unique. It has also been subject to considerable disturbance, lacks any associated diagnostic artefacts, and thus has limited potential to contribute to an understanding of the area's historic development. This recommendation will, however, require assessment and formal confirmation from the DoA. The site does retain an intact and undisturbed historic setting.

Feature AHF004

Feature AHF004 is a domestic building that has been built into a natural rock shelter in the lower level of a rocky massif (Figure 3-17) which itself overlaps with the southern boundary of the proposed pipeline's footprint. The natural rock shelter has been adapted for domestic purposes through the construction of a stacked stone wall which encloses the space. The wall is made of stones of various sizes, which have been stacked and held together with cement and clay mortar. Some areas of the external wall face also feature a covering of clay and cement plaster, although this has disintegrated in most places, leaving the stacked stone construction largely exposed. The enclosing wall is 4.4m long and survives up to 2.6m tall in places.

A metallic waterspout is fixed to the highest point of the external wall in the northeast, protecting the wall below from water degradation (Figure 3-19). Despite the inclusion of this feature, the feature is in poor condition as a result of water and wind erosion and a lack of maintenance since its abandonment. Many sections of the wall have collapsed or are failing. The stone massif into which the building has been constructed is itself noteworthy for its distinctive shape. Of particular note is the pointed stone formation immediately below which the building has been constructed;

this formation appears almost as a chimney and was likely intentionally chosen for the unusual and interesting aesthetic it provides.

The wall enclosing the shelter features three distinct openings: a relatively large central door, a small ground-level opening in the northeast, and a relatively large window in the southwest (Figure 3-18 and Figure 3-19). A wooden jamb survives on either side of the door, mismatched in size and character. The window also features a surviving wooden lintel and the wall around it has been plastered externally with cement. One further opening can be seen between the door and window although this appears to be the result of wall collapse rather than an intentional feature.

The internal space of the building is divided into two rooms: a large central room and a smaller room to the southwest. The large room appears to be the main space and can be accessed through the central door and through the small ground-level opening, although this latter opening may have originally had an alternative function. The smaller southwestern room is separated from the main room by an internal wall of similar construction to the external wall. This smaller room features only a window, although the fact that the same plastered exterior observed around this window also extends down to the floor level in this location may indicate that this was originally a door, later blocked and converted to a window. Modern trash was found strewn throughout the interior of the enclosed shelter.

The site's construction allows this feature to be interpreted as a modern domestic shelter. While the shelter is certainly an interesting and visually arresting feature, CH Arabia recommends that this site should be considered of **low** heritage significance. This is predominantly because of the modern character and date of the shelter and thus its limited potential to contribute to an understanding of the area's **historic** development. This recommendation will, however, require assessment and formal confirmation from the DoA.

Figure 3-17. Overview of modern shelter AHF004, looking south.

Figure 3-18. View of the window and doorway within shelter AHF004, looking east.

Figure 3-19. Close-up view of AHF004's enclosing wall and openings, looking southeast.

AHF005

Site AHF005 comprises a large lithic scatter identified in an open space at the foot of a rocky hill (Figure 3-20) within the footprint of the proposed pipeline. The scatter comprises a moderate to dense concentration of lithic flakes, tools, cores, and debitage. It has been interpreted as a production or lithic knapping area. The feature, as defined by the extent of the surface scatter, is 400m long (northwest-southeast) × 60m wide (northeast-southwest).

The feature is in poor condition, disturbed by an existing dirt track and associated spoil heaps (Figure 3-21). The presence of large rubble and boulders in some areas of the feature indicates that the site may also have been considerably disturbed by subsequent colluvial deposition (hill wash). These disturbances have likely led to the loss of some artefacts and the displacement of others from their original places of deposition. The site also lies immediately to the south of the existing tarmacked road which runs through the WRPA buffer zone and may have originally been larger and since truncated by the construction of this road also.

The survey team identified more than 220 lithics. Most lithics were undiagnostic. Some lithics were tentatively ascribed to the Middle Paleolithic but this dating is uncertain and they may be from more recent periods. The lithics observed consist of:

- Two hammerstones
- Two ground stones
- 13 grey chert cores
- A grey orthoquartzite core
- Six grey chert pedestal cores (Figure 3-22)

- One possible sickle blade (Figure 3-23)
- Two light grey modified flakes with edge retouching, possible points
- A light grey chert modified flake with single edge retouching, possible scraper
- A reddish grey modified flake with edge retouching, possible point blank
- A light grey possible point blank
- A grey flake with single modified edge retouching, possible scraper
- Four light grey modified flakes with edge retouching, possible blade blanks
- A gray orthoquartzite modified flake with edge retouching, possible point blank
- A grey chert modified flake with edge retouching, possible point blank
- A reddish orthoquartzite modified flake with edge retouching, possible point blank
- Two light grey chert modified flakes with edge retouching
- Six grey chert flakes with edge retouching
- Two reddish orthoquartzite modified flakes with edge retouching
- Two reddish orthoquartzite modified flakes with single edge retouching
- Five grey chert modified flakes with edge retouching
- Two quartzite modified flakes with edge retouching
- A reddish grey chert flake
- Seven grey chert flakes
- One marbled chert flake
- Four grey chert chunks
- Over 150 other pieces of undiagnostic debitage

CH Arabia recommends that this site should be considered of **low** heritage significance. This assessment is based upon the site's considerable degree of disturbance, the heavily disturbed nature of its historic setting, its lack of features or definitively diagnostic artefacts, the commonality of its site type within the local area, and thus its limited potential to contribute to an understanding of the area's historic development. This recommendation will, however, require assessment and formal confirmation from the DoA.

Figure 3-20. View showing feature AHF005 adjacent to the existing road, looking east.

Figure 3-21. Considerable disturbances within Feature AHF005, looking west.

Figure 3-22. A grey chert pedestal core found within AHF004, plan view.

Figure 3-23.A possible sickle blade found within AHF004, plan view.

Isolated Artefacts

One isolated artefact was also found within the proposed site of the PV plant but was not associated with any site. This was an undiagnostic, wheel made, cream ware body sherd. Given its isolated nature, it is most likely to represent an artefact within a secondary context, i.e., it has been disturbed or moved from its original site of placement. This, along with its undiagnostic form, endow it with little significance and it is not considered to contribute any further material understanding to the area's historic use or significance.

3.5 Archaeological Potential and Limitations

Although the number of known sites within the AOI is relatively low, (see Section 3.4.3), it is important to examine this record in the context of both the area's history and the amount and type of archaeological research it has been subject to. This is necessary to understand whether the current inventory of known sites is representative of the area's actual archaeological resource, or whether it may be an underestimation, leaving potential for further (buried and surface) sites to survive.

In general, there has been relatively little archaeological investigation of the AOI, particularly as compared to other parts of Jordan, and certainly no complete inventory for it. This is true of both Wadi Yutum (the north-south wadi through which the OHTL and end of the pipeline will pass) and the northern buffer zone of the WRPA (through which the remainder of the proposed work will pass). Nevertheless, both areas are likely to have a relatively rich archaeological heritage, and the aforementioned paucity of finds in these areas may therefore be a result of research bias rather than an accurate depiction of the area's heritage potential.

Wadi Yutum would have formerly provided favorable conditions for settlement and other human activities, including lots of good, raised and sheltered ground adjacent to water sources. It is also

likely to have been an important north-south routeway since antiquity, as demonstrated by the presence of a number of infrastructure-related sites, both ancient (e.g., the Roman milestone at Ras An-Naqb, Roman forts in Wadi Yutum and at Qweira) and modern (Highway 47). It is likely to have formed part of major caravan routes for the incense trade and would have become particularly important from the Islamic period for pilgrimage to the Holy Lands of Makkah and Madinah. Finally, the stretch of Wadi Yutum between Wadi Rum and Ras an-Naqab to the north has also been identified as the likely location of late Neolithic "mega-sites," such as those already investigated further north in the Greater Petra Area (Tetra Tech International Development 2022b, 2025; ECO Consult & Energies Group 2025; USAID 2025).

The archaeological resource across the WRPA's northern buffer zone may also be greater than currently represented for a number of reasons. Firstly, investigation across southern Jordan in general suggests that much of the country is "immensely rich in archaeological remains" (Tetra Tech International Development 2022b: 301), with most remains identified being pre-Islamic and probably several thousand years old. An important archaeological resource within the Project Area is also considered likely, given the area's proximity to Wadi Rum which is itself the site of a wide range of different archaeological remains left behind by numerous different cultures over at least 12,000 years (Tetra Tech International Development 2022b).

Although most previous studies within and around the AOI have not been published or only partially published, the few preliminary reports available do certainly support the idea of a richness to the area's archaeological resource that is not reflected within the MEGAJordan data.

A preliminary report (Jobling 1984) and online documentation (Corbett 2025) for the Aqaba-Ma'an Archaeological and Epigraphic survey documented the identification of numerous sites in the general area; although none have yet been published to the extent that they can be incorporated into the MEGAJordan database. These include numerous prehistoric sites (lithic and ceramic scatters, stone circles, enclosures, rock shelters, desert settlements, and cairns); an early Islamic village and open-air mosque; extensive wadi systems with springs, pools, wells, cisterns and dams; and (of particular note) thousands of boulders and rock faces featuring rock art and inscriptions dating from the Prehistoric to the Modern period (Jobling 1984; Corbett 2025).

The 2014 season in Wadi Ramm (partially within the AOI) also identified 22 new sites comprising 18 structures, 164 examples of rock art, over 70 inscriptions, and associated ceramic and lithic scatters (Farès & Norris 2017). Finally, single seasons of the Wadi Hafir Petroglyph Survey and the Wadi Judayid Epigraphic Survey (both outside but close to the AOI) identified 1,200 and 1,888 inscription and rock art sites, respectively, and estimate many thousands more await discovery (Corbett 2011, 2015). Data provided for the Wadi Hafir Petroglyph Survey by Mr Glen Corbett (Project Director) is depicted within Figure 3-24 to demonstrate the sheer density of rock art and inscription sites typically present within the wadis of the AOI (Corbett 2010).

In summary, there is good potential for many, as yet unidentified, archaeological sites to exist across the AOI. These sites would certainly include above-ground sites and are also likely to include buried sites, although potential for the latter is uncertain as most investigations of the area have been restricted to ground surface surveys. Considering the types of sites found across the region generally, they are likely to include all periods and many different site types, including flint and ceramic scatters, stone circles and enclosures; agricultural installations; towers; and graves and cemeteries. The potential for further rock art and inscriptions on rock outcrops and particularly within wadis is also very high. Any such sites are of as an yet unknown significance (Tetra Tech International Development 2022a).

While the archaeological potential of the Project Area is assessed to be high, it is nevertheless important to note that this archaeological resource may have been subject to loss or damage within certain parts of the Project Area itself. In particular, the route of the pipeline is likely to have been heavily disturbed by the previous development of the existing road. The potential for further archaeological remains within the footprint of the proposed pipeline is therefore predicted to be low. This is supported by the CH Arabia survey conducted which identified no new surface assets across this part of the Project Area. Nevertheless, a **low** potential for buried archaeological remains.

The route of the OHTL passes variably through developed land (agricultural and urban areas) and apparently undisturbed desert. Some previous disturbance is therefore likely and the potential for archaeological remains within the footprint of the proposed OHTL is thus predicted to be low-moderate. Based on the results of the CH Arabia survey, which found no new surface assets across this part of the Project Area, this assessment is refined to predict a **low** potential for buried archaeological remains across this area.

Finally, the site of the PV plant appears to be undisturbed by modern development and thus is predicted to retain a high potential for further archaeological remains. Based on the results of the CH Arabia survey, which found 5 surface sites considered to be of low significance within this area, this assessment is refined to predict a **moderate** potential for buried archaeological remains in this location, including potential for assets which relate to the metalworking activities evidenced at AHF003. Based on the results of the CH Arabia survey, any further buried remains are most likely to comprise common site types typical within the area and of low, local significance. However, this cannot currently be definitively ascertained.

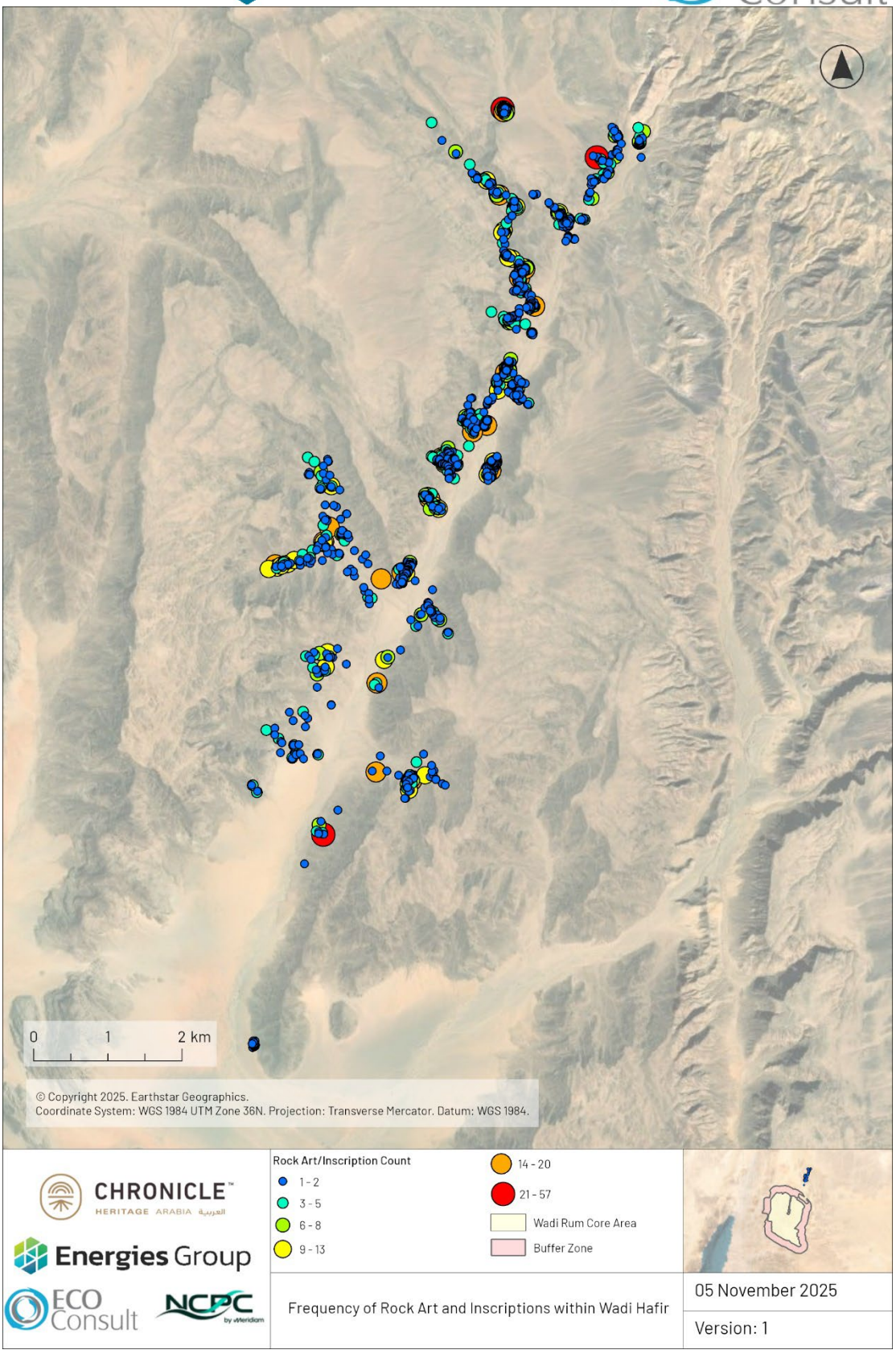

Figure 3-24. Frequency of rock art and inscriptions within Wadi Hafir.

3.6 Historic Landscape Character, Setting, and Historic Views

Baseline Assessment

A detailed baseline description and assessment of the area's historic landscape character, the setting of relevant heritage assets, and important historic views was included within the Scoping Report. It was informed by a thorough scoping visit to the AOI and the WRPA. This baseline will be used against which to assess impacts of the Project and is reproduced below.

Historic Landscape Character and Views from Development Area

Pipeline Route

The route of the proposed pipeline generally follows an existing road as it travels east-west through the WRPA's buffer zone, just north of the northern boundary of the WRPA's core area. Along this line, the existing road is an evident feature within all views and presents as a dark tarmacked surface with white and yellow road markings that stand out starkly against the orange-brown desert surrounds. An existing OHTL also runs along the side of the road, and some streetlights are present along the roadside towards the east (Figure 3-25).

Otherwise, beyond the road, views are dominated by a vast, largely flat, desert landscape with orange-brown sand stretching off into the distance and dotted in places by sparse, low, shrubs. On all sides, dark, rocky mountains and outcrops rise up above the desert sands and are dominant and impressive features within all views. The road passes close to some of these rocky massifs in places. Many form interesting formations (Figure 3-26) and provide the viewer with both impressive close-up views and expansive vistas that are both aesthetically pleasing and majestic (Figure 3-27 and Figure 3-28). The most impressive views are of course to the south, into the WRPA, as this is where the largest rock formations lie.

These aspects of the landscape, their relatively untouched condition, and the views they permit, are reflective of the historic situation, in which the landscape would have been traversed and used, but in a generally ephemeral way (e.g., pastoralism, camps), leaving the landscape predominantly natural and untouched. The road, OHTL, and streetlamps are existing modern developments that are intrusive within this landscape and views; however, the landscape is generally otherwise relatively untouched and is likely to look much as it has for eons past.

The well-preserved remains of the Aqaba Railway line also intersects with the Project Area in places, while in other areas it diverts from the existing road and the proposed pipeline route to run further north. It is a low, unassuming feature in the landscape that does not detract from the largely natural surrounds of the Project Area and, indeed, confers heritage significance through its association with the Ottoman Hejaz railway and its exemplification of Jordan's late twentieth-century industrial and infrastructural development.

Although the historic landscape character and historic views along the pipeline route are generally well-preserved, there are instances of intrusive modern development along its length. Spread across the central part of the route, there are a number of small villages and groups of buildings adjacent to the road that encroach locally upon the desert (Figure 3-29). The impact of these is relatively limited until the route passes into and east of Disi; from this point, the large village of Disi and large expanses of cultivated fields north of the road make the area rather more modern and urban/agriculture in character. At the western end of the route, a number of modern buildings,

some agricultural fields, and a large substation (Figure 3-30) are also intrusive within historic views.

Where intrusive development does exist, it is generally to the north of the road, meaning that views southwards into the core area of the WRPA are generally undisturbed and largely preserved as they would have been in the past (Figure 3-31). As noted, agricultural fields lie to the north of the road along the eastern end of the route; some more distant OHTLs are also visible from the route in various locations looking north (Figure 3-32). While traffic along the road creates some amount of pollution, light, dust, and noise, this is relatively minimal and has a limited impact upon the setting of nearby heritage assets or the historic landscape character in general.

The only other notable visual impact appears to be dirt vehicle tracks which are visible in numerous places either side of the main tarmacked road (Figure 3-33) and which upset the pristine and aesthetic character of the desert sands. Some areas beside the road, particularly towards the eastern end of the route, were also noted to have been artificially truncated, flattened, or graded (Figure 3-34). The existing PV plant which lies to the north of the western end of the route cannot be seen from the pipeline route. Long-distance views are generally hazy due to the heat.

Figure 3-25: The existing road through the WRPA's buffer zone, looking southeast.

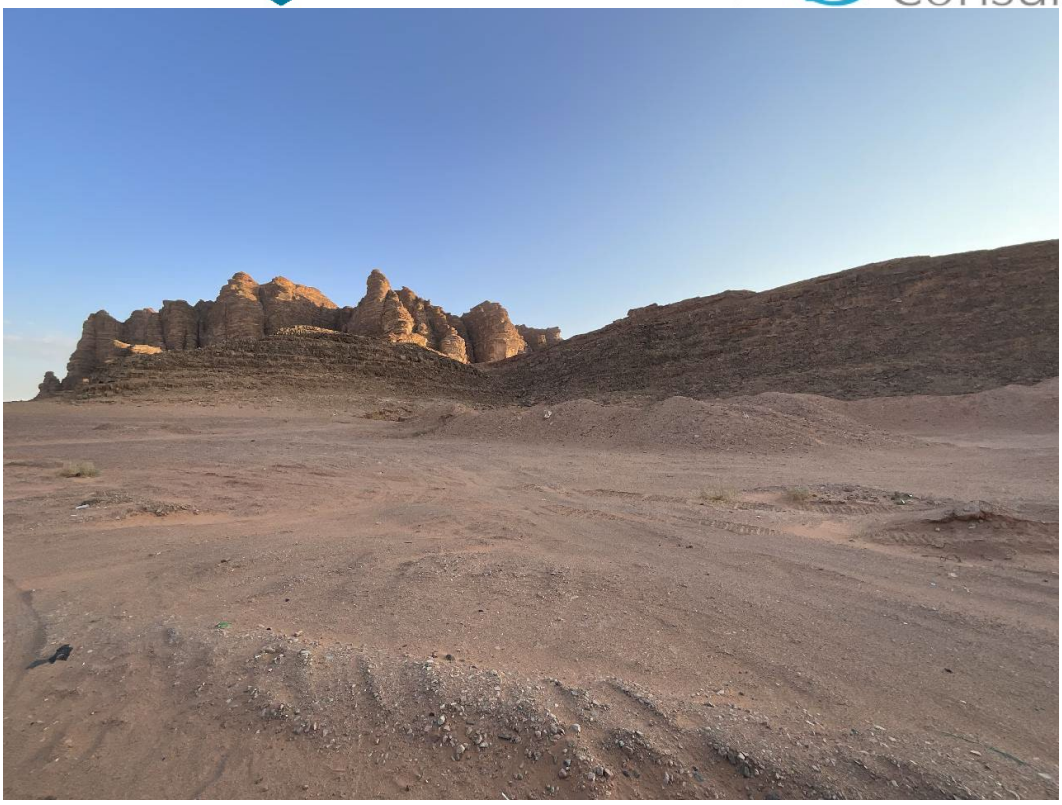

Figure 3-26: Impressive rock formations within the WRPA, looking south.

Figure 3-27: Expansive and majestic views into the WRPA, looking south.

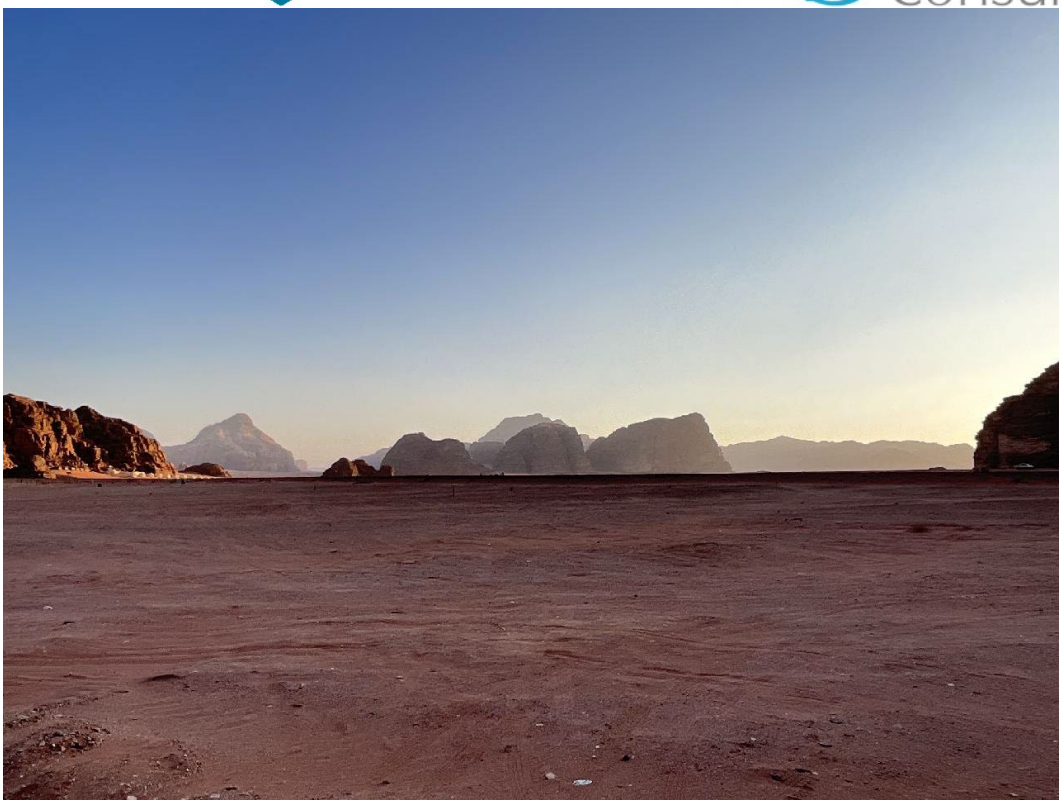

Figure 3-28: Expansive and majestic views into the WRPA, looking south.

Figure 3-29: A small village just outside of the WRPA core zone, looking southeast.

Figure 3-30: Substation within the northern buffer of the WRPA, looking southwest.

Figure 3-31: Well-preserved views into the WRPA, looking south.

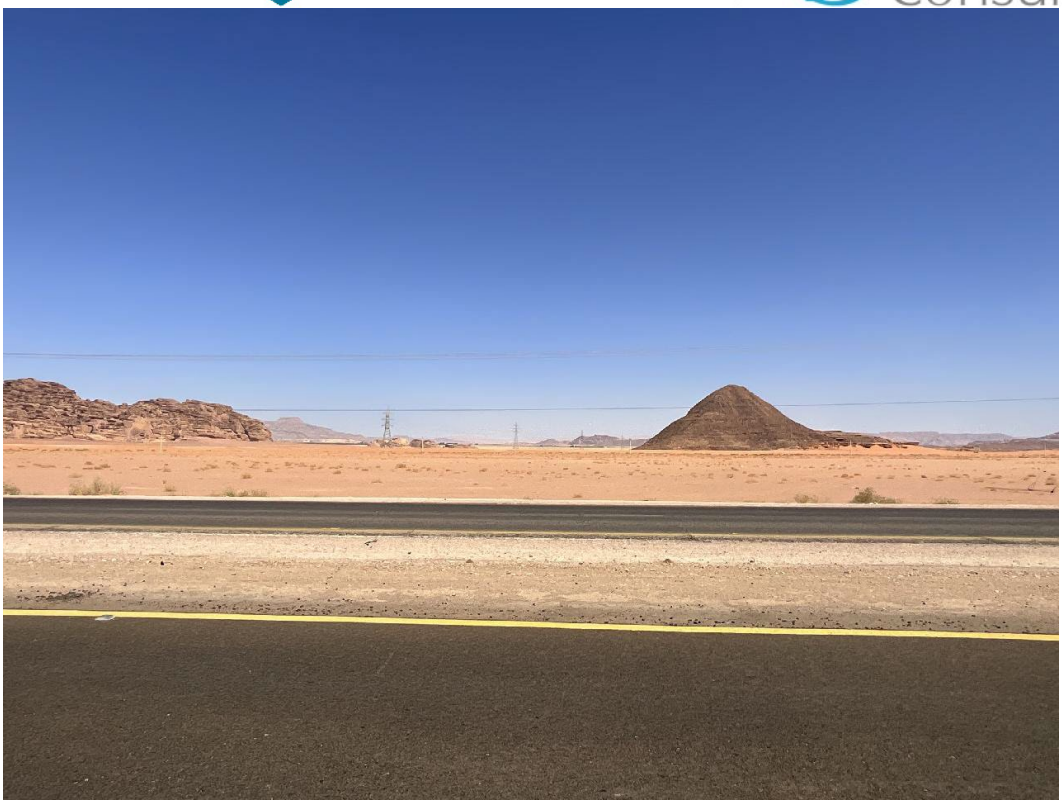

Figure 3-32: Existing OHTLs visible within the WRPA buffer zone, looking north.

Figure 3-33: Dirt tracks across the desert, looking southwest.

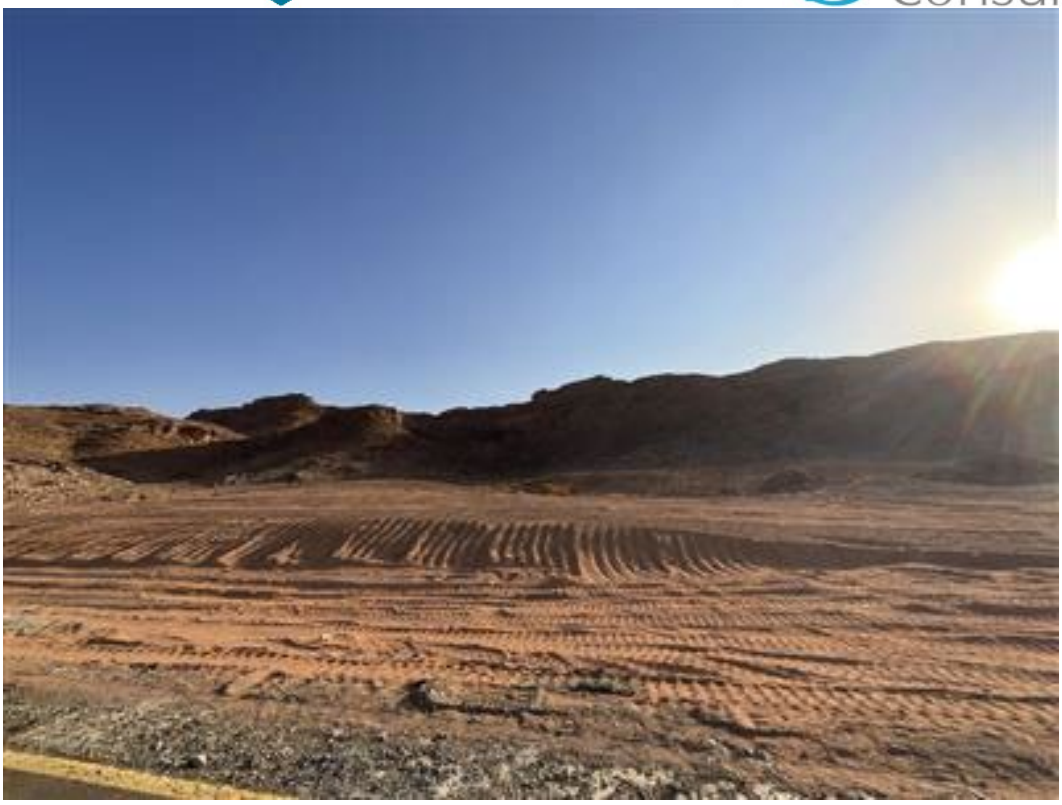

Figure 3-34: Graded areas next to the existing road in the WRPA buffer zone, looking southwest.

OHTL Route

The route of the OHTL follows an existing north-south road along the west of the WRPA before departing to run through undeveloped farm land to the north. In general, the historic landscape character is less intact, and preserved historic views more limited, along the route of the proposed OHTL as compared to the route of the pipeline. This is because it passes through an area of modern residential development and, in the north, through an area that has been partially developed for modern agriculture (plantations and fields and associated infrastructure, e.g. fencing). A number of existing OHTLS are also visible in this area in views to both the north and south (Figure 3-35).

Nevertheless, the route does pass through many areas of undisturbed desert and thus retains views that would be reflective of the situation in the past (Figure 3-36). Two mosques are present within the settlement also provide points of cultural interest (Figure 3-37 and Figure 3-38).

Figure 3-35: Agricultural fencing and OHTLs along the new OHTL route, looking northeast.

Figure 3-36: Undisturbed desert landscape, looking west.

Figure 3-37: Mosque along the route of the new OHTL, looking southeast.

Figure 3-38: Mosque along the route of the new OHTL, looking northeast.

Location of Solar PV Plant

The location of the solar PV plant presents as an entirely undeveloped area of desert, apart from some minor vehicle tracks and a small, tarmacked road. Despite the relatively short distance between this site and the existing PV to the south, the existing plant cannot be seen in views to the south. The site thus retains intact, historic views towards the massifs of Wadi Rum, although these are distant and not highly visible (Figure 3-39). Nevertheless, the site preserves an important historic view towards the protected area that reflects what ancient and historic travelers would have seen and experienced as they approached the Wadi Rum area.

A closer inspection of the existing PV plant showed that this is likely difficult to see within longer views because it is actually relatively low to the ground. While its visibility may depend on which way the reflective panels are facing at the time, it is generally not greatly evident from surrounds, apart from in the immediate vicinity (Figure 3-40).

Figure 3-39: View from the Solar PV Plant site towards the WRPA, looking south.

Figure 3-40: The low-lying, existing Solar PV Plant, looking south.

Historic Landscape Character and Views from the WRPA

The WRPA core area has a largely undisturbed historic landscape character and for the most part presents as a natural area characterised by desert sands and rocky massifs. The sheer sides and sometimes unusual formations of the rock massifs dominate views and provide pleasing and impressive vistas (Figure 3-41). Often, the landscape allows vast vistas across the majestic landscape (Figure 3-42); within some wadis and areas enclosed by rocks, these views are more intimate and equally impressive (Figure 3-43).

The area's historic landscape character is best preserved towards the center and south of the Protected Area which, with the exception of Wadi Rum village in the center of the WRPA, lies furthest from surrounding modern development. Even close to Wadi Rum village, the dominance of the natural landscape and its historic character is well preserved, considering the small, low-key character of the settlement and contrasting majesty and magnitude of the surrounding rocky massifs and desert (Figure 3-44).

Historic landscape character is slightly more impacted by modern intrusive development towards the north of the WRPA core area. From the northern end of the core area, various power lines are intrusive within views northwards, as are the various settlements, groups of buildings, and large agricultural areas that exist along the northern edge of the WRPA and within its northern buffer zone. While evident within views, this infrastructure is limited and does not tend to interrupt the overall impression of the natural landscape; this is often thanks to the fact that the rock massifs in any case dwarf and remain prominent above the low, modern infrastructure (Figure 3-45).

Although the WRPA core area largely retains its historic landscape character, vehicles and vehicle tracks are having an increasingly important detrimental impact upon the natural, pristine

character of the area (Figure 3-41 and Figure 3-46). The noise, pollution, and particularly the dust caused by vehicles are also detrimental impacts. Modern structures (some abandoned), trash, camps, and scrap also exist in some places (Figure 3-47) and detrimentally impact the untouched natural beauty of the landscape.

Figure 3-41: Impressive vistas dominated by the vertical rock massifs, looking northwest.

Figure 3-42: Vast, majestic vistas across the WRPA, looking northeast.

Figure 3-43: Equally impressive, intimate views within the WRPA, looking north.

Figure 3-44: Wadi Rum village, dwarfed by rocky massifs on either side, looking south.

Figure 3-45: Modern buildings just visible below hills in the WRPA, looking northwest.

Figure 3-46: Dirt tracks, vehicles, and dust impacting the desert, looking northwest.

Figure 3-47: Abandoned structures, camps, and scrap within the WRPA, looking east.

Setting of Heritage Assets

The setting of those heritage assets identified within the AOI vary in nature, according to each site's type and function, age, and condition as well as the nature of its surrounds and the degree to which they may have been altered over time. A brief discussion of the setting of each site is provided below.

NN/Ma'an Desert Survey Site 8

The lack of information available regarding this site makes it difficult to assess which aspects of its setting may reflect and enhance its significance and which may be intrusive within it. It should nevertheless be noted that this site sits at the base of a cliff within the WRPA's buffer zone. It retains a long view down a sandy, east-west wadi tributary, but otherwise is enclosed by large rocky massifs which prevent any intervisibility with the wider surrounding landscape, including the village of Disi which lies behind one such large massif to the north.

Although the age, type, and function of the site is unknown, its location suggests it was originally created within a largely natural landscape. While it may be possible to experience ambient noise and light associated with Disi from the site, the site therefore generally retains a peaceful, natural and undeveloped setting that is likely to be reflective, and conducive to the preservation, of its heritage significance.

NN/Raikes Site A2

The NN/Raikes Site A2 is recorded within a Project's ESIA report (Tetra Tech International Development 2025) as having been washed away. As such, the site can no longer be considered to have a setting in any meaningful sense. For the purposes of this report, its setting should be considered lost as the site itself no longer exists.

Mersed

Mersed is the location of another watch tower and is located on a high plateau which separates Wadi Yutum and the WRPA. Positioned on the edge of a steep cliff, it retains commanding views across Wadi Yutum to the west. Its views down into the wadi have changed considerably since its construction, with the introduction of Highway 47 and a number of urban and agricultural developments. Increased noise and light levels associated with these developments may also be experienced from the site and intrude upon its historic setting.

While these developments are visible and intrusive within the site's historic setting, they do not alter appreciation of the tower's original function, nor more distant views across the desert landscape. Views from the site across the natural, mountainous landscape of Wadi Rum to the east are also unspoiled. Although Highway 47 is at odds with the historic character of the site's setting, it is represents the site's original views across an important route of travel and communication and is reflective of the site's original purpose and use.

NN/Ras An-Naqb Highway Survey Milestone

As the NN/Ras An-Naqb Highway Survey Milestone has been removed from its original location, the site can no longer be considered to have a setting in any meaningful sense. For the purposes of this report, its setting should be considered lost as it is no longer present within its original location.

WR-14_19

The cairns and rock art which comprise site WR-14_19 are located on the top of a small rocky outcrop which jutts out into the sandy basin of the northern end of Wadi Ramman and intersects with the Project AOI. This site's elevation affords clear views south, deeper into Wadi Rammam and the WRPA, revealing a natural and majestic desert landscape, undisturbed by modern development. Views in other directions are also generally characterised and dominated by natural features, although an existing road to the north and a small village (present since at least 2004) to the west are visible. While these modern developments would not have been present within the site's historic setting, they do little to detract from the predominantly natural, majestic surrounds. Nor do they detract from the site's elevated and prominent location above the desert basin, a location that would have purposefully chosen for the cairns to make them conspicuous and prominent to passers-by.

WR-14_22

The rock art comprising site WR-14_22 lies on the lower slopes of the northern face of a small rocky outcrop in the northern end of Wadi Ramman, approximately 450m southwest of site WR-14_19. This rock art would have originally sat adjacent to the undeveloped wadi bed and natural surrounds, reflected and reinforced by the inclusion of local, native fauna (e.g., ibex, oryx) amongst the site's carvings.

Although Wadi Ramman has witnessed generally very minimal development since antiquity, the historic, natural setting of this site is intruded upon by the introduction of a number of modern structures at the base of the outcrop, immediately north of the site. Further structures have been introduced to the southwest of the outcrop. Satellite imagery indicates that structures (likely for occupation) were introduced and proliferated in this location from at least 2016. Although some of these structures now appear dilapidated, the location is marked on Figure 3-48 as the site of a Bedouin camp and is thus likely still active. While the presence of a culturally important camp adjacent to the site may be reflective of the historic relationship between the site and traditional desert occupants, the modern character of the structures does still detract from this site's setting.

Despite their small size and the surrounding unaltered landscape, the proximity of these structures to the site make them considerably intrusive within, and detract from, the site's historic setting. The dilapidated character of the structures and associated scrap also detract generally from the aesthetic of the site, interfering with the appreciation of the rock art and its wider majestic surrounds.

Aqaba Railway

The Aqaba Railway runs through a largely undeveloped and natural landscape. While it is itself a modern infrastructural development related to modern industrial practices, its setting is therefore in contrast to its own historic character. Nevertheless, the retention of a predominantly natural, undeveloped landscape is reflective of the landscape it would have passed through following its construction and during its operation.

AHS002-AHS005 and AHF003

Sites AHS002-AHS005 and AHF003 are all located within the same area and have a comparable historic setting. They lie within a flat, natural and deserted area that remains predominantly undisturbed by modern development. The retention of this natural and undeveloped setting

contributes to an understanding of their original landscape setting and an appreciation of the vast, remote, and often inhospitable, environment that past peoples would have lived in and experienced.

AHF004 and AHF005

Features AHF004 and AHF005 also have comparable settings, as both lie in or close to rocky massifs just to the south of the existing road. The modern road detracts from the historic setting of AHF004 to some degree, although its undeveloped and natural surrounds are otherwise undisturbed and reflect the kind of environment in which the feature would have originally formed. As building AHF005 is itself modern and was likely constructed when the road was already in existence, the modern road is likely to have been part of its original setting and does not detract from the feature's significance. The setting of AHF005 is therefore considered intact. Key Historic Views and Significant Visual Receptors

A list of key historic views and significant visual receptors has also been identified, so that impacts to these significant aspects of the area's heritage significance can be assessed. As the number of possible views looking toward, out from, and around the WRPA are numerous, CH Arabia as identified those that are most significant. These include views that are best preserved, most representative of the historic situation, and/or those that convey important information about how the area would have been experienced and viewed in the past. Significant visual receptors are also identified below (Table 3-4).

Table 3-4. Key Historic Views and Significance Visual Receptors

Key Historic View/Significant Visual Receptor	Justification	Integrity	Level of Sensitivity
Key Historic Views			
Views towards Wadi Rum from relatively undeveloped areas to the north. These include the proposed site of the new PV plant and undeveloped areas to the north of the existing road but west of Disi.	These views have been identified as they preserve and convey an idea of how Wadi Rum would have been approached and seen in both the ancient and historic past.	Moderate (Modern infrastructure is intrusive within some of these views)	Moderate (Already partially impacted)
Views either way along the length of the WRPA's various north-south wadis.	These views have been identified as they provide an idea of how past peoples travelling through Wadi Rum may have experienced it.	High (Largely unaffected by modern development and activity)	High (Generally pristine and unaffected)
Views either way along east-west tributaries within the WRPA.	These views have been identified as they provide an idea of how past peoples travelling through the wadi may have experienced it; especially considering evidence identified for important east-west travel routes cross Wadi Rum (Farès & Norris 2017).	High (Largely unaffected by modern development and activity)	High (Generally pristine and unaffected)

Key Historic View/Significant Visual Receptor	Justification	Integrity	Level of Sensitivity
Views from accessible high points in the landscape, particularly those where cairns have been placed (e.g., site WR-14_19).	These views have been identified as they convey the views people would have experienced when accessing and using these high points, whether for burial, ritual, or travel purposes.	High (Modern OHTL lines and road visible but generally unobtrusive in these long views)	Moderate (Already partially impacted)
Views from wadi beds within Wadi Rum towards cairn sites that sit on high points in the landscape.	These views have been identified as they show how people would have seen, experienced, and perceived of these funerary sites, which were intentionally placed on high points to be visible, dominant, and perhaps even to convey power or ownership over an area.	High (Largely unaffected by modern development and activity)	High (Generally pristine and unaffected)
	Significant Visual Receptors		
Existing road through the WRPA buffer zone	Represents a highly-frequented travel route that large numbers of people will experience the WRPA from	Moderate (Provides important views but is inevitably impacted by modern infrastructure)	Moderate
Road along Wadi Yutum where it passes through the Project Area	Represents a highly-frequented travel route that large numbers of people will experience the WRPA from; and follows a long-used travel route through the region	Low (Provides important but distant views and is inevitably impacted by surrounding modern infrastructure)	Moderate (Already partially impacted)
Bedouin Camps (as identified on Figure 3-48)	Although often comprising modern structures, these camps reflect a traditional style of occupation across the landscape. The views from them are thus important to experiencing these camps and the traditional aspects of the landscape's occupation and use that they reflect.	High (The majority of camps retain a natural and predominantly undeveloped landscape setting)	High (Generally pristine and unaffected)

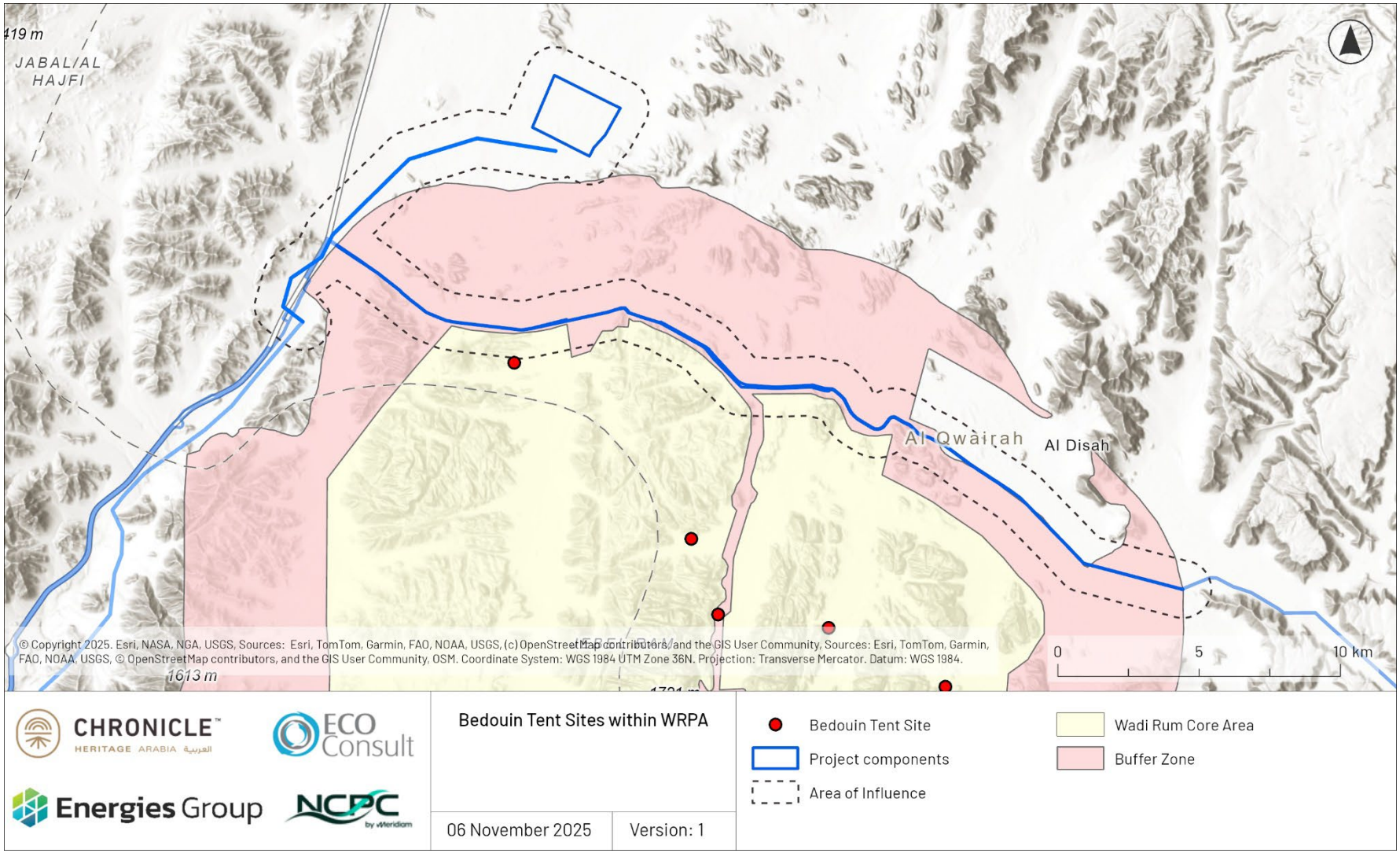

Figure 3-48. Identified location of existing Bedouin Tent Sites.

3.7 Intangible Cultural Heritage

There are several ICH that represent cultural expressions, understandings, and interactions with the landscape that are related to the WRPA. As a State Party to the *UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage* (UNESCO 2003), Jordan has made significant progress documenting and promoting its living heritage.

As of 2024, seven elements practiced in Jordan are inscribed on UNESCO's *Representative List of the Intangible Cultural Heritage of Humanity* (UNESCO 2025b) (Table 3-5). These elements represent the country's diverse cultural expressions, ranging from hospitality traditions and culinary practices to social rituals, craftsmanship, and the living Bedouin heritage of Wadi Rum and Petra. Only the first inscription from 2008 directly relates to the WRPA, but an additional five are indirectly related as they are part of the national identity of Jordan and part of the cultural milieu of the region.

Table 3-5. UNESCO-Recognized ICH Elements in Jordan.

Year	Element	Associated Communities/Regions	Description
2008	Cultural Space of the Bedu in Petra and Wadi Rum	Wadi Rum, Petra	Jordan's first inscription, this element represents the oral poetry, knowledge of nature, tribal customs, and traditional skills of the Bedouin communities of southern Jordan. The cultural space includes practices of camel breeding, navigation, and storytelling that shape Bedouin identity and their relationship with the desert environment.
2018	As-Samer in Jordan	Nationwide	A collective performing art combining dance, rhythmic movement, and sung poetry, traditionally performed at weddings and community celebrations. As-Samer strengthens social bonds and transmits oral literature across generations.
2021	Arabic Calligraphy: Knowledge, Skills and Practices	Amman, Irbid, Zarqa, and national art institutions	A regional inscription emphasizing the art of Arabic script as a key cultural expression. In Jordan, calligraphers, teachers, designers, and artisans maintain diverse calligraphic traditions in educational, religious, and artistic contexts.
2022	Date Palm: Knowledge, Skills, Traditions and Practices	Jordan Valley, Aqaba, Ma'an	A multinational inscription highlighting the cultivation, processing, and use of the date palm. In Jordan, it is practiced in the Jordan Valley and southern oases, linking agricultural heritage to social and festive traditions.
2022	Al-Mansaf in Jordan: A Festive Banquet and Its Social and Cultural Meanings	Nationwide	Jordan's national dish, Mansaf, symbolizes generosity, unity, and identity. The preparation and communal consumption of Mansaf are central to family gatherings, weddings, and tribal events, reflecting deep-rooted Bedouin customs of hospitality.

Year	Element	Associated Communities/Regions	Description
2024	Arabic Coffee, a Symbol of Generosity	Nationwide	An extended multinational inscription recognizing the centrality of Arabic coffee (*gahwa sada*) in Arab hospitality. In Jordan, coffee rituals accompany reconciliation councils, celebrations, and daily hospitality, symbolizing honour and respect.
2024	Henna: Rituals, Aesthetic and Social Practices	Southern and central Jordan	A transnational inscription representing the social, ritual, and artistic uses of henna. In Jordan, henna adornment is integral to weddings and festive events and is practiced by women in both rural and urban communities.

In addition to the UNESCO recognized ICHI, Jordan maintains a National Inventory of Intangible Cultural Heritage, coordinated by the Ministry of Culture and the Department of Antiquities, with technical support from UNESCO (Ministry of Culture 2021)(Table 3-6). The inventory follows the five UNESCO ICH domains: oral traditions and expressions; performing arts; social practices, rituals and festive events; knowledge and practices concerning nature and the universe; and traditional craftsmanship (UNESCO 2016). Some of these directly and indirectly relate to the WRPA.

Table 3-6. Nationally Recognized (Non-Inscribed) ICH in Jordan.

UNESCO Domain	Element	Associated Communities / Regions	Description
Oral Traditions and Expressions	*Nabati* poetry and oral verse	Bedouin tribes	Traditional poetic form used to commemorate tribal events, express values of honour, and transmit oral history.
	Proverbs and oral genealogies	Rural and Bedouin communities	Use of sayings and genealogical recitation to transmit ethical values and lineage knowledge.
Performing Arts	*Dabke* (folk dance)	Nationwide; especially northern and central governorates	Line dance performed at social gatherings and weddings; symbol of communal unity and celebration.
	Rababa and *mijwiz* music	Southern desert and rural areas	Traditional string and reed instruments used in Bedouin song and oral poetry.
Social Practices, Rituals and Festive Events	Tribal reconciliation councils (*majalis al-sulh*)	Bedouin and tribal communities	Customary dispute-resolution assemblies using dialogue, mediation, and symbolic rituals such as the "cup of coffee" ceremony.
	Wedding and engagement rituals	Nationwide	Series of customs including henna nights, music, and communal feasting that affirm social bonds.
	Religious and seasonal festivals	Nationwide	Celebrations such as Eid al-Fitr, Eid al-Adha, and harvest festivals

UNESCO Domain	Element	Associated Communities / Regions	Description
			marking communal cooperation and gratitude.
Knowledge and Practices Concerning Nature and the Universe	Camel breeding and racing traditions	Wadi Rum, Ma'an, Aqaba	Knowledge of camel care, lineage, and desert navigation; integral to Bedouin identity and desert ecology.
	Traditional herbal medicine	Ajloun, Karak, Ma'an	Local healers' knowledge of medicinal plants, mineral waters, and holistic treatment.
	Water-sharing and irrigation customs (*qanat* and *sabeel*)	Jordan Valley, Karak	Traditional systems of equitable water distribution, managed through communal rules and oral agreements.
Traditional Craftsmanship	*Sadu* weaving	Bedouin women	Hand-woven textiles using goat and camel hair, featuring geometric designs used for tents and furnishings.
	Embroidery (*tatreez*)	Women's cooperatives nationwide	Embroidered motifs reflecting regional identities and social status, often used in traditional dress.
	Leatherwork and saddle-making	Ma'an, Wadi Rum	Traditional production of saddles, harnesses, and bags, often ornamented with beadwork.

Jordan's rich ICH encompasses a diverse array of practices, expressions, knowledge systems, and skills that are passed down through generations and shape community identity, social cohesion, and relationships with the environment that are not nationally or internationally inscribed (Table 3-7). These elements reflect the interplay between urban, rural, and Bedouin communities, demonstrating how language, ritual, and craft continue to sustain cultural identity and resilience. Understanding these living traditions is critical for assessing potential impacts of the pipeline project and for designing appropriate safeguarding and mitigation measures. Again, some of these directly and indirectly relate to the WRPA.

Table 3-7. Additional ICH in Jordan

ICH Domain	Element	Community/ Region	Context	Current Status	Description
Oral Traditions and Expressions	Rock Art Traditions and Oral Memory	Nationwide, but particularly in wadis	Oral storytelling; observation and imitation of motifs; intergenerational transmission through craft, education, and community tourism	Continuing / Revitalized	Rock engravings depicting hunters, animals, and inscriptions embody ecological knowledge and moral codes of desert life. Contemporary initiatives reinterpret rock

ICH Domain	Element	Community/ Region	Context	Current Status	Description
					art through living craftsmanship, heritage education, and guided storytelling (Al-Manaser & Alturki 2025; Farès 2006)
Performing Arts	*Rababa* and *mijwiz* music	Southern desert and rural areas	Accompanies tribal poetry and ceremonies	Continuing	Traditional string and reed instruments used in Bedouin song and oral poetry (UNESCO 2017).
Social Practices, Rituals, and Festive Events	Medaina Festival	Petra and Wadi Rum	New	Active; combines cultural and tourism promotion.	Immersive desert event and festival blending music, art, and Bedouin heritage experiences (Ardehali 2025).
	Camel Racing Festivals	Diesah–Wadi Rum, Aqaba Governorate	Major events across the Middle East, including the Sheikh Zayed International Festival in the UAE, Crown Prince Festival in the KSA, and Arab Cup Festival (September–January).	Actively practiced; significant regional participation and heritage value.	Annual camel racing events central to Bedouin heritage, featuring community gatherings and friendly competition (Wadi Rum - ADCRC 2023).
Knowledge and Practices Concerning Nature and the Universe	Falcon Hunting	Al-Jafr Desert, Ma'an Governorate	Environmental and wildlife knowledge, animal husbandry, and traditional hunting techniques.	Actively practiced during the annual hunting season (September–November); continues as a valued cultural heritage.	Traditional Bedouin practice involving the seasonal hunting and training of falcons, requiring specialized ecological knowledge and skills linked to desert life (Krawietz 2014).
	Camel breeding and racing traditions	Wadi Rum, Ma'an, Aqaba outskirts	Animal husbandry, desert navigation	Actively practiced	Knowledge of camel care, breeding, racing; central to

ICH Domain	Element	Community/ Region	Context	Current Status	Description
					Bedouin identity (Haddad 2025).
	Traditional Pastoralism and Seasonal Mobility	Bedouin and semi-nomadic communities of Maʿan, Wadi Rum, Hisma Basin, and the Eastern Badia	Environmental knowledge; livestock care; seasonal grazing and navigation practices; oral traditions and social organization	Continuing / Evolving	Traditional mobility, herd management, and environmental care adapted to arid landscapes. Oral knowledge of pasture cycles, water sources, and animal behaviour passed down through families and tribes, reflecting social values of cooperation and resilience (Kharabsheh & Al-Gharaibeh 2022).
Traditional Craftsmanship	Arab Kohl making (traditional eyeliner)	Bedouin women, southern Jordan	Grinding stibnite and mixing with natural oils or herbs	Continuing	Ancient cosmetic craft used to contour and protect the eyes; practiced by Bedouin women and passed down through generations as part of traditional adornment and identity (Hankir 2023).

3.8 Ecology

The Study Corridor passes through arid and largely disturbed environments, as discussed in more detail within the biodiversity chapter of the Project ESIA.

The WRPA is recognized for its outstanding natural heritage, including dramatic geological formations, distinct desert ecosystems, and significant biodiversity. These natural values form a key part of WRPA's inscription as a UNESCO World Heritage Site under both cultural and natural criteria.

Geologically, the WRPA is characterized by towering sandstone massifs, granite formations, narrow gorges, and extensive sand dunes. These diverse formations, such as Disi Sandstone, granite massifs, and volcanic outcrops, are distributed across the landscape and play a critical role in shaping its ecological diversity.

As a result of this diversity, the WRPA sustains remarkable biological diversity:

- 183 plant species, some of which are rare or endemic
- 26 recorded mammal species
- 34 reptile species
- 120 bird species.

4 Discussion of Significance

Per the methodology recommended by the UNESCO HIA Toolkit (UNESCO 2022), Table 4-1 provides an assessment of the significance of the heritage assets identified within the AOI. As a World Heritage Site, the WRPA is assessed according to its OUV; this should be read in reference to UNESCO's OUV criteria (Table 2-3) and requirements for authenticity and integrity (Table 2-4).

Table 4-1: Assessment of Significance of Heritage Assets Within the AOI

Level of Recognition	Heritage/Conservation Values	Attributes	Condition	Sensitivity
Wadi Rum Protected Area				
OUV	Exceptional testimony to the cultural traditions of the area's early inhabitants and evidence of continued habitation and land use for at least 12,000 years	Rock art, inscriptions, archaeological sites, features, and finds	Largely intact and well-preserved. Exhibits good **integrity** and **authenticity**, largely due to the area's management since 1879.	High
OUV	Evidence of long-term patterns of pastoral, agricultural, and urban human activity	Archaeological sites (n=154)		
OUV	Testimony to the widespread literacy among the area's pastoral societies	Thamudic, Nabataean, and numerous Arabic inscriptions in four different scripts (n=20,000 inscriptions)		
OUV	Illustration of deep, complex human interactions with the local environment, and the essential role of the landscape in fostering human settlement	A semiarid desert and a variety of natural landforms in combination with the rock art, inscriptions, water catchment systems, and other cultural sites imposed upon and around them.		
OUV	Illustration of the adaptability and ingenuity of human communities using scarce resources	The archaeological sites, rock art, and inscriptions that provide evidence of the continuum of settled and mobile lifestyles in the desert landscape		
OUV	Iconic desert landscape	A variety of natural landforms, but particularly their diversity and sheer size, mosaic of colors, vistas into both narrow canyons and very large wadis, and the scale of the cliffs		

Level of Recognition	Heritage/Conservation Values	Attributes	Condition	Sensitivity
OUV	An exceptional combination of landforms in a protected setting	The wide range of landforms created from different geological processes, including the world's most spectacular networks of honeycomb weathering features		
OUV	Reputation as a classic desert landscape, both globally and within Arab states	Associations of the landscape with the writings of T.E. Lawrence		
Cultural Space of the Bedu in Wadi Rum				
International	Rare and valuable illustration of ancient Bedouin cultural lifestyles and practices and their persistence into the modern day	Continued practice/knowledge/oral transmission of the following: Pastoral techniques Social and moral code Local mythology (poetry, folktales, songs) Medicine; tent-making; tracking; climbing; camel husbandry; and weaving	Poor, due to globalisation, modernisation, and the impacts of desert tourism.	High
International	Illustration of a highly integrated relationship with the natural environment and the environment's influence on settlement practices	The continued coexistence and complementary relationship of the area's settled and nomadic Bedouin communities and the local Bedouin's complex knowledge of local fauna and flora		
Historic Landscape Character				
International	Illustration of a largely intact historic landscape which conveys how the WRPA	Retention of large expanse of natural desert and rocky	Good: largely intact and well-preserved.	High

Level of Recognition	Heritage/Conservation Values	Attributes	Condition	Sensitivity
	would have appeared, and how it may have been experienced, for thousands of years in the past	outcrops with relatively minor modern incursions, particularly within the WRPA itself and looking out of from it. Retention of numerous interesting rock formations which, set within the desert, provide both intimate and expansive vistas of majestic form, particularly within the WRPA itself.		
International	Illustration of the inseparable interrelationship between the natural form and features of the land and the cultural activities and features that took place across it	Numerous rock art and illustration sites located on the natural rocky massifs of the area, and featuring desert fauna and flora (e.g. camels) Cairns lining the base of escarpments or located on high points in the landscape Water management structures exploiting springs and natural water sources Settlement and pastoral sites variously exploiting natural features, e.g., rock shelters	Good: largely intact and well-preserved.	High
The Aqaba Railway Line and Wadi Rum Train Station				
National	Associated with, and comprises a Jordanian continuation of, the Ottoman Hejaz Railway system, which is itself an asset of exceptional, international significance as a physical manifestation of the Hajj pilgrimage.	Partial alignment and intersection with the original Hejaz Railway system (albeit outside the AOI).	Good: largely intact and well-preserved.	High

Level of Recognition	Heritage/Conservation Values	Attributes	Condition	Sensitivity
National	Illustration of a major transition in the development of national infrastructure and industry and a nationally important landscape work	The well-preserved physical remains of the railway, station, and associated structures.	Good: largely intact and well-preserved.	High
Undesignated Heritage Assets (Known and Newly Identified)				
Local	Illustration of range of human activities (water management, travel, tool production, occupation, metalworking) across a wide period of time (prehistoric to modern) and typical of the local area	The sites' surviving physical remains and their historic settings as far as preserved	Variable, as identified below. Good condition: ▪ Mersed Moderate condition (some erosion, collapse, loss, disturbance): ▪ Desert Survey Site 8 ▪ WR-13_19 ▪ WR-13_22 Poor condition (considerable loss and displacement): ▪ AHS002 ▪ AHS003 ▪ AHS004 ▪ AHS005 ▪ AHF003 ▪ AHF004 ▪ AHF005 Considered lost:	Variable, as identified below. None (as already considered lost): ▪ NN/Raikes Site A2 ▪ NN/Ras An-Naqab Highway Survey Milestone High (as not protected): ▪ All remaining assets
Local	Evidential potential through further study and excavation	The sites' surviving physical remains		

Level of Recognition	Heritage/Conservation Values	Attributes	Condition	Sensitivity
			▪ NN/Raikes Site A2 (washed away) ▪ NN/Ras An-Naqab Highway Survey Milestone (relocated)	
Potential Heritage Assets (above or below ground)				
Currently Unknown	Currently Unknown	The surviving physical remains within their settings; possible other, as yet unknown, attributes	Currently Unknown. Condition of buried remains may be high.	Currently Unknown

5 Landscape and Visual Impact Assessment (LVIA)

Various assessments have been undertaken to determine the Project's impact upon the historic landscape character. As the area's historic landscape character is an important contributor to the setting of heritage assets in the AOI and the significance of the WRPA, this will also inform the determination of the Project's impact upon the heritage significance of the WRPA and undesignated heritage assets (see Section 6).

5.1 Viewshed Analysis

A viewshed analysis was undertaken which involved plotting those areas within the WRPA from which the new Project infrastructure would be visible. The same analysis was done for infrastructure that already exists (i.e. the existing PV plant and existing OHTLs), to understand how the visibility of each would compare; whether the new infrastructure proposed would have a new, cumulative, or no impact; and what the magnitude of any new or cumulative impact might be. The results of this analysis are discussed below.

5.2 Photomontages

A series of photomontages were also produced to complement the viewshed analysis and enhance CH Arabia's ability to accurately assess and demonstrate the Project's impact upon historic views and landscape character. Photomontages are photographs taken from sensitive visual receptors or of key historic views that have then had the development infrastructure projected onto them. Their purpose is to help understand, visualise, and assess how such views will be altered, negatively or positively, by a Project. The photomontages produced are discussed below in combination with the results of the viewshed analysis.

5.2.1 Visibility of Existing Infrastructure

As demonstrated by the analysis projections (see Figure 5-1), the existing OHTLs are visible from almost all locations across the WRPA's northern buffer zone, with the exception of a limited number of locations where rocky outcrops screen the infrastructure from view.

Although most WRPA wadi areas have no intervisibility with existing infrastructure (given their low-lying nature, their distance from the infrastructure, and the nature of the intervening topography), the existing OHTLs are also visible from many places within the wadis in the north of the WRPA core area. Although the existing OHTL can be seen from these locations it is, nevertheless, important to note that the infrastructure is not highly intrusive within these views.

The existing OHTLs and PV plant are also visible from most elevated points across the northern core area of the WRPA, i.e., along the WRPA's northern mountain peaks and ridges. However, as noted when standing in such locations, and demonstrated by Figure 5-2, this infrastructure is not highly visible or intrusive upon the historic landscape character. As demonstrated by Figure 5-2, the OHTL pylons are visible but do not break the horizon within these views. As such, they are not easily discernible and indeed are unlikely to even be visible on hazy days or during the night. Considering their minor intrusion on these views, they detract to only a minor degree from the appreciation of the wider natural landscape and expanse of desert in general. The PV plant can be seen from elevated points as low rows of tiny structures in the distance but are seen in the context

of surrounding agricultural development (Figure 5-2). As such, the PV plant similarly detracts only negligibly from appreciation of the wider natural landscape and its historic character.

It is also important to note that most of these projected elevated views would in fact never be experienced, given the rugged and inaccessible terrain they would be possible from. Although some of these high points would have been accessible in the past, and some were indeed exploited as the location of funerary or waymarking structures (e.g., the cairns at site WR-14_19), a large proportion would not have been accessible or used by past peoples, given the difficulty accessing them as well as the limited resources such high rocky areas would have provided. As such, while the existing infrastructure is visible from most high points across the northern core area of the WRPA, in reality, these views would not have been seen or experienced to a very great degree in the past. As such, most do not contribute to an appreciation and understanding of the WRPA's heritage significance.

While the lack of current access to an area does not preclude it from having a historic setting, it is also important to note that current access to these high points (e.g., to tourists and local communities) is also very limited and, even then, generally limited to people with specialist guides. As such, these views are also unlikely to be seen or experienced by more than a small minority of people and will not figure prominently within the general appreciation of the area's heritage significance and historic character. In summary, these elevated views largely do not form an integral part of, or reflect, the Wadi Rum experience (either today or in the past), which is instead mostly focused within the low wadis of the WRPA.

5.2.2 Visibility of Proposed Infrastructure

Pipeline Construction Works

As demonstrated by Figure 5-1, works, machinery, spoil heaps, and other effects (e.g., dust) associated with the construction of the pipeline will be visible across some areas of the WRPA's buffer zone and northern core area. Views of the construction works from the core area will, however, largely be limited to elevated points within the WRPA. It is also important to note that these visual impacts will only be experienced temporarily over the short term, while the pipeline is being constructed. Following the completion of the construction phase, these impacts will be entirely reversed. As such, the impact of the pipeline construction works upon the area's historic character is assessed to be **negligible**, temporary, and short-term.

Proposed OHTL and PV Plant

When compared with the visibility of the existing OHTLs, it is clear that the new OHTL and PV plant (see Figure 5-1) will be visible from a far smaller range of locations. The OHTL will be more visible than the PV plant, particularly within the northwest of the WRPA buffer zone.

As demonstrated by Figure 5-1, at least some element of the proposed Project infrastructure will be visible from many areas within the western end of the WRPA's northern buffer zone, but from very limited areas within the buffer zone's eastern end. Across the WRPA buffer zone, the new infrastructure will only be visible from locations from which one can also already see the existing OHTLs. This means that the new infrastructure will have a cumulative, rather than a new, impact upon the historic landscape character and historic views. This is clearly demonstrated by Figure 5-3.

The new infrastructure will also be visible from limited locations within the WRPA core area. Visibility will be limited to a limited number of elevated locations within the north (and largely

within the northwest) of the WRPA core area, and to some areas along the northern end of Wadi Rammam, which lies in the west of the WRPA core area.

While the OHTL, and in some cases the PV plant, will be visible from a limited number of elevated locations, their impact upon the landscape within these views will be **negligible** to **indiscernible** (none). This is because, as demonstrated by Figure 5-4, the OHTL, even when visible, they will be barely discernible against the existing landscape and only as a series of tiny black points. This is due to the vast distance between the pylons and the WRPA. The pylons will not break the horizon or skyline and will in no way preclude a continued appreciation of the vastness, majesty, and aesthetic of the natural landscape or what it conveys about the historic development and character of the area. The PV plant will be even less intrusive within even fewer views, given the fact that it is lower to the ground, more distant from the WRPA, and behind an existing PV plant. On hazy days or during the night, the new infrastructure will not be visible at all.

It should also be noted that, within these views, existing OHTL lines are already present and lie closer to the WRPA (see Figure 5-4). This means that the **negligible** or **indiscernible** impact of the new infrastructure will be cumulative rather than new, and considerably less than that already experienced as a result of the existing OHTLs. As noted above, it is also likely that only a limited number of these elevated views would have been accessible and experienced by people in the past and thus would not generally have formed an important component of the historic experience of the area. For these reasons, the final impact of the new OHTL and PV plant on these views should be considered to be **neutral.**

While the OHTL, and in some cases the PV plant, will be visible from some places within Wadi Rammam, the actual impact of the new infrastructure upon the historic significance of these views is considered to be **none/neutral** (indiscernible). This is because, without the advantages of a higher vantage point, the new infrastructure will be even harder to discern within views from the ground than from elevated locations (assessed above). A closer, existing OHTL is also already visible within these views. Considering that the existing OHTL, which is significantly closer than the proposed infrastructure, is already hard to discern against the wider landscape (see discussion above and Figure 5-2 , it is clear that the new infrastructure will be unappreciable within these views and will have no impact upon their heritage significance.

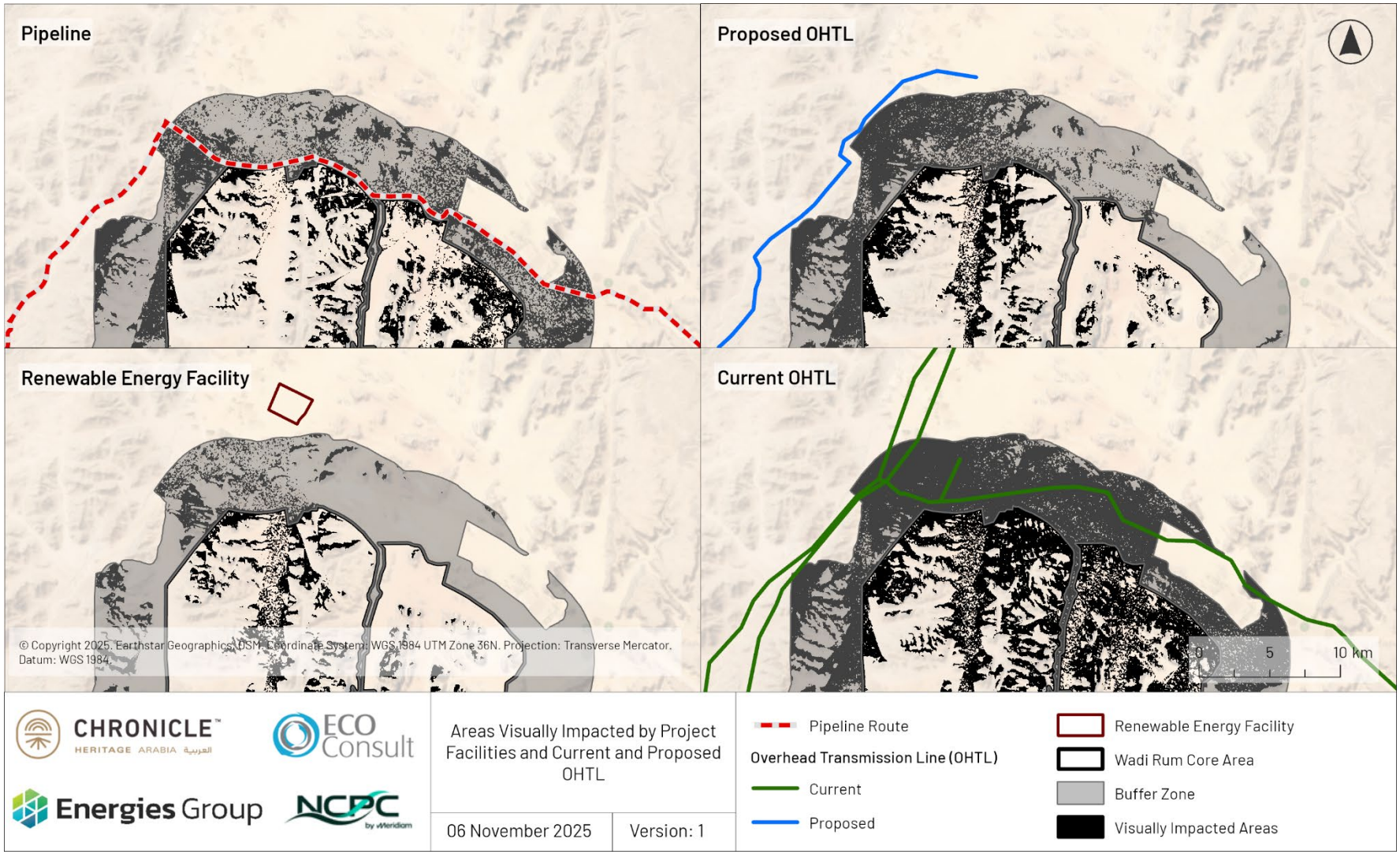

Figure 5-1. Areas Visually Impacted by Existing and Proposed Infrastructure.

Figure 5-2. View of existing OHTL from site WR-14_19 at the northern end of the WRPA core area (elevated location).

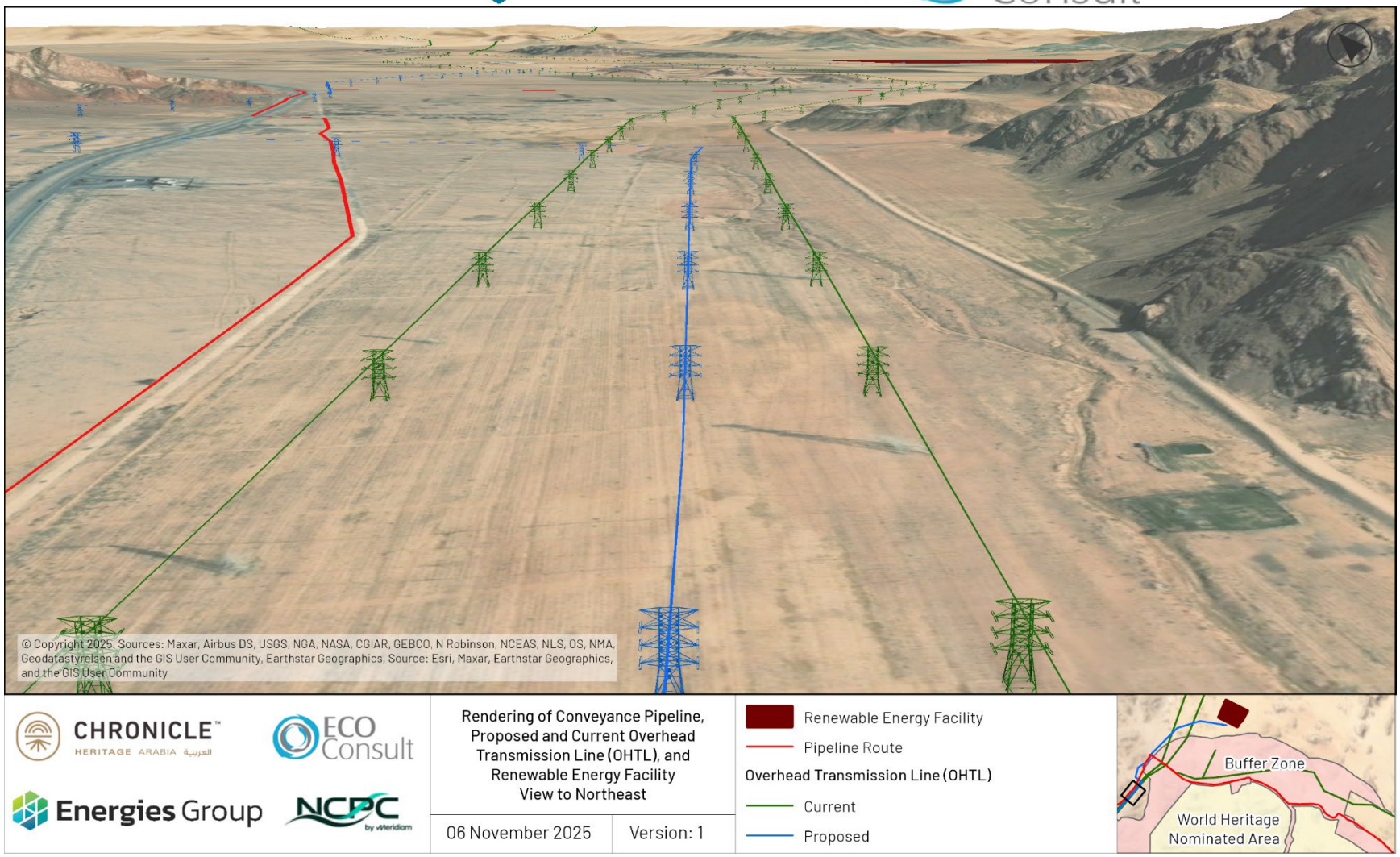

Figure 5-3. Rendering of Proposed OHTL and PV plant within the existing landscape (view north along Wadi Yutum).

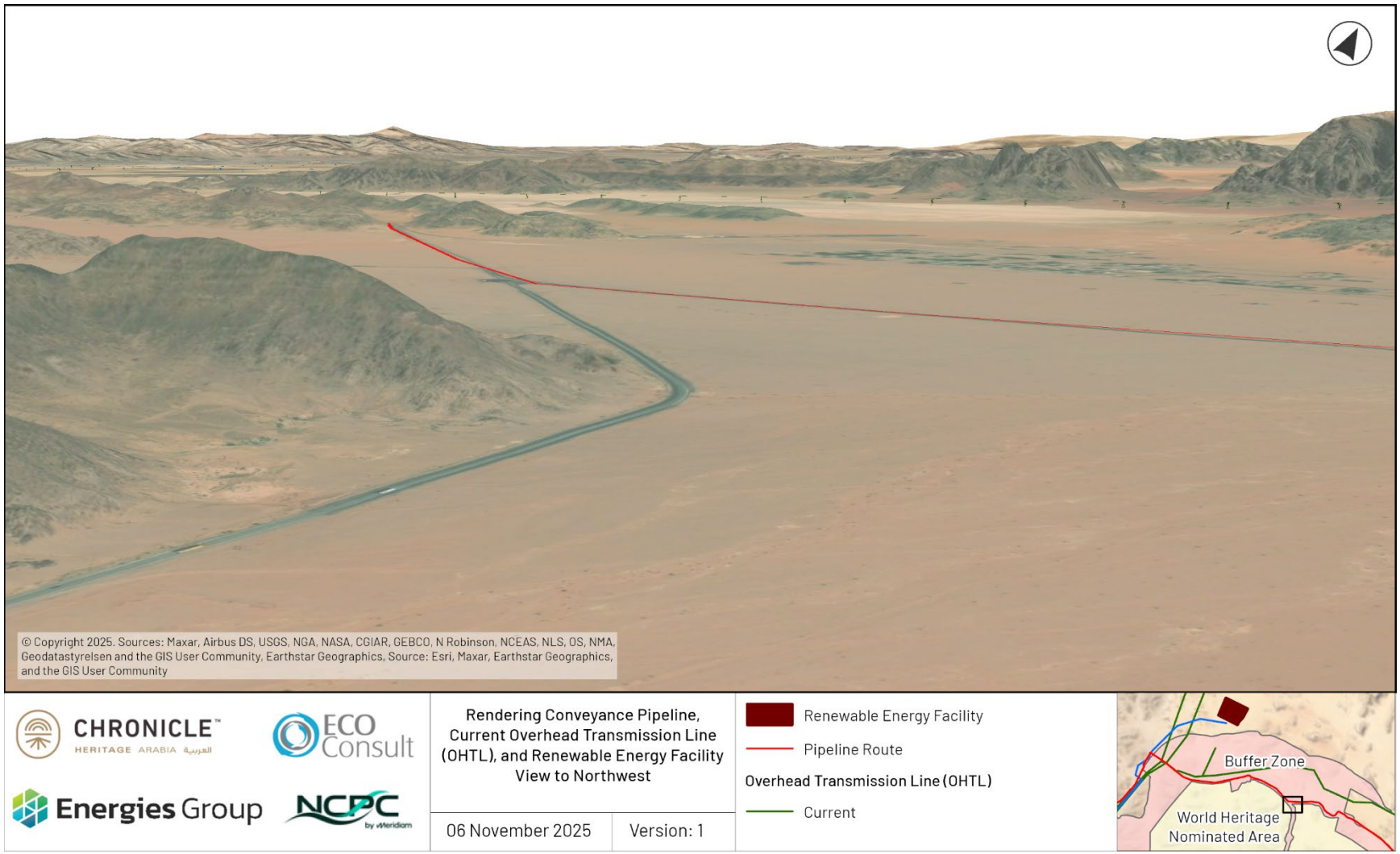

Figure 5-4. Rendering of Proposed OHTL and PV plant within the existing landscape (view north from the WRPA).

5.3 Setting of Heritage Assets

A discussion and assessment of the Project's impact upon individual heritage assets within the AOI is also provided below. This is informed by the results of the above assessments (Sections 5.1 and 5.2) and observations made during CH Arabia's survey.

NN/Ma'an Desert Survey Site 8

Given this site's location within a cluster of rocky massifs, the site is already screened from existing development to the north (Disi and the existing road) and will also be screened from the proposed development and any associated construction activities. Increased noise, light, and dust levels associated with the construction phase are also likely to be largely screened by the surrounding rocky hills. Even if these effects are felt to some degree at the site, they will be experienced against the background of ambient noise and light already produced by Disi and thus be indistinguishable and largely unappreciable. These effects will also only occur during construction and thus be temporary and short-term.

For these reasons, it is assessed that the setting of NN/Ma'an Desert Survey Site 8 will experience a **negligible** negative change as a result of the Project.

NN/Raikes Site A2

The NN/Raikes Site A2 has been washed away since it was originally identified and recorded. As such, neither the site nor its setting exist in any meaningful sense. The Project will therefore have **no further impact** on this site or its setting.

Mersed

The Project will in no way detract from the most important elements of Mersed's setting; that is, its elevated position and prominence within the landscape and the extensive views it is afforded across the neighboring wadis. These elements of its setting contribute to the appreciation and understanding of the site as an ancient watchtower. Views from the site across the WRPA to the east will also remain entirely unaffected.

To the west, the new OHTL and PV plant will be visible, within the wadi below; however, they will have little appreciable impact upon the integrity of these views. This is because the OHTL and PV plant will sit very close to the existing PV plant and OHTLs. While the landscape may thus appear a little more "cluttered" with modern development, this cumulative negative impact is likely to be negligible, as it will be seen within the context of existing large infrastructure. The new infrastructure will not intrude onto an untouched landscape and the wider, natural desert landscape as seen from this site will remain undisturbed.

Construction effects (increased noise, light, and dust) will largely be unappreciable from the site (given the intervening distance) and will in any case be temporary, short term and entirely reversible. Any increase in lighting or noise as a result of the Project's operation is also likely to be minimal, given the site's distance from the development. Given the existence of operational effects associated with existing infrastructure, any new development effects will also be indistinguishable from the site and make no appreciable difference to its setting.

For these reasons, it is assessed that the setting of Mersed will experience a **negligible** negative change as a result of the Project.

NN/Ras An-Naqb Highway Survey Milestone

The NN/Ras An-Naqb Highway Survey Milestone has been relocated since it was originally identified. As such, the site's setting no longer exists in any meaningful sense, as the artefact itself is no longer in its original location. The Project will therefore have **no further impact** on this site or its setting.

WR-14_19

Given the site's position on the top of a rocky outcrop at the northern end of the WRPA core area, views of the new OHTL will be visible in the distance from this site. However, as demonstrated by photographs taken from this site (Figure 5-2) the OHTL will be a barely appreciable change within this view. This is because of the site's distance from the new OHTL and the fact that it will be seen in the context of a landscape already crossed by large infrastructure. The PV plant is not visible from the site given the intervening distance and the PV plant's low construction profile. Construction activities and effects associated with the installation of the pipeline will be visible and experienced from the site; however, these negative impacts upon the site's setting will be temporary, short-term, and reversible.

For these reasons, it is assessed that the setting of site WR-14_19 will experience a **negligible** negative change as a result of the Project.

WR-14_22

Given the presence of intervening rocky massifs, the OHTL and PV plant will be entirely hidden from this site and thus will have no visual impact on its setting. Some views from the site to the existing road are possible, meaning that visual and aural effects of construction works along it (for the installation of the pipeline) may be experienced from the site. However, these effects will be minor (given the distance, nature, and scale of works) and only experienced temporarily over the short term. Any increase in ambient noise, lighting, dust, or pollution as a result of the construction or operation of the OHTL and PV plant will not be experienced from the site, given the considerable intervening distance.

For these reasons, it is assessed that the setting of site WR-14_22 will experience a **negligible** negative change as a result of the Project.

Aqaba Railway

Increased noise, dust, pollution, light, and modern machinery (associated with the construction of the pipeline) will likely be experienced along some sections of the Aqaba Railway. This will detract to some degree from its predominantly natural, undeveloped landscape; however, this impact will only be experienced during the construction phase and will thus be short term, temporary, and entirely reversible. Although the new OHTL may also be visible from the railway where it passes through the western end of the WRPA buffer zone, the OHTL will be experienced in the context of a number of existing OHTLs and will thus have no appreciable further impact upon the railway's setting.

For these reasons, it is assessed that the setting of the Aqaba Railway (where it passes through the WRPA buffer zone) will experience a **negligible** negative change as a result of the Project.

AHS002-AHS005 and AHF003

Sites AHS002-AHS005 and AHF003 lie within the proposed footprint of the PV plant. As such, all of these assets and their associated historic settings, will all be lost as a result of the Project. For this reason, it is assessed that the setting of these sites will experience a **major** negative impact (total loss) as a result of the Project.

AHF004 and AHF005

Construction works and effects (e.g., noise, light, dust, pollution) will be experienced from features AHF004 and AHF005 during work to install the pipeline, given these features proximity to this aspect of the proposed works. Considering the modern date of AHF005 and the fact that it was likely constructed adjacent to the existing road, these effects are not considered out of character with its setting or significance. As such, the Project should have **no** negative upon the setting or significance of AHF005.

Construction effects will be intrusive within the setting of AHF004 which is likely prehistoric. However, these negative effects will be short-term, entirely reversible and only experienced temporarily during the construction phase. For these reasons, it is assessed that the setting and significance of AHF004 will experience a **negligible** negative impact as a result of the Project.

5.3.1 Key Historic Views and Significant Visual Receptors

A discussion and assessment of the Project's impact upon key historic views and significant visual receptors is also provided in Table 5-1. This is informed by the results of the above assessments (Sections 5.1, 5.2, and 5.3) and observations made during CH Arabia's survey.

Table 5-1. Assessed Impacts upon Key Historic Views and Significant Visual Receptors.

Key Historic View/Significant Visual Receptor	Description of Potential Impact	Quality and Type of Impact	Impact Magnitude
Key Historic Views			
Views towards Wadi Rum from relatively undeveloped areas to the north. These include the proposed site of the new PV plant and undeveloped areas to the north of the existing road but west of Disi.	Views towards Wadi Rum from the northern buffer zone will only be interrupted temporarily and in the short term by construction works and effects associated with the installation of the pipeline.	Negative, reversible, temporary and short-term.	Negligible
	The new PV plant and OHTL will be visible within views towards Wadi Rum from outside the buffer zone to the northeast. While this infrastructure will be intrusive within these views, it will make little appreciable difference to the experience and appreciation of Wadi Rum which, within these views, only presents as a low series of hills on the horizon. Existing OHTLs will also already be visible	Negative, cumulative, reversible, long-term and effectively permanent	Negligible

Key Historic View/Significant Visual Receptor	Description of Potential Impact	Quality and Type of Impact	Impact Magnitude
	within these views, meaning only cumulative, rather than new, impacts will occur.		
Views either way along the length of the WRPA's various north-south wadis.	The majority of such views will remain entirely unchanged given their distance from the new infrastructure and the intervening topography which serve to screen the development. Construction operations will be visible within limited views from the very northern end of some wadis in the WRPA core area; however, these impacts will be temporary and short-term. The OHTL will be visible from a limited number of views from the very northern end of some wadis in the WRPA core area. However, given the intervening distance, the OHTL will constitute an unappreciable change within the landscape.	Negative, reversible, temporary and short-term. Negative, cumulative, reversible, long-term, and effectively permanent.	Neutral Neutral
Views either way along east-west tributaries within the WRPA.	The development will be fully screened in these views by the intervening topography. There is a possibility that non-visual effects (e.g., noise) or indirect visual effects (e.g., ambient light) may be experienced during the construction phase in those tributaries at the very northern end of the WRPA core area. However, these impacts would be temporary, short-term and affect a small minority of the WRPA area.	Negative, reversible, temporary, and short-term.	Neutral
Views from accessible high points in the landscape, particularly those where cairns have been placed (e.g., site WR-14_19).	The OHTL will be visible from some accessible high points, although the number of such points are limited in themselves. However, even where the OHTL is visible, it will present as a barely appreciable change to the landscape and will not break the horizon as seen from these locations. Any impact would also be a cumulative, rather than new, impact as the new OHTL will already	Negative, cumulative, reversible, long-term, and effectively permanent.	Neutral

Key Historic View/Significant Visual Receptor	Description of Potential Impact	Quality and Type of Impact	Impact Magnitude
	be visible within these views and considerably closer. Construction effects may be experienced from some such elevated points but such impacts would be temporary and short-term.	Negative, reversible, temporary and short-term.	Neutral
Views from wadi beds within Wadi Rum towards cairn sites that sit on high points in the landscape.	The development will be fully screened in these views by the intervening topography. The focus and significance of these views are also of a short-distance nature and any development visible in the distance would not in any case materially affect the significance of these views.	No Change	Neutral
	Significant Visual Receptors		
Existing road through the WRPA buffer zone	These views would be impacted by the introduction of machinery, works, spoil heaps, noise, dust, and light during the installation of the pipeline. However, these effects would be entirely reversible, short-term, and temporary.	Negative, reversible, short-term, and temporary.	Negligible
Road along Wadi Yutum where it passes through the Project Area	The new OHTL will be visible in views from the road towards the WRPA. However, it will appear as another modern development within views already considerably impacted by existing infrastructure of a similar type. While a cumulative impact will thus be experienced, it will thus change the current view minimally and will not materially affect the appreciation of Wadi Rum from this road.	Negative, cumulative, long-term, reversible and effectively permanent.	Negligible
Bedouin Camps (as identified on Figure 3-48)	The majority of identified Bedouin camps will remain entirely unaffected by the development, given the intervening distance and the presence of intervening topography which will screen all visual and aural effects.	Most camps: No change	Neutral Neutral

Key Historic View/Significant Visual Receptor	Description of Potential Impact	Quality and Type of Impact	Impact Magnitude
	Just one Bedouin camp is identified at the northern end of Wadi Rammam. Given its adjacent position to site WR-14_22, impacts upon this camp will be as assessed for WR-14_22. That is, effects will be limited to the experience of some temporary and short-term visual and aural effects associated with the construction of the pipeline to the north.	Camp in Wadi Rammam: Negative, reversible, short-term, and temporary.	

6 Impact Assessment

6.1 Impacts

Per the methodology recommended by the UNESCO HIA Toolkit (UNESCO 2022), the HIA scoping report identified all **potential** impacts of the Project upon heritage significance. Table 6-1 lists the impacts identified, a detailed description of those potential impacts, and the heritage attributes that they could affect. Attributes are only included in the table if potential impacts to them were identified.

While the scoping report identified potential impacts, the HIA undertakes a detailed assessment of those impacts based on the heritage baseline described above and the results of site visits, stakeholder engagement, and results of the LVIA assessment above (Section 5). The results of this impact assessment are provided in

Table 6-2.

In some cases, a detailed assessment–taking into account the specific details of the proposed works and the nature and condition of heritage attributes–concluded that the potential impact would in fact have not have any effect (i.e., a neutral impact) upon the identified heritage attributes. In other cases, the assessment did identify an impact. In this case,

Table 6-2 also details the assessed type, quality, and magnitude of that impact.

Table 6-1: Identified Potential Heritage Impacts

Element of Proposed Action	Attribute	Description of Potential Impact
Construction of New Infrastructure: Ground disturbing works within the physical footprint of the Conveyance Pipeline, OHTL, Solar PV Plant, and associated work compounds, stockpiles, access roads, etc.	Rock art, inscriptions, archaeological sites, finds, and features (**WRPA**) Palimpsest of semiarid desert, natural landforms, and cultural features (**WRPA**)	Direct physical impacts should generally be avoided to these attributes as no Project infrastructure is proposed within the WRPA core area (and natural and cultural features within the WRPA buffer zone do not contribute to the OUV of the WRPA). There is, however, potential for damage or loss of some of these attributes if any construction machinery were to be moved or used across or within the WRPA during the construction phase, or if any associated access roads, stockpile sites, etc. (the locations of which have not yet provided) are ultimately placed within the WRPA.
	Traditional pastoral techniques, skills, beliefs, and activities of the Bedouin (**Cultural Space of the Bedu**)	Potential disruption (e.g., to traditional camel husbandry, pastoral activities, etc.) if construction works involve temporarily blocking or altering access to traditional pastoral, habitation, or 'industrial' areas. Such disruption could also have the general effect of further divorcing and alienating local Bedouin communities from their traditional landscape and the practices, codes, and stories they tell about it. No details regarding Project access arrangements or changes have yet been provided.
	Coexistence and complementary relationship of settled and nomadic Bedouin communities (**Cultural Space of the Bedu**)	Potential disruption of relationships if construction works involve temporarily blocking or altering access to traditional resources and thereby lead to increased pressure and competition. No details regarding Project access arrangements or changes have yet been provided.
	Heritage sites specifically placed to exploit the area's natural characteristics and illustrating the inseparable relationship between the natural and cultural spheres (**Historic Landscape Character**)	A detrimental impact to this attribute could be experienced if any heritage sites contributing to it (e.g., as yet unknown and unrecorded sites) intersect with the Project's excavation footprint and are thus damaged or lost.
	The well-preserved physical remains of the	The proposed pipeline will cross the route of the railway in one location, where it is already crossed, and has been partially removed, by the existing road. Depending on

Element of Proposed Action	Attribute	Description of Potential Impact
	railway, station, and associated structures (**Undesignated Heritage Assets**).	the extent to which the existing road has already truncated the railway, there may be potential for further damage or loss of the rail line in this location. The proposed pipeline will also pass close to the route of the railway in a number of other locations. In these places, there is potential for damage or loss of the rail line and its embankment; for instance, if any construction machinery were to be moved or used across it, or if any associated access roads, stockpile sites, etc. (the locations of which have not yet provided) are ultimately placed across it.
	The surviving physical remains and setting of AHS002, AHS003, AHS004, AHS005, and AHF003 (**Undesignated Heritage Assets**).	The construction of the PV plant will entirely remove these sites and their setting.
	The surviving physical remains and setting of AHF004 and AHF005 (**Undesignated Heritage Assets)**.	The construction of the pipeline could remove or damage these assets if any aspect of these works (e.g., the trench for the pipeline, machinery movement, etc.) overlaps or encroaches too closely to these assets.
	Potential surface or buried archaeological remains (**Potential Heritage Assets**).	Damage or loss of any potential sites or features (as yet unknown and unrecorded) that intersect with the excavation footprint of the proposed infrastructure or any associated enabling works (e.g. stockpile sites, work compounds, access roads, etc.).
Construction Effects: Increased noise, dust, pollution, lighting, vibrations, and visual effects (e.g., visible machinery, spoil heaps) associated with construction work.	Rock art, inscriptions, archaeological sites, finds, and features (**WRPA**) Palimpsest of semiarid desert, natural landforms, and cultural features (**WRPA**)	Potential for indirect damage or loss of these attributes if they sit close to the northern boundary of the WRPA core area and if construction vibrations, dust, or pollution to have a detrimental impact upon their long-term preservation. Increased noise, dust, pollution, lighting, and visual effects (e.g., visible machinery, spoil heaps) could also detract from the largely undeveloped, natural setting of these assets, especially those that sit along the northern border of the WRPA core area. These setting effects would be temporary, short-term, reversible, and during construction only.
	A wide variety of natural and spectacular landforms	Increased noise, dust, pollution, lighting, and visual effects (e.g., visible machinery, spoil heaps) could also detract from the aesthetic and appreciation of this attribute, especially along the northern border of the WRPA core area and will be closest to

Element of Proposed Action	Attribute	Description of Potential Impact
	in a protected setting (**WRPA**)	construction works. These setting effects would be temporary, short-term, reversible, and during construction only.
	Large, preserved expanses of natural desert with relatively minor modern incursions (**Historic Landscape Character**)	Increased noise, dust, pollution, lighting, and visual effects (e.g., visible machinery, spoil heaps) also have the potential to detract from the largely undeveloped and natural historic landscape character. These setting effects would be temporary, short-term, reversible, and during construction only.
	The well-preserved physical remains of the railway, station, and associated structures (**Undesignated Heritage Assets**).	Increased noise, dust, pollution, lighting, and visual effects (e.g., visible machinery, spoil heaps) also have the potential to detract from this asset's largely undeveloped and natural setting. These setting effects would be temporary, short-term, reversible, and during construction only.
	The setting of the surviving physical remains of Mersed, NN/Ma'an Desert Survey Site 8, WR-14_19, WR-14-22, AHF004, and AHF005 (**Undesignated Heritage Assets**)	Increased noise, dust, pollution, lighting, and visual effects (e.g., visible machinery, spoil heaps) could also detract from the historic setting of these assets. These setting effects would be temporary, short-term, reversible, and during construction only.
	Potential surface or buried archaeological remains (**Potential Heritage Assets**)	Increased noise, dust, pollution, lighting, and visual effects (e.g., visible machinery) also has the potential to detract from the setting of any further (as yet unknown) heritage assets that may exist within or around the Project Area. These setting effects would be temporary, short-term, reversible, and during construction only.
Permanent Visible Infrastructure: Permanent infrastructure that remains visible and above-ground following construction. This includes the OHTL, Solar PV plant, and potentially other	Rock art, inscriptions, archaeological sites, finds, and features (**WRPA**) Palimpsest of semiarid desert, natural landforms,	This new, visible, modern infrastructure has the potential to intrude upon the largely natural, undeveloped setting of these attributes, particularly where they lie close to northern border of WRPA and/or on high points in landscape. This risk is likely to be relatively low given the distance between the WRPA and the proposed OHTL and Solar PV plant; however, it is a potential risk that needs to be fully assessed.

Element of Proposed Action	Attribute	Description of Potential Impact
access roads, maintenance depots, etc. (not yet detailed)	and cultural features (**WRPA**)	
	Traditional pastoral techniques, skills, beliefs, and activities of the Bedouin (**Cultural Space of the Bedu**)	Potential permanent disruption or loss (e.g., to traditional camel husbandry, pastoral activities, etc.) if infrastructure or its operation permanently block or alter access to traditional pastoral, habitation, or "industrial" areas. This could also have the general effect of further divorcing and alienate local Bedouin communities for their traditional landscape and the practices, codes, and stories they tell about it. No details regarding Project access arrangements or changes have yet been provided.
	Coexistence and complementary relationship of settled and nomadic Bedouin communities (**Cultural Space of the Bedu**)	Potential permanent disruption of relationships if infrastructure or its operation involves permanently blocking or altering access to traditional resources and thereby leads to increased pressure and competition. No details regarding Project access arrangements or changes have yet been provided.
	Large, preserved expanses of natural desert with relatively minor modern incursions (**Historic Landscape Character**)	The Project would increase the amount of modern visible infrastructure within the area, resulting in a potential detrimental impact upon the (generally undeveloped and natural) historic landscape character.
	The setting of the surviving physical remains of Mersed and WR-14_19 (**Undesignated Heritage Assets**)	The introduction of new modern infrastructure could detract from the historic setting of these assets.
	The well-preserved physical remains of the railway, station, and associated structures (**Undesignated Heritage Assets**)	The introduction of new modern infrastructure could detract from the historic setting of this asset.
	Potential surface or buried archaeological	Large, visible infrastructure has the potential to detract from the setting of any further (as yet unknown) heritage assets that may exist within or around the Project Area.

Element of Proposed Action	Attribute	Description of Potential Impact
	remains (**Potential Heritage Assets**)	
Operational Effects: Increased noise, dust, pollution, lighting, vibrations, and visual effects (e.g., maintenance machinery and works) associated with the Project's operation	Rock art, inscriptions, archaeological sites, finds, and features (**WRPA**) Palimpsest of semiarid desert, natural landforms, and cultural features (**WRPA**)	Operational effects (e.g., noise, dust, light, pollution) could detract intermittently from the setting some assets along the northern boundary of the WRPA core zone; for instance, if maintenance works and machinery were required along the route of the pipeline.
	Large, preserved expanses of natural desert with relatively minor modern incursions (**Historic Landscape Character**)	Operational effects (e.g., noise, dust, light, pollution) could potentially detract intermittently from the predominantly natural and undeveloped historic landscape character; for instance, if maintenance works and machinery were required along the route of the pipeline or around the OHTL and PV plant.
	The setting of the surviving physical remains of Mersed, NN/Ma'an Desert Survey Site 8, WR-14_19, WR-14-22, AHF004, and AHF005 (**Undesignated Heritage Assets**)	Operational effects (e.g., noise, dust, light, pollution) could intermittently detract from the setting of these assets; for instance, if maintenance works and machinery were required along the route of the pipeline or around the OHTL and PV plant.
	The well-preserved physical remains of the railway, station, and associated structures (**Undesignated Heritage Assets**)	Operational effects (e.g., noise, dust, light, pollution) could intermittently detract from the setting of this; for instance, if maintenance works and machinery were required along the route of the pipeline or around the OHTL and PV plant.
	Potential surface or buried archaeological	Operational effects (e.g., noise, dust, light, pollution associated with operational maintenance works) could potentially detract intermittently from the setting of any

Element of Proposed Action	Attribute	Description of Potential Impact
	remains (**Potential Heritage Assets**)	further (as yet unknown) heritage assets (particularly surface assets) that may exist within or around the Project Area.
Maintenance and Repair Works: If such works require additional excavations that will exceed the construction excavation footprint, there is potential for destruction or damage to further sites or features.	The well-preserved physical remains of the railway, station, and associated structures (**Undesignated Heritage Assets**).	Potential for damage or loss of sections of the rail line if any excavation were required outside the construction excavation footprint, and across the route of the railway.
	The surviving physical remains and setting of AHF004 and AHF005 (**Undesignated Heritage Assets)**.	Potential for damage or loss of these assets if any excavation were required outside the construction excavation footprint, and overlapping with these assets.
	Potential surface or buried archaeological remains (**Potential Heritage Assets**)	Damage or loss of any potential sites or features (as yet unknown and unrecorded) that intersect with any new or enlarged excavation footprint.

Table 6-2. Assessed Type, Quality, and Magnitude of Identified Potential Heritage Impacts

Element of Proposed Action	Attribute	Frequency of Action	Duration of Action	Reversibility of Action	Reversibility of Change to the Attribute	Longevity of Change to the Attribute	Degree of Change to the Attribute	Quality of Change to the Attribute	Evaluation of Impact
Construction of new Infrastructure	Rock art, inscriptions, archaeological sites, finds, and features (**WRPA**) Palimpsest of semiarid	Once	Short-term	Irreversible	Irreversible	Permanent	Some	Negative	Moderate

Element of Proposed Action	Attribute	Frequency of Action	Duration of Action	Reversibility of Action	Reversibility of Change to the Attribute	Longevity of Change to the Attribute	Degree of Change to the Attribute	Quality of Change to the Attribute	Evaluation of Impact
	desert, natural landforms, and cultural features (**WRPA**)								
	Traditional pastoral techniques, skills, beliefs, and activities of the Bedouin (**Cultural Space of the Bedu**)	Once	Short-term	Reversible	Reversible	Temporary	Some	Negative	Moderate
	Coexistence and complementary relationship of settled and nomadic Bedouin communities (**Cultural Space of the Bedu**)	Once	Short-term	Reversible	Reversible	Temporary or Permanent	Some	Negative	Moderate
	Heritage sites specifically placed to exploit the natural characteristics of the site and illustrating the inseparable relationship	Once	Short-term	Irreversible	Irreversible	Permanent	Negligible	Negative	Slight

Element of Proposed Action	Attribute	Frequency of Action	Duration of Action	Reversibility of Action	Reversibility of Change to the Attribute	Longevity of Change to the Attribute	Degree of Change to the Attribute	Quality of Change to the Attribute	Evaluation of Impact
	between the natural and cultural spheres (**Historic Landscape Character**)								
	The well-preserved physical remains of the railway, station, and associated structures (**Undesignated Heritage Assets**).	Once	Short-term	Irreversible	Irreversible	Permanent	Negligible	Negative	Slight
	The surviving physical remains and setting of AHS002, AHS003, AHS004, AHS005, and AHF003 (**Undesignated Heritage Assets**).	Once	Short-term	Irreversible	Irreversible	Permanent	Major	Negative	Moderate/Slight
	The surviving physical remains and	Once	Short-term	Irreversible	Irreversible	Permanent	Minor-Major (depend-	Negative	Neutral-Slight (depending

Element of Proposed Action	Attribute	Frequency of Action	Duration of Action	Reversibility of Action	Reversibility of Change to the Attribute	Longevity of Change to the Attribute	Degree of Change to the Attribute	Quality of Change to the Attribute	Evaluation of Impact
	setting of AHF004 and AHF005 (**Undesignated Heritage Assets)**.						ing on Project work's overlap with asset)		on Project work's overlap with asset)
	Potential surface or buried archaeological remains (**Potential Heritage Assets**)	Once	Short-term	Irreversible	Irreversible	Permanent	Negligible (pipeline route) Moderate (OHTL route and (PV Plant site)	Negative	Neutral-Slight (depending on signifi-cance of asset) Slight-Large (depending on signifi-cance of asset)
Construction Effects	Rock art, inscriptions, archaeological sites, finds, and features (**WRPA**) Palimpsest of semiarid desert, natural landforms, and	Once	Short-term	Permanent (physical impacts) Reversible (setting impacts)	Permanent (physical impacts) Reversible (setting impacts)	Permanent (physical impacts) Reversible (setting impacts)	Some (physical impacts) Negligible (setting impacts)	Negative	Moderate (physical impacts) Minor (setting impacts)

Element of Proposed Action	Attribute	Frequency of Action	Duration of Action	Reversibility of Action	Reversibility of Change to the Attribute	Longevity of Change to the Attribute	Degree of Change to the Attribute	Quality of Change to the Attribute	Evaluation of Impact
	cultural features (**WRPA**)								
	A wide variety of natural and spectacular landforms in a protected setting (**WRPA**)	Once	Short-term	Reversible	Reversible	Temporary	Negligible	Neutral	Minor
	Large, preserved expanses of natural desert with relatively minor modern incursions (**Historic Landscape Character**)	Once	Short-term	Reversible	Reversible	Temporary	Negligible	Neutral	Slight
	The well-preserved physical remains of the railway, station, and associated structures (**Undesignated Heritage Assets**).	Once	Short-term	Reversible	Reversible	Temporary	Negligible	Negative	Slight
	The well-preserved	Once	Short-term	Reversible	Reversible	Temporary	Negligible	Negative	Slight

Element of Proposed Action	Attribute	Frequency of Action	Duration of Action	Reversibility of Action	Reversibility of Change to the Attribute	Longevity of Change to the Attribute	Degree of Change to the Attribute	Quality of Change to the Attribute	Evaluation of Impact
	physical remains of the railway, station, and associated structures (**Undesignated Heritage Assets**).								
	The setting of the surviving physical remains of Mersed, NN/Ma'an Desery Survey Site 8, WR-14_19, WR-14-22, AHF004, and AHF005 (**Undesignated Heritage Assets**).	Once	Short-term	Reversible	Reversible	Temporary	Negligible	Negative	Neutral/ Slight
	Potential surface or buried archaeological remains (**Potential Heritage Assets**)	Once	Short-term	Reversible	Reversible	Temporary	Negligible	Negative	Neutral-Slight (depending on the signifi-cance of the asset)

Element of Proposed Action	Attribute	Frequency of Action	Duration of Action	Reversibility of Action	Reversibility of Change to the Attribute	Longevity of Change to the Attribute	Degree of Change to the Attribute	Quality of Change to the Attribute	Evaluation of Impact
Permanent Visible Infrastructure	Rock art, inscriptions, archaeological sites, finds, and features (**WRPA**) Palimpsest of semiarid desert, natural landforms, and cultural features (**WRPA**)	Continuous	Long-term	Reversible	Reversible	Permanent (effectively)	Neutral	Neutral	Neutral
	Traditional pastoral techniques, skills, beliefs, and activities of the Bedouin (**Cultural Space of the Bedu**)	Continuous	Long-term	Reversible	Reversible	Permanent (effectively)	Some	Negative	Moderate
	Coexistence and complementary relationship of settled and nomadic Bedouin communities	Continuous	Long-term	Reversible	Reversible	Permanent (effectively)	Some	Negative	Moderate

Element of Proposed Action	Attribute	Frequency of Action	Duration of Action	Reversibility of Action	Reversibility of Change to the Attribute	Longevity of Change to the Attribute	Degree of Change to the Attribute	Quality of Change to the Attribute	Evaluation of Impact
	(**Cultural Space of the Bedu**)								
	Large, preserved expanses of natural desert with relatively minor modern incursions (**Historic Landscape Character**)	Continuous	Long-term	Reversible	Reversible	Permanent (effectively)	Negligible	Neutral	Slight
	The setting of the surviving physical remains of Mersed and WR-14_19 (**Undesignated Heritage Assets**)	Continuous	Long-term	Reversible	Reversible	Permanent (effectively)	Negligible	Negative	Neutral/ Slight
	The well-preserved physical remains of the railway, station, and associated structures (**Undesignated Heritage Assets**)	Continuous	Long-term	Reversible	Reversible	Permanent (effectively)	Negligible	Negative	Slight

Element of Proposed Action	Attribute	Frequency of Action	Duration of Action	Reversibility of Action	Reversibility of Change to the Attribute	Longevity of Change to the Attribute	Degree of Change to the Attribute	Quality of Change to the Attribute	Evaluation of Impact
	Potential surface or buried archaeological remains (**Potential Heritage Assets**)	Continuous	Long-term	Reversible	Reversible	Permanent (effectively)	Negligible	Negative	Neutral-Slight (depending on the signifi-cance of the asset)
Operational Effects	Rock art, inscriptions, archaeological sites, finds, and features (**WRPA**) Palimpsest of semiarid desert, natural landforms, and cultural features (**WRPA**)	Continuous	Long-term	Reversible	Reversible	Permanent (Effectively)	Negligible	Neutral	Minor
	Large, preserved expanses of natural desert with relatively minor modern incursions (**Historic**	Continuous	Long-term	Reversible	Reversible	Permanent (Effectively)	Negligible	Neutral	Slight

Element of Proposed Action	Attribute	Frequency of Action	Duration of Action	Reversibility of Action	Reversibility of Change to the Attribute	Longevity of Change to the Attribute	Degree of Change to the Attribute	Quality of Change to the Attribute	Evaluation of Impact
	Landscape Character)								
	The setting of the surviving physical remains of Mersed, NN/Ma'an Desert Survey Site 8, WR-14_19, WR-14-22, AHF004, and AHF005 (**Undesignated Heritage Assets**)	Continuous	Long-term	Reversible	Reversible	Permanent (Effectively)	Negligible	Negative	Neutral/ Slight
	The well-preserved physical remains of the railway, station, and associated structures (**Undesignated Heritage Assets**)	Continuous	Long-term	Reversible	Reversible	Permanent (Effectively)	Negligible	Negative	Slight
	Potential surface or buried archaeological remains (**Potential**	Continuous	Long-term	Reversible	Reversible	Permanent (Effectively)	Negligible	Negative	Neutral-Slight (depending on the signifi-

Element of Proposed Action	Attribute	Frequency of Action	Duration of Action	Reversibility of Action	Reversibility of Change to the Attribute	Longevity of Change to the Attribute	Degree of Change to the Attribute	Quality of Change to the Attribute	Evaluation of Impact
	Heritage Assets)								cance of the asset)
Maintenance and Repair Works	The well-preserved physical remains of the railway, station, and associated structures (**Undesignated Heritage Assets**)	Intermittent	Long-term	Irreversible	Irreversible	Permanent	Negligible	Negative	Slight
	The surviving physical remains and setting of AHF004 and AHF005 (**Undesignated Heritage Assets)**.	Intermittent	Long-term	Irreversible	Irreversible	Permanent	Minor-Major (depend-ing on Project work's overlap with asset)	Negative	Neutral-Slight (depending on Project work's overlap with asset)
	Potential surface or buried archaeological remains (**Potential Heritage Assets**)	Intermittent	Long-term	Irreversible	Irreversible	Permanent	Negligible	Negative	Neutral-Slight (depending on the signifi-cance of the asset)

7 Recommendations

The HIA Statement has assessed that the Project would have a range of negative impacts, including **minor-moderate** negative impacts upon the OUV of UNESCO-protected areas and **slight-large** detrimental impacts upon the heritage significance of other heritage assets. The following recommendations are provided to address the impacts identified in Section 6. These recommendations are provided to ensure that, wherever possible, any identified impacts are avoided or minimised as far as possible. This is in compliance with the relevant heritage legislation and to ensure compliance with Lender requirements.

The following recommendations are also summarised in Table 7-1. This table also includes an assessment of the Project's residual effects, i.e., the heritage impacts that would remain following the implementation of all recommended mitigation. Table 7-1 concludes that, if all recommended mitigation is implemented, the negative impacts of the Project will be considerably reduced, resulting in a Project which poses **no (i.e., neutral) impacts** to the OUV of UNESCO-protected areas (the WRPA and the Cultural Space of the Bedu in Wadi Rum) and **slight** impacts to the heritage significance of other, non-UNESCO heritage assets.

7.1 Development and Implementation of an ESMS and CHMP

A range of negative impacts to OUV and heritage significance and OUV have been identified. Although none of these impacts are major, most can be avoided or further minimised through the development of sensitive provisions, to be implemented across the life-time of the Project. Recommendations for provisions to protect and conserve heritage are provided below.

It is important that the developer makes a commitment to adhering to these provisions at all relevant stages of the Project (construction and operation, as applicable) and across the lifetime of the Project. To ensure this compliance, these provisions should be formally entered into the Environmental and Social Management System (ESMS) for the Project and in a Cultural Heritage Management Plan (CHMP). This is in compliance with Lender policies which require the development and implementation of an ESMS and CHMP for the Project across its lifetime. Some lenders (notably the ERBD, the EIB, and the WBG) require that cultural heritage provisions are integrated into both an ESMS and a Cultural Heritage Management Plan (CHMP).

To ensure compliance with all Lender requirements, it is thus recommended that the following cultural heritage provisions (Sections 7.1.1 - 7.1.8), at a minimum, are developed and integrated into both the Project's ESMS and a more detailed and bespoke CHMP. Avoidance is the preferred mitigation method and will be considered along with mitigation measures to ensure that all cultural heritage potentially affected by the Project is managed responsibly, legally, and in a manner that respects its historical, scientific, and social significance. The plan seeks to avoid or minimise harm to cultural heritage wherever feasible, and to ensure that any unavoidable impacts are appropriately mitigated or offset.

The CHMP should be guided by five core principles:

- Compliance – full adherence to national laws and international lender requirements.
- Avoidance and Mitigation – preference for design and planning measures that prevent impacts rather than compensate for them.

- Integration – embedding heritage protection into broader project planning and construction management systems.
- Transparency and Engagement – open communication with the DoA, local authorities, and affected communities regarding heritage issues.
- Proportionality – ensuring that heritage management measures correspond to the level of significance and potential impact identified

The Cultural Heritage Management Framework Plan (CHMP) establishes the framework through which the Project will identify, protect, and manage cultural heritage resources in compliance with national legislation and international lender standards. It provides the procedures, responsibilities, and technical requirements for safeguarding both tangible and intangible cultural heritage that may be affected during all stages of the Project lifecycle — from pre-construction through construction, operation, and eventual decommissioning.

The CHMP forms a component of the Project's Environmental and Social Management System (ESMS) and ensures alignment with the Jordanian Law of Antiquities No. 21 of 1988 (as amended in 2024) (General Department of Antiquities 2024), the Regulations for Archaeological Projects in Jordan (General Department of Antiquities 2015), and the cultural heritage protection mandates of the Department of Antiquities (DoA). International obligations are further reflected through adherence to IFC Performance Standard 8 (Cultural Heritage), EBRD Performance Requirement 8 (Cultural Heritage), and the principles of the UNESCO 1972 and 2003 Conventions (UNESCO 1972).

7.1.1 Avoid: Aqaba Railway

A requirement for the Project to avoid physical impacts to the known heritage site of the Aqaba Railway, through Project design. The pipeline is proposed to cross the route of the railway in one location. In this location, the Project design should be carefully developed to route the new pipeline through ground that has already been disturbed by the existing road, i.e., areas where the railway has already been truncated and removed.

7.1.2 Avoid: Features AHF004 and AHF005

A requirement for the Project to avoid physical impacts to the known heritage sites of AHF004 and AHF005, through Project design. The Project Area currently overlaps with these sites, both of which survive on the southern side of the existing road. In these locations, the Project design should be carefully developed to route the new pipeline through a part of the Project Area that does **not** overlap with these assets. The easiest way to achieve this is likely to be to ensure that all Project works (including both excavation and the movement and use of machinery and equipment) is maintained on the northern side of the road in these locations, as this would ensure all works take place outside of, and a reasonable distance from, both heritage assets.

7.1.3 Avoid: Known Cultural Heritage Sites

A requirement for the contractor to conspicuously mark and protect all identified cultural heritage sites (apart from AHS002-AHS005 and AHF003, discussed below) within 50 m of the Project construction footprint. Both the site and an appropriate surrounding protection buffer should be marked as "no-go" zones. In accordance with the Jordan's Antiquities Law No. 23, the provided buffer should be between 5-25m as appropriate, or greater if deemed necessary by the Minister of Tourism and Antiquities (General Department of Antiquities 2024). Temporary barriers around sites and buffers might involve a bright colored plastic or wire mesh fence with highly visible

flagging or tape attached to it, in cooperation with the competent authorities (DoA). The fencing should be removed following the completion of the construction phase and (as applicable) any required maintenance or repair activities during the operational phase. All fencing should be freestanding on the ground surface with no intrusion into the ground; if necessary, sandbags should be used to stabilise and ground the fencing.

7.1.4 Avoid: Unspecified Design Details

A requirement that all, currently unspecified, aspects of the Project (e.g., access roads, machinery use areas and movement routes, construction camps, stockpiles, future maintenance works, etc.) are designed and designated to avoid intruding into the WRPA core zone or across known heritage sites (as identified in this report). These designated areas and routes should be demarcated if necessary. No vehicle or equipment movement or construction activities may take place outside of these designated areas and routes. Drive-over traffic in wet conditions should also be prohibited. This provision will also reduce impacts to potential buried archaeology as it will generally restrict and reduce ground disturbance across the AOI.

7.1.5 Avoid and Minimise: Construction Effects

A requirement that measures are put in place to minimise noise, dust, pollution, and lighting along the length of the pipeline works (the closest works element to the WRPA.) during both construction and (if applicable) operational maintenance or repair works. This might include requirements to use low-noise and low-vibration machinery, minimal lighting (if required at all), dust-tamping methods, a minimum number of small machinery, etc.

A requirement for the contractor to visually monitor dust generation and concentrations in the air during construction and operational maintenance activities. If dust is visible, mitigation measures, such as spraying with water or the imposition of tighter speed limits, will be implemented with the aim of avoiding causing disturbance within the setting of heritage assets or to the quality of the historic landscape character.

A requirement for noise and vibration to be periodically monitored at cultural heritage sites within the AOI during construction and operational maintenance activities. If harmful levels are identified, the works should cease until suitable mitigation measures have been implemented and the levels reduced to an acceptable level. ASEZA defines harmful levels as noise levels exceeding 45 dB or vibrations lasting more than three minutes if they are strong enough to be felt by humans (ASEZA n.d.a).

A requirement that, in the case that part or all of a cultural heritage site is damaged due to excessive vibration, the relevant authorities will be informed, consulted and building conservators will be called in immediately to repair the structure with conventional conservation techniques.

A requirement that the condition and structural integrity of sites with above-ground components located within 50 m of the Project footprint will be recorded prior to construction in cooperation with the competent authorities. The condition and structural integrity of those features will be monitored periodically for signs of degradation caused by vibration and for signs of pollution (most commonly in the form of dust and soot) in cooperation with the competent authorities. If dust from the project damages a CH site, the site will be cleaned by professional conservators and protected from further damage.

A requirement that all workers are informed of, and abide, by the workers' Code of Conduct which prohibits employee activities that might interfere with or damage cultural heritage sites.

A requirement to develop and adhere to a sensitive backfilling and site clean-up methodology, such that construction areas are returned to their original condition and appearance (excluding new, permanent above-ground infrastructure) following the completion of the construction phase and (as applicable) any required operational maintenance or repair work.

7.1.6 Reduce and Offset: Chance Finds Procedure and Archaeological Monitoring

The Project should implement a Chance Finds Procedure (CFP) that details the process to be followed in case an archaeological find is made during construction or any required operational maintenance works. The management of any finds will be handled in accordance with Jordanian national requirements and IFC and EBRD performance requirements.

The required CFP should include a requirement for the archaeological monitoring of all construction (and, as applicable, maintenance) activities by a professional archaeologist or archaeological team under the supervision of the Department of Antiquities, and a commitment to temporarily stop work in the vicinity of any new archaeological discovery. The chance find procedure will detail the process to be followed in case an archaeological find is made during construction. Construction activities at a chance find will resume after the implementation of government-approved mitigation measures, in accordance with Jordanian Law and IFC and EBRD performance requirements.

If government-approved mitigation measures include a requirement for further evaluation of chance finds or sites, the Project will engage the appropriate Jordanian authorities in this further evaluation and the use of intrusive and non-intrusive methods, according to the Jordanian Law.

If archaeological rescue is required at a chance find or site, the rescue will be conducted according to international and Jordanian standards and with supervision and involvement of the appropriate government institutions.

A detailed CFP and archaeological monitoring methodology should be submitted to, and approved by, the Jordanian DoA in advance of the commencement of any Project works.

7.1.7 Avoid, Minimise, Reduce, and Offset: Archaeological Investigation and Recording

A requirement to further investigate sites AHS002-AHS005 and AHF003; the PV plant site; and the surrounding area. Although avoidance of impacts to these identified sites—through relocation of the PV plant site—would typically be the most preferable option, it is possible that this action would only serve to impact similar (or potentially more significant remains) nearby. As such, the most sensitive course of action is considered to be to undertake further evaluation of these sites, the surrounding PV plant site, and immediate surrounding area. This would serve to confirm or revise the significance of AHS002-AHS005 and AHF003 and characterise the potential for and significance of further buried or surface remains within the PV plant and the land around it. This information could then be used to determine whether harm to heritage significance could most efficiently be avoided/minimised by:

- Relocating or shifting the PV plant site, such it avoids or minimises impacts to heritage assets; or

- Retain the PV plant site in its proposed location, accepts the loss of AHS002-AHS005 and AHF003 (likely low significance), and avoid greater harm to heritage significance elsewhere.

The nature and extent of archaeological evaluation should be designed and conducted under the supervision of and in collaboration with the DoA. Recommended evaluative techniques include magnetometry survey (to identify the potential for buried remains, particularly furnaces, hearths, and slag halos); targeted evaluation trenching (to assess and characterise the nature and significance of identified potential buried remains); and further walkover survey (to characterise the surface archaeological resource outside and around the PV plant site).

Depending on whether the PV plant site is ultimately relocated or not, it may still involve the inevitable removal of some heritage assets within its final footprint. In this case, these assets would need to be fully investigated, excavated, recorded, and published to extract the maximum possible information from these sites before their loss and offset this impact to their heritage significance. The work should be carried out by a professional archaeologist or archaeological team under the supervision of the DoA. A detailed methodology should be submitted to, and approved by, the DoA in advance of the commencement of the work.

7.1.8 Avoid: Traditional Access

A requirement that the design of both the final development, and its construction, should be developed to ensure that traditional access (e.g., to traditional pastoral, habitation, "industrial," or other cultural areas and resources) is maintained. This may include the retention of access to some cultural heritage sites. This is to avoid impacts to heritage significance and community issues.

Where feasible, Project equipment and activities will be planned and placed to avoid restricting traditional access.

In the case that access to traditional cultural areas and resources, or important cultural heritage sites, are restricted or blocked, the Project will arrange alternative access using stakeholder input.

More detailed recommendations may be found within the ICH report.

Table 7-1. Identified Heritage Impacts, Recommended Mitigation, and Assessed Residual Impacts

Element of Proposed Action	Attribute	Evaluation of Impact (Negative unless otherwise defined)	Recommended Mitigation	Residual Impact (Negative unless otherwise defined)
Construction of new Infrastructure	Rock art, inscriptions, archaeological sites, finds, and features (WRPA) Palimpsest of semiarid desert, natural landforms, and cultural features (WRPA)	Moderate	Avoid physical impacts to any assets in the WRPA through sensitive design of final development details, such that they avoid intrusion into the WRPA (see Section 7.1.4)	Neutral
	Traditional pastoral techniques, skills, beliefs, and activities of the Bedouin (Cultural Space of the Bedu)	Moderate	Avoid impacts by ensuring the maintenance, or alternative equivalent provision, of traditional access during Project construction (see Section 7.1.8)	Neutral
	Coexistence and complementary relationship of settled and nomadic Bedouin communities (Cultural Space of the Bedu)	Moderate	Avoid impacts by ensuring the maintenance, or alternative equivalent provision, of traditional access during Project construction (see Section 7.1.8)	Neutral
	Heritage sites specifically placed to exploit the natural characteristics of the site and illustrating the inseparable relationship between the natural and cultural spheres (Historic Landscape Character)	Slight	Avoid physical impacts to known assets through demarcation of the assets and a protection buffer (see Section 7.1.3) Avoid physical impacts to known assets through sensitive design of final development details, such that they avoid overlap with those assets (see Section 7.1.4)	Neutral

Element of Proposed Action	Attribute	Evaluation of Impact (Negative unless otherwise defined)	Recommended Mitigation	Residual Impact (Negative unless otherwise defined)
	The well-preserved physical remains of the railway, station, and associated structures (Undesignated Heritage Assets).	Slight	Avoid physical impacts where pipeline crosses railway route through Project design (see Section 7.1.1) Avoid physical impacts to asset through demarcation of site and protection buffer (see Section 7.1.3) Avoid physical impacts to asset through sensitive design of final development details, such that they avoid overlap with the asset (see Section 7.1.4)	Neutral
	The surviving physical remains and setting of AHS002, AHS003, AHS004, AHS005, and AHF003 (Undesignated Heritage Assets).	Moderate/Slight	Undertake evaluation of these sites and their surrounds to determine the most sensitive location for the PV plant. If the loss of these sites cannot be avoided without causing greater heritage impacts elsewhere, offset their loss through a comprehensive program of investigation, excavation, recording, and publishing (see Section 7.1.7)	Neutral/Slight
	The surviving physical remains and setting of AHF004 and AHF005 (Undesignated Heritage Assets).	Neutral-Slight (depending on Project work's overlap with asset)	Avoid physical impacts where Project Area crosses these assets, through Project design (see Section 7.1.2)	Neutral
	Potential surface or buried archaeological remains (Potential Heritage Assets)	Neutral-Slight (depending on significance of asset)	Reduce physical impacts to asset through sensitive design of final development details,	Neutral/Slight

Element of Proposed Action	Attribute	Evaluation of Impact (Negative unless otherwise defined)	Recommended Mitigation	Residual Impact (Negative unless otherwise defined)
			such that final land take is minimised (see Section 7.1.4) Develop and implement a CFP and program of archaeological monitoring (see Section 7.1.6)	
Construction Effects	Rock art, inscriptions, archaeological sites, finds, and features (WRPA) Palimpsest of semiarid desert, natural landforms, and cultural features (WRPA)	Moderate (physical impacts) Minor (setting impacts)	Avoid and minimise construction effects (e.g., noise, light, pollution, dust, vibrations) through the development and implementation of appropriate provisions (see Section 7.1.5).	Neutral
	A wide variety of natural and spectacular landforms in a protected setting (WRPA)	Minor	Avoid and minimise construction effects (e.g., noise, light, pollution, dust, vibrations) through the development and implementation of appropriate provisions (see Section 7.1.5).	Neutral
	Large, preserved expanses of natural desert with relatively minor modern incursions (Historic Landscape Character)	Slight	Avoid and minimise construction effects (e.g., noise, light, pollution, dust, vibrations) through the development and implementation of appropriate provisions (see Section 7.1.5).	Neutral
	The setting of the surviving physical remains of Mersed, NN/Ma'an Desery Survey Site 8, WR-14_19, WR-14-22, AHF004, and AHF005 (Undesignated Heritage Assets).	Neutral/Slight	Avoid and minimise construction effects (e.g., noise, light, pollution, dust, vibrations) through the development and implementation of appropriate provisions (see Section 7.1.5).	Neutral

Element of Proposed Action	Attribute	Evaluation of Impact (Negative unless otherwise defined)	Recommended Mitigation	Residual Impact (Negative unless otherwise defined)
	Potential surface or buried archaeological remains (Potential Heritage Assets)	Neutral-Slight (depending on the significance of the asset)	Avoid and minimise construction effects (e.g., noise, light, pollution, dust, vibrations) through the development and implementation of appropriate provisions (see Section 7.1.5).	Neutral
Permanent Visible Infrastructure	Rock art, inscriptions, archaeological sites, finds, and features (WRPA) Palimpsest of semiarid desert, natural landforms, and cultural features (WRPA)	Neutral	N/A—neutral impacts identified	Neutral
	Traditional pastoral techniques, skills, beliefs, and activities of the Bedouin (Cultural Space of the Bedu)	Moderate	Avoid impacts by ensuring the maintenance, or alternative equivalent provision, of traditional access during Project operation (see Section 7.1.8)	Neutral
	Coexistence and complementary relationship of settled and nomadic Bedouin communities (Cultural Space of the Bedu)	Moderate	Avoid impacts by ensuring the maintenance, or alternative equivalent provision, of traditional access during Project operation (see Section 7.1.8)	Neutral
	Large, preserved expanses of natural desert with relatively minor modern incursions (Historic Landscape Character)	Slight	None recommended. The visual impacts of the OHTL and PV plant is not considered capable of further, sensitive mitigation	Slight

Element of Proposed Action	Attribute	Evaluation of Impact (Negative unless otherwise defined)	Recommended Mitigation	Residual Impact (Negative unless otherwise defined)
	The setting of the surviving physical remains of Mersed and WR-14_19 (Undesignated Heritage Assets)	Neutral/Slight	None recommended. The visual impacts of the OHTL and PV plant is not considered capable of further, sensitive mitigation	Neutral/Slight
	The well-preserved physical remains of the railway, station, and associated structures (Undesignated Heritage Assets)	Slight	None recommended. The visual impacts of the OHTL and PV plant is not considered capable of further, sensitive mitigation	Slight
	Potential surface or buried archaeological remains (Potential Heritage Assets)	Neutral-Slight (depending on the significance of the asset)	None recommended. The visual impacts of the OHTL and PV plant is not considered capable of further, sensitive mitigation	Neutral/Slight
Operational Effects	Rock art, inscriptions, archaeological sites, finds, and features (WRPA) Palimpsest of semiarid desert, natural landforms, and cultural features (WRPA)	Minor	Avoid and minimise effects associated with maintenance or repair works (e.g., noise, light, pollution, dust, vibrations) through the development and implementation of appropriate provisions (see Section 7.1.5).	Neutral
	Large, preserved expanses of natural desert with relatively minor modern incursions (Historic Landscape Character)	Slight	Avoid and minimise effects associated with maintenance or repair works (e.g., noise, light, pollution, dust, vibrations) through the development and implementation of appropriate provisions (see Section 7.1.5).	Neutral
	The setting of the surviving physical remains of Mersed, NN/Ma'an Desert Survey Site 8, WR-14_19, WR-14-22, AHF004,	Neutral/Slight	Avoid and minimise effects associated with maintenance or repair works (e.g., noise, light, pollution, dust, vibrations) through the development and	Neutral

Element of Proposed Action	Attribute	Evaluation of Impact (Negative unless otherwise defined)	Recommended Mitigation	Residual Impact (Negative unless otherwise defined)
	and AHF005 (Undesignated Heritage Assets)		implementation of appropriate provisions (see Section 7.1.5).	
	The well-preserved physical remains of the railway, station, and associated structures (Undesignated Heritage Assets)	Slight	Avoid and minimise effects associated with maintenance or repair works (e.g., noise, light, pollution, dust, vibrations) through the development and implementation of appropriate provisions (see Section 7.1.5).	Neutral
	Potential surface or buried archaeological remains (Potential Heritage Assets)	Neutral-Slight (depending on the significance of the asset)	Avoid and minimise effects associated with maintenance or repair works (e.g., noise, light, pollution, dust, vibrations) through the development and implementation of appropriate provisions (see Section 7.1.5).	Neutral
Maintenance and Repair Works	The well-preserved physical remains of the railway, station, and associated structures (Undesignated Heritage Assets)	Slight	Avoid physical impacts to the railway through sensitive design of operational maintenance or repair works (see Section 7.1.1)	Neutral
	The surviving physical remains and setting of AHF004 and AHF005 (Undesignated Heritage Assets).	Neutral-Slight (depending on Project work's overlap with asset)	Avoid physical impacts where Project Area crosses these assets, through sensitive design of operational maintenance or repair works (see Section 7.1.2)	Neutral
	Potential surface or buried archaeological remains (Potential Heritage Assets)	Neutral-Slight (depending on the significance of the asset)	Reduce physical impacts to potential assets through sensitive design of final development details, such that final land take is minimised and remains within the original	Neutral/Slight

Element of Proposed Action	Attribute	Evaluation of Impact (Negative unless otherwise defined)	Recommended Mitigation	Residual Impact (Negative unless otherwise defined)
			construction footprint (see Section 7.1.4)	

7.2 Compliance with Legislation and Lender Standards

The HIA assessment concludes that, if all recommended mitigation is implemented, the negative impacts of the Project will be considerably reduced, resulting in a Project which poses **no (i.e., neutral) impacts** to the OUV of UNESCO-protected areas (the WRPA and the Cultural Space of the Bedu in Wadi Rum) and **slight** impacts to the heritage significance of some other, non-UNESCO heritage assets and elements (Table 7-1).

It is nevertheless important to additionally assess whether the Project, following mitigation, complies with all relevant heritage legislation and Lender standards and requirements. This is assessed and demonstrated within Table 7-2 to Table 7-10, below.

An interim Lenders' Environmental and Social Due Diligence Report (SLR Consulting 2025) was also consulted. This report discusses the position of the Lenders with regard to the Project as described within the 2022 ESIA and sets out their recommendations for the 2025 ESIA. Relevant comments and recommendations made within this report in relation to cultural heritage are addressed below.

7.2.1 Lenders' Environmental and Social Due Diligence Report

The Lenders' Environmental and Social Due Diligence Report (SLR Consulting 2025) noted that the Lenders generally accepted the heritage baseline produced for the 2022 ESIA but that it was lacking assessment of impacts to the OUV of the WRPA specifically, to marine heritage, and to intangible cultural heritage. Each of these aspects of cultural heritage has now been thoroughly assessed within this HIA Statement, the associated marine heritage and ICH reports, and the resultant ESIA chapter.

The Lenders also required a baseline element for the Hejaz Railway (as it passes through the AOI) be provided. This has been provided within this HIA Statement.

The Lenders acknowledged that the risks and impacts of the Project, as described in the 2022 ESIA, would be relatively limited, provided Good International Practice (GIP) is implemented during construction. CH Arabia can confirm that this will be achieved in relation to cultural heritage as the mitigation recommended for the Project (see Section 7) ensures adherence to GIP regarding cultural heritage (e.g., the demarcation of heritage sites and a surrounding protection buffer, etc.).

The Lenders also required confirmation that the Project activities in the WRPA buffer zone would not affect, or have a "material effect," on the OUV of the WRPA or the intangible cultural heritage of the Cultural Space of the Bedu in Wadi Rum. The assessment carried out within this HIA (see Table 7-1) confirms and demonstrates that, provided that all recommended mitigation is implemented, the Project will have **no impact** upon the OUV of either UNESCO-protected area. While some minor residual impacts are identified to undesignated heritage assets and elements outside the WRPA and within its buffer zone, these impacts will not affect the OUV of the WRPA itself. While some development is proposed within the WRPA buffer zone, it is also important to acknowledge that, although the buffer zone serves to protect the OUV of the WRPA core area, elements within it do **not** contribute to the OUV of the WRPA itself.

The Lenders also required confirmation that the Project complies with all other heritage legislation, e.g., that of the ASEZA. CH Arabia found that the Project already complied with most other heritage legislation. Where it did not, specific mitigation was recommended to ensure compliance. For instance, CH Arabia recommended that noise levels were monitored at cultural

sites during construction and maintenance works to ensure they do not exceed 45 dB, as specifically required within ASEZA's Regulatory Provisions for the Wadi Rum Protected Area Buffer Zone (ASEZA n.d.a).

The Lenders required that the 2025 ESIA included a requirement for a CFP to be included within the Project's ESMS and CHMP. This requirement is included within CH Arabia's recommended mitigation (Section 7.1).

Finally, the Lenders specified a requirement for more, and more meaningful stakeholder engagement. This has been undertaken as part of the stakeholder engagement for the Project.

7.2.2 Specific Lender Standards and Requirements

Table 7-2. Requirements of the EBRD's Environmental and Social Policy (EBRD 2024)

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
Cultural Heritage Policy ESR8 and Annex B		
Identify and assess any potential impacts to cultural heritage as part of a wider ESIA. This baseline should inform the adoption of a mitigation hierarchy to avoid, minimise, mitigate, or offset adverse impacts.	Yes	Completed as part of this HIA Statement, and the associated ICH report and marine heritage reports. All have been used to inform the relevant ESIA chapter.
The development and implementation of mitigation will be integrated as part of an ESMS and CHMP for the Project.	Yes	This HIA Statement provides comprehensive mitigation measures, and the recommendation that they be implemented by means of an ESMS and CHMP.
Process should involve cultural heritage experts and meaningful consultation with all key stakeholders.	Yes	This HIA Statement is informed by meaningful and comprehensive stakeholder engagement (see Section 2.4) and developed by cultural heritage experts CH Arabia.

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
Requirement for developer to ensure that: Provisions for managing chance finds are in place Provisions for sustaining, or alternatively providing, safe access to cultural heritage are in place Awareness, appreciation, and enhancement of cultural heritage is undertaken		This HIA Statement's provided recommendations which ensure compliance with all these requirements. Awareness, appreciation, and enhancement of cultural heritage will be achieved through the publication and dissemination of both the cultural heritage survey already undertaken, and of all future programs of archaeological investigation and monitoring recommended.
Requirement for the developer to ensure compliance with specific requirements surrounding use of cultural resources and their equitable sharing	N/A	Not applicable as the Project does not propose to use or take possession of any cultural resources.
Specific requirements for different types of cultural heritage: **Archaeological sites:** Should be subject to desk-based research, to include the consultation of national and international registries, undertaking of field surveys, mapping and investigation of archaeological remains, and development of appropriate mitigation in consultation with heritage experts. **Built heritage:** Identify and implement appropriate mitigation measures to address project impacts to built heritage. Cultural landscapes with natural features: Identify natural features associated with cultural heritage significance and (if applicable) the users and custodians who will represent them. **Moveable cultural heritage:** Identify any movable cultural heritage that may be affected by the Project and adopt measures for its protection.	Yes	All of these requirements have been carried out as part of the assessment and recommendation stages of this HIA, the marine report, and the ICH report.

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
Where a Project has the potential to adverse legally protected or internationally recognised cultural heritage, the developer should seek to avoid such impacts, wherever viable.	Yes	As demonstrated within this report (and the associated marine and ICH reports), if all recommended mitigation is implemented, the Project will have **no impact** upon the OUV of the WRPA or upon the intangible cultural heritage of the Cultural Space of the Bedu in Wadi Rum.
Environmental and Social Exclusion List		
Any projects that impact UNESCO Natural and Mixed World Heritage Sites will not qualify for lender funding.	Yes	As demonstrated within this report (and the associated marine and ICH reports), if all recommended mitigation is implemented, the Project will have **no impact** upon the OUV of the WRPA or upon the intangible cultural heritage of the Cultural Space of the Bedu in Wadi Rum.
Risk and Impact Assessment Policy ESR1		
Requires an integrated assessment of identified environmental and social risks and impacts of the Project; an ESMS to manage environmental and social performance throughout the Project's lifetime; and meaningful consultation with all relevant stakeholders as a part of this process.	Yes	A comprehensive and detailed assessment of risks and impacts to cultural heritage has been conducted as part of this HIA Statement and the associated marine heritage and ICH reports. These have been used to inform the relevant ESIA chapter. These reports also recommend comprehensive heritage mitigation, to be implemented as part of an ESMS, and have involved meaningful and comprehensive consultation with all relevant stakeholders. Therefore, the Project is in compliance with ESR1 with regards to cultural heritage. CH Arabia cannot comment on whether the Project complies with this policy with regards to other environmental and social sectors as this is outside the scope and requirements of this report.
Land Acquisition Policy ESR5		
Requires the developer to identify and assess potential displacements of people within the required environmental and social assessment; consider feasible	N/A	This is outside the scope of the report and a matter to be assessed within the relevant social chapter of the ESIA.

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
alternative project designs to avoid or minimise any such displacement; and minimise and mitigate remaining land acquisition in consultation with relevant stakeholders.		
Stakeholder Engagement Policy ESR10		
Requires the design and implementation of a SEP, initiated at the early project stage and continuing throughout the Project cycle.	Yes	All stakeholder engagement conducted concerning cultural heritage has been conducted in accordance with the Project's SEP. CH Arabia cannot comment on whether the Project complies with this policy with regards to other environmental and social sectors as this is outside the scope and requirements of this report.

Table 7-3. Requirements of the IFC's Performance Standards (IFC 2012)

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
Performance Standard 8 (General Requirements)		
Requirements are largely comparable and specify the same general requirements as the EBRD's ESR8 (see above).	Yes	See above.
Performance Standard 8 (Specific Requirements)		
Specific requirements for different types of cultural heritage: Where replicable tangible cultural heritage is encountered, the client will apply mitigation measures that favor	Yes	All recommended mitigation measures will serve to avoid, minimize, reduce, or offset impacts (in that order) to replicable tangible heritage. The Project does not assess any impacts to non-replicable tangible cultural heritage.

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
avoidance. Where avoidance is not feasible, the client will apply a mitigation hierarchy that, in order of preference, minimises, restores, or (as a last resort and in certain specified allowable cases) offsets the impact. Where non-replicable tangible cultural heritage is encountered, the client will not remove any such cultural heritage, unless certain specified conditions are met.		
The developer must not remove, significantly alter, or damage any critical cultural heritage (critical cultural heritage includes that which is legally protected).	Yes	As demonstrated within this report (and the associated marine and ICH reports), if all recommended mitigation is implemented, the Project will have **no impact** upon the OUV of the WRPA or upon the intangible cultural heritage of the Cultural Space of the Bedu in Wadi Rum.
Any projects that will take place within a legally defined buffer zone will only qualify for funding if the development: • complies with all national and local cultural heritage regulations or the protected area's management plans • involves consultation with the area's sponsors and managers, local communities, and other key stakeholders • implements additional programs, as appropriate, to promote and enhance the conservations aims of the protected area	Yes	(As demonstrated within Section 7.2.3 below, the Project complies with all relevant heritage legislation and the relevant management plans. The Project has also been informed by thorough and meaningful stakeholder engagement (see Section 2.4). The Project (and mitigation recommended in this report) has been designed to (and, as demonstrated by the report, will succeed in) protecting the OUV of the WRPA and the intangible cultural heritage of the Cultural Space of the Bedu in Wadi Rum from any negative impacts. This is in line with, and therefore promotes, the conservation aims of these protected areas.
Risk and Impact Assessment Performance Standard PS1		
The IFC's PS1 is comparable, and specifies the same general requirements, as the EBRD's ESR1 (see above).	Yes	See above
Land Acquisition Performance Standard PS5		
The IFC's PS5 is comparable, and specifies the same general requirements, as the EBRD's ESR5 (see above).	N/A	This is outside the scope of the report and a matter to be assessed within the relevant social chapter of the ESIA.

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
In addition, this policy also requires that avoidance, minimisation, or mitigation of identified impacts are managed through the developer's ESMS.		

Table 7-4. The EIB's Environmental and Social Standards (EIB 2022)

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
Standard 10 (General Requirements)		
Requirements are largely comparable and specify the same general requirements as the EBRD's ESR8 (see above).	Yes	See above.
Standard 10 (Specific Requirements)		
Any projects that will take place within a legally defined buffer zone will only qualify for funding if the developers meet the following additional requirements: • comply with all international, national and/or local cultural heritage regulations or the protected area's management plans • Conduct meaningful consultation with the protected area's sponsors and managers, local communities, and other key stakeholders • Implement additional programs, as appropriate, to reduce the project's impacts, including visual impacts, and to promote and enhance the		(As demonstrated within Section 0 below, the Project complies with all relevant heritage legislation and relevant management plans. The Project has also been informed by thorough and meaningful stakeholder engagement (see Section 2.4). The Project (and mitigation recommended in this report) has been designed to (and, as demonstrated by the report, will succeed in) protecting the OUV of the WRPA and the intangible cultural heritage of the Cultural Space of the Bedu in Wadi Rum from any negative impacts. This is in line with, and therefore promotes, the conservation aims of these protected areas.

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
conservation aims of the protected area (EIB 2022: 80).		
Risk and Impact Assessment Standard 1		
The EIB's Standard 1 is comparable, and specifies the same general requirements, as the EBRD's ESR1 (see above). In addition, this standard requires that the assessment of environmental and social impacts and risks is carried out in the form of an EIA or ESIA for this particular Project.	Yes	See above This HIA Statement, and the associated ICH and marine heritage reports, have informed the ESIA carried out for this Project.
Land Acquisition Standard 6		
The EIB's Standard 6 is comparable, and specifies the same general requirements, as the EBRD's ESR5 (see above).	N/A	This is outside the scope of the report and a matter to be assessed within the relevant social chapter of the ESIA.
Stakeholder Engagement Standard 2		
The EIB's Standard 2 is comparable, and specifies the same general requirements, as the EBRD's ESR10 (see above).	Yes	See above

Table 7-5. The World Bank Group (WBG)"s Environmental and Social Framework (WBG 2017)

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
Environmental and Social Standard 8 (General Requirements)		

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
Requirements are largely comparable and specify the same general requirements as the EBRD's ESR8 (see above).	Yes	See above.
Environmental and Social Standard 8 (Specific Requirements)		
Any projects that will take place within a legally defined buffer zone will only qualify for funding if the developers meet the following additional requirements: • comply with national and local cultural heritage regulations or the protected area's management plans • Consult the area's sponsors and managers, project-affected parties (both individuals and communities) and other interested parties on the proposed project; and • Implement additional programs, as appropriate, to promote and enhance the conservations aims of the protected area (WBG 2017: 87).	Yes	(As demonstrated within Section 0 below, the Project complies with all relevant heritage legislation and relevant management plans. The Project has also been informed by thorough and meaningful stakeholder engagement (see Section 2.4). The Project (and mitigation recommended in this report) has been designed to (and, as demonstrated by the report, will succeed in) protecting the OUV of the WRPA and the intangible cultural heritage of the Cultural Space of the Bedu in Wadi Rum from any negative impacts. This is in line with, and therefore promotes, the conservation aims of these protected areas.
Risk and Impact Assessment ESS1		
The WBG's ESS1 is comparable, and specifies the same general requirements, as the EBRD's ESR1 (see above).	Yes	See above
Land Acquisition ESS5		
The WBG's ESS5 is comparable, and specifies the same general requirements, as the EBRD's ESR5 (see above).	N/A	This is outside the scope of the report and a matter to be assessed within the relevant social chapter of the ESIA.
Stakeholder Engagement ESS10		
The WBG's ESS10 is largely comparable, and specifies the same general requirements, as the EBRD's ESR10 (see above).	Yes	See above

Table 7-6. The Development Finance Corporation (DFC)'s Environmental and Social Policy and Procedures (DFC 2024)

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
General		
The DFC adopts the IFC's Performance standards and the EHS Guidelines of the IFC and WBG.	Yes	See above
Categorical Prohibitions 7 and 8		
These prohibitions prohibit the DFC from financing any Project that has any impact on a World Heritage Site, or any area on the United Nations List of National Parks and Protected Areas. It also requires that an environmental and social assessment is conducted for the project which demonstrates the Project will: • Not result in the degradation of the protected area; • Produce positive environmental and social benefits	Yes	As demonstrated within this report (and the associated marine and ICH reports), if all recommended mitigation is implemented, the Project will have **no impact** upon the OUV of the WRPA or upon the intangible cultural heritage of the Cultural Space of the Bedu in Wadi Rum. Although it does not regard cultural heritage, the Project will have a significant social and environmental benefits by supplying a ready supply of drinking water to communities, thereby resolving existing social and environmental issues associated with a severe lack of water across the region.

Table 7-7. The European Union (EU)'s heritage policies

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
Environmental Impact Assessment (EIA) Directive		

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
Requires that major building projects must be assessed for their impact on the environment before the project can start, to include assessment of impacts on cultural heritage.	Yes	This assessment has been completed with the production of this HIA Statement, and the associated ICH and marine heritage reports. All have been used to inform the relevant ESIA chapter.

Table 7-8. PROPARCO and AFD"s Environmental and Social Framework (Agence Française de Développement (AFD) Group 2018)

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
General		
PROPARCO adopts the IFC's Performance standards and the EHS Guidelines of the IFC and WBG.	Yes	See above.
Exclusion List		
Exclusion 13 prohibits PROPARCO from funding any development or operation which would result in an irreversible alteration or significant displacement of a critical element of cultural heritage.	Yes	As demonstrated within this report (and the associated marine and ICH reports), if all recommended mitigation is implemented, the Project will have **no impact** upon the OUV of the WRPA or upon the intangible cultural heritage of the Cultural Space of the Bedu in Wadi Rum.
Exclusion 17 excludes any development or project which would take place within a natural and mixed site on the UNESCO World Heritage List or within a legally protected area (IUCN categories).	Yes	This exclusion technically does not apply as the Project will **NOT** take place within a UNESCO World Heritage Site or legally protected area (such as the WRPA) – it will only take place partially within the WRPA's buffer zone, all elements of which do NOT contribute to the OUV of the WRPA.

Table 7-9. The EDFI's Principles for Responsible Financing of Sustainable Development (European Development Finance Institutions [EDFI] 2019)

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
General		
The EDFI adopts the IFC's Performance standards and the EHS Guidelines of the IFC and WBG.	Yes	See above.
Harmonised Exclusion List		
The exclusion list prohibits the EDFI from funding any project that will result in the destruction [elimination or severe diminution] of High Conservation Value (HCV) areas, such as the WRPA and Cultural Space of the Bedu in Wadi Rum.	Yes	As demonstrated within this report (and the associated marine and ICH reports), if all recommended mitigation is implemented, the Project will have **no impact** upon the OUV of the WRPA or upon the intangible cultural heritage of the Cultural Space of the Bedu in Wadi Rum.

The requirements of the following entities are not further evaluated as they specify no requirements dealing specifically with cultural heritage and/or they align with the requirements of entities (e.g., the IFC, EGB, EBRD) already assessed above.

- The IFC and WBG' Environmental, Health, and Safety (EHS) Guidelines (IFC and WBG 2007a, 2007b, 2007c)
- The Jordanian National Environmental, Social, Health, and Safety (EHS) Guidelines.

7.2.3 Relevant Heritage Legislation

Table 7-10. Relevant Heritage Legislation

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
UNESCO World Heritage Convention 1972		
Requirement to conserve designated World Heritage Sites and Protected Areas.	Yes	As demonstrated within this report (and the associated marine and ICH reports), if all recommended mitigation is implemented, the Project will have **no impact** upon the OUV of

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
		the WRPA or upon the intangible cultural heritage of the Cultural Space of the Bedu in Wadi Rum. Thus, these protected sites and areas will be conserved.
UNESCO World Heritage Conference 2003		
Requirement to safeguard and raise awareness and appreciation in intangible cultural heritage	Yes	The ICH report has involved considerable investigation into the intangible cultural heritage of the area (thereby raising awareness and appreciation of it) and provides recommendations to safeguard it.
UNESCO Operational Guidelines 2024		
Requirement for an HIA to assess project impacts for any developments planned in or around a World Heritage Site	Yes	The production of this HIA fulfills this requirement.
UNESCO HIA Guidance and Toolkit 2022		
Provides specific guidance on how to conduct an HIA for a World Heritage Site or Protected Area	Yes	This HIA has been carried out in strict accordance with this document.
Antiquities Law No 23. (2024)		
Prohibits heavy or dangerous activities within 1 km of antique sites. Also requires that new structures be built at least 5-25m (or greater if deemed necessary by the Minister of Tourism and Antiquities) from antique sites.	Yes	The Project does not propose any heavy or dangerous developments. CH Arabia also provides a specific recommendation that sites are afforded a protection buffer (of between 2-25m, or greater if deemed necessary by the Minister of Tourism and Antiquities) from all identified heritage assets.
Protection of Architectural and Urban Heritage Law No. 5 (2005)		
This law outlines the responsible parties and procedures for identifying, documenting, and protecting Jordan's architectural and urban heritage, including significant buildings and historic districts.	Yes	This HIA, and all assessments and work supporting it, have been carried out in strict accordance with this document.
Regulations for Archaeological Projects in Jordan (2015)		

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
These regulations set out the procedures and standards for conducting archaeological work in Jordan, including excavation, survey, and documentation. The regulations also recognise both tangible and intangible heritage values, ensuring that archaeological projects consider associated cultural practices and knowledge linked to sites.	Yes	This HIA, and all assessments and work supporting it, have been carried out in strict accordance with this document. This HIA, the ICH report, marine archaeology report, and resultant ESIA chapter also include a thorough impact assessment with regard to all relevant tangible and intangible heritage values, including those related to cultural practices and knowledge linked to sites.
Regulation No. 24 for the Development of the Wadi Rum Protected Area (ASEZA) (2001)		
Requires the preservation of the WRPA's natural, cultural, and heritage environment and unique landscapes.	Yes	As demonstrated within this report (and the associated marine and ICH reports), if all recommended mitigation is implemented, the Project will have **no impact** upon the OUV of the WRPA. Thus, all aspects of the WRPA will be preserved.
Regulatory Provisions for the Wadi Rum Protected Area Buffer Zone (ASEZA)		
These provisions forbid projects or activities within the WRPA buffer zone if they will: Be incompatible with the culture and heritage of the area or in any other way cause its destruction Involve construction and/or activities within archaeological sites Introduce mining, quarries, crushers, sand and gravel plants or industry plants of any kind Involve the introduction of any above-ground infrastructure facilities and services Produce noise levels exceeding 45dB or vibrations lasting more than three minutes if they are strong enough to be felt by humans	Yes	As demonstrated within this report (and the associated marine and ICH reports), if all recommended mitigation is implemented, the Project will have **no impact** upon the OUV of the WRPA and only **slight** impacts upon the heritage significance of other non-UNESCO remains. As such the Project will not be incompatible with the buffer zone's cultural heritage, or in any way cause its destruction. The Project will not involve any construction or activities across any known heritage assets with the WRPA buffer zone. The Project will not involve the introduction of any mining, quarries, crushers, sand and gravel plants or industry plants into the WRPA buffer zone. The Project will not involve the introduction of any above-ground infrastructure facilities and services into the buffer zone.

Requirements Relevant to the Project	Already compliant or compliant following mitigation?	How is compliance achieved or how will it be achieved?
Involve anything other than 'low development' within the "social corridor" (through which the Project will pass) (as defined on AESEZA's Strategic Use Plan)		Specific mitigation has been recommended to ensure that the Project does not produce noise levels exceeding 45dB or vibrations lasting more than three minutes if they are strong enough to be felt by humans within the WRPA buffer zone. The only development proposed through the WRPA buffer zone is an underground pipeline. As this will require excavation adjacent to an existing road (and thus within a previously disturbed area) and will introduce in no new, permanent above-ground infrastructure, this should be considered 'low development.'

8 Conclusions

This HIA Statement has identified, described, and assessed the heritage baseline for the Project Area and AOI. It is also informed by the results of a new archaeological walkover survey, undertaken to address identified gaps within the heritage baseline. The OUV of the WRPA and the heritage significance of all other relevant non-UNESCO heritage assets were also assessed and discussed.

The HIA Statement then conducted a comprehensive assessment of the impacts of all elements of the Project upon the OUV of the WRPA and the Cultural Space of the Bedu in Wadi Rum and the heritage significance of non-UNESCO heritage assets and elements. This included a detailed assessment of the Project's impact upon the setting of heritage assets and the WRPA, the historic landscape character, key historic views, and significant visual receptors. The Statement found that the Project posed a range of negative impacts upon heritage significance. These included **minor-moderate** detrimental impacts upon the OUV of the WRPA and **slight-large** detrimental impacts upon the heritage significance of other heritage assets.

The HIA Statement then provided a suite of detailed and comprehensive recommendations to avoid, minimise, and otherwise mitigate identified impacts, in line with UNESCO's mitigation hierarchy. Recommendations included:

- the avoidance of identified heritage assets and the reduction of land take through Project design
- the avoidance and minimisation of construction effects (e.g., noise, light) through appropriate provisions
- the development and implementation of a CFP and program of archaeological monitoring
- further investigation into identified sites of low significance that may be lost as a result of the Project;
- the maintenance of safe access to cultural heritage sites, areas, and resources;
- and the integration of all of the above provisions within an ESMS and CHMP.

The HIA Statement concluded with an assessment of residual impacts, i.e., those impacts remaining to heritage significance if all recommended mitigation were implemented. CH Arabia concluded that the mitigation would considerably reduce harm to heritage significance, resulting in a Project which poses **no (i.e., neutral) impacts** to the OUV of UNESCO-protected areas (the WRPA and the Cultural Space of the Bedu in Wadi Rum) and **slight** impacts to the heritage significance of some other, non-UNESCO heritage assets and elements.

Due to the low magnitude of residual negative impacts associated with the Project, and the absence of any negative impacts at all upon the WRPA and Cultural Space of the Bedu in Wadi Rum, no assessment of alternatives was undertaken within the report. As demonstrated and discussed in detail within the final section of this report, this also means that the Project (supposing all recommended mitigation is implemented) will comply with all relevant heritage legislation and Lenders' standards and requirements.

9 References

Abadi Y. & Rosen S.A. 2008. A Chip Off the Old Millstone: Grinding Stone Production and Distribution in the Early Bronze Age of the Negev. Pages 99–115 in *New Approaches to Old Stones: Recent Studies of Groundstone Artifacts*. London: Equinox

Abdelhamid G. 1990. The geology of the Jabal Umm Ishrin area (Wadi Rum). Jordan: National Resources Authority: Amman, Jordan

Abu Azizeh W., Tarawneh M., Crassard R., & Sánchez Priego J.A. 2021. Discovery and excavation of desert kites in the south-eastern Badia of Jordan. Pages 225- in *The gazelle's dream: game drives of the Old and New Worlds*. Sydney: Sydney University Press

Abu Hamdan T. & Mason O. 2025. Constructing citizenship and indigeneity in Jordan: The politics of Bedouin rights and identities in cultural heritage sites. *The Geographical Journal*: e70010.

Agence Française de Développement (AFD) Group. 2018. Environmental and social framework.

Al-Eisawi D. 2012. Conservation of natural ecosystems in Jordan. *Pak. J. Bot* 44: 95–99.

Al-Eisawi D.M.H. 2005. Water scarcity in relation to food security and sustainable use of biodiversity in Jordan. *Food security under water scarcity in the Middle East: Problems and solutions. CIHEAM Options Méditerranéennes: Série A. Séminaires Méditerranéens* 65: 239–248.

Alghazawi R. & Al-Manaser A. 2024. Unveiling Jordan's Rock Art Legacy: The Flute Player at the Jordan Museum as a Case Study. *Arqueología Iberoamericana* 54: 110–116.

Alhasanat M.B., Kabir S., Wan Hussin W.M.A., & Addison E. 2012. Spatial analysis of a historical phenomenon: using GIS to demonstrate the strategic placement of Umayyad desert palaces. *GeoJournal* 77/3: 343–359.

Alhejoj I. & Salameh E. 2023. *An Introduction to the Geology of Jordan*. Cambridge: Cambridge Scholars Publishing

Al-Homoud A.S., Allison R.J., Sunna B.F., & White K. 1995. Geology, geomorphology, hydrology, groundwater and physical resources of the desertified Badia environment in Jordan. *GeoJournal* 37/1: 51–67.

Al-Homoud A.S., Allison R.J., Sunna B.F., & White K. 1996. A study on geology, geomorphology, hydrology, groundwater, and physical resources of the desertified Badia environment in Jordan towards sustainable development. *Environmental Geology* 27/3: 198–209.

Al-Muheisen Z. & Villeneuve F. 2005. Arachaeological Research at Khirbat adh-Dharih. *Annual of the Department of Antiquities of Jordan* 49: 489–499.

Alon Y. 2006. Tribes and State-Formation in Mandatory Transjordan. *Civil Wars* 8/1: 66–82.

Al-Shorman A., Ababneh A., Rawashdih A., Makhadmih A., Alsaad S., & Jamhawi M. 2017. Travel and Hospitality in Late Antiquity: A Case Study from Umm el-Jimal in Eastern Jordan. *Near Eastern Archaeology* 80/1: 22–28.

Amr Z.S. 2012. *Mammals of Jordan*. . 2nd ednAmman: Al Rai Press

Anderson S.C. 2001. Amphibians and reptiles of the Hashemite Kingdom of Jordan. An Atlas and Field Guide. *Herpetological Review* 32/4: 288.

Aqaba Special Economic Zone Authority [ASEZA]. 2001. Regulation no. (24) for the year 2001: regulation for the development of Wadi Rum Area: issued in accordance with articles (11) and (56) of the Aqaba Special Economic Zone Law no. (32) for the year 2000.

Aqaba Special Economic Zone Authority [ASEZA]. 2024. Wadi Rum Protected Area: state of conservation report.

Aqaba Special Economic Zone Authority [ASEZA]. n.d.a. General provisions and regulation of the buffer zone of Wadi Rum Protected Area.

Aqaba Special Economic Zone Authority [ASEZA]. n.d.b. Strategic plan for land use planning in the buffer zone of Rum Protected Area.

Armon M., Dente E., Smith J.A., Enzel Y., & Morin E. 2018. Synoptic-scale control over modern rainfall and flood patterns in the Levant Drylands with implications for past climates. *Journal of Hydrometeorology* 19/9: 1077–1096.

Avni Y. 2017. Tectonic and physiographic settings of the Levant. Pages 3–16 in Enzel, Y., & O. Bar-Yosef (eds.) *Quaternary of the Levant: Environments, climate change, and humans*. Cambridge: Cambridge University Press

Beck H.E., Zimmermann N.E., McVicar T.R., Vergopolan N., Berg A., & Wood E.F. 2018. Present and future Köppen-Geiger climate classification maps at 1-km resolution. *Scientific Data* 5/1: 180214.

Bender F. 1975. *Geology of the Arabian Peninsula: Jordan*. U.S. Gelogical Survey Professional Paper: 1–34.

Berlin A. 2003. The Hellenistic Period. in Richard, S. (ed.) *Near Eastern Archaeology: A Reader*. Winona Lake, Indiana: Eisenbrauns

Bienkowski P. 2001. The Persian Period. in MacDonald, B., R. Adams, & P. Bienkowski (eds.) *The Archaeology of Jordan*. Sheffield: Sheffield Academic Press

Bienkowski P. 2013. Edom During the Iron Age II Period. Pages 782–794 in Killebrew, A. E., & M. Steiner (eds.) *The Oxford Handbook of the Archaeology of the Levant*. Oxford University Press

Bourke S.J. 2002. The Origins of Social Complexity in The Southern Levant: New Evidence From Teleilat Ghassul, Jordan. *Palestine Exploration Quarterly* 134/1: 2–27.

Brown G.F., Schmidt D.L., & Huffman A.C. 1989. *Geology of the Arabian Peninsula; shield area of western Saudi Arabia*. Reston, Virginia

Chesson M.S. 2018. The Southern Levant during the Early Bronze Age I–III. Pages 163–182 in Yasur-Landau, A., E. H. Cline, & Y. Rowan (eds.) *The Social Archaeology of the Levant*. Cambridge: Cambridge University Press

Cohen S.L. 2017. Reevaluation of Connections Between Egypt and the Southern Levant in the Middle Bronze Age in Light of the New Higher Chronology. *Journal of Ancient Egyptian Interconnections* 13: 34–42.

Coinman N.R. 1997. The Upper Paleolithic in Jordan: Evidence from the Wadi al-Hasa and South Jordan. *Studies in the History and Archaeology in Jordan* 6: 209–217.

Corbett G.J. 2010. *Mapping the mute immortals: A locational and contextual analysis of Thamudic E/Ḥismaic inscriptions and rock drawing from the Wādī Ḥafīr of southern Jordan*. Ph.D. thesis Thesis, Chicago, Illinois: University of Chicago [Unpublished]

Corbett G.J. 2011. Preliminary report on the Wadi Hafir petroglpyh survey, 2005-2006, with special comment on the distribution of selected Thamudic E/Hismaic inscriptions and rock drawings. *Annual of the Department of Antiquities of Jordan* 55: 233–248.

Corbett G.J. 2012. Desert Traces: Tracking the Nabataeans in Jordan's Wādī Ramm. *Near Eastern Archaeology* 75/4: 208–219.

Corbett G.J. 2015. The Wadi Hafir petroglyph survey: shedding new light on Thamudic inscriptions2015. 17 October 2025. https://publications.acorjordan.org/2015/03/10/the-wadi-hafir-petroglyph-survey-shedding-new-light-on-thamudic-inscriptions/

Corbett G.J. 2025. Wadi Ramm survey archive finds new home at ACOR2025. 17 October 2025. https://acorjordan.org/2017/08/08/wadi-ramm-survey-archive-finds-new-home-acor/

Cordova C.E., DeWitt R., & Winsborough B. 2014. Geology, landforms, and depositional systems in Wadi Rum. Pages 13–28 in Henry, D., & J. Beaver (eds.) *The Sands of Time: The Desert Neolithic Settlement of Ayn Abū Nukhayla.* Berlin: Ex Oriente

Cordova C.E., Nowell A., Bisson M., Ames C.J.H., Pokines J., Chang M., & al-Nahar M. 2013. Interglacial and glacial desert refugia and the Middle Paleolithic of the Azraq Oasis, Jordan. *Quaternary International* 300: 94–110.

DFC. 2024. Environmental and social policy and procedures.

EBRD. 2024. Environmental and social policy.

ECO Consult 2025. National Conveyor Details.

ECO Consult & Energies Group 2025. The Aqaba Amman water desalination and conveyance project (AAWDCP): detailed scope of work for the 2025 environmental and social impact assessment (ESIA). Draft: revision 2.

EIB. 2022. Environmental and social standards.

Eisenberg-Degen D., Nash G.H., & Schmidt J. 2016. Inscribing History: The Complex Geographies of Bedouin Tribal Symbols in the Negev Desert, Southern Israel. Pages 157–187 in Brady, L. M., & P. S. C. Tacçon (eds.) *Relating to Rock Art in the Contemporary World: Navigating Symbolism, Meaning, and Significance*. University Press of Colorado

Electromontaj S.A. 2019a. 132 kV tower type D1: general arrangement. Drawing no 14/18 EJ 2211.

Electromontaj S.A. 2019b. 132 kV tower type D3: general arrangement. Drawing no 14/18 EJ 2311.

Electromontaj S.A. 2019c. 132 kV tower type D9/DT: general arrangement. Drawing no 14/18 EJ 2511.

Electromontaj S.A. 2019d. 132 kV tower type DL: general arrangement. Drawing no 14/18 EJ 2111.

European Commission. 2019. European framework for action on cultural heritage.

European Commission. 2025. Environmental Impact Assessment: evaluating the effects of public and private projects on the environment2025. 9 October 2025. https://environment.ec.europa.eu/law-and-governance/environmental-assessments/environmental-impact-assessment_en

European Development Finance Institutions [EDFI] 2011. Harmonized EDFI Exclusion List.

European Development Finance Institutions [EDFI]. 2019. EDFI principles for responsible financing of sustainable development.

Farès S. & Norris J. 2017. The Wadi Ramm project. *Annual of the Department of Antiquities of Jordan* 58: 525–540.

Finlayson B., Makarewicz C., & Smith S. 2024. Cultural Hybridity in Central and Southern Jordan at the End of the Pre-Pottery Neolithic A. *Paleorient* 49/2: 149–164.

Finlayson B., Makarewicz C., Smith S., & Mithen S. 2014. The Transition from PPNA to PPNB in Southern Jordan. *Studies in the History and Archaeology in Jordan* 11: 105–109.

Fradley M., Wilson A., Finlayson B., & Bewley R. 2023. A lost campaign? New evidence of Roman temporary camps in northern Arabia. *Antiquity* 97/393: e15.

Freeman P. 2001. Roman Jordan. Pages 427–459 in *The Archaeology of Jordan*. Sheffield: Sheffield Academic Press

Freiwan M. & Kadioglu M. 2008. Spatial and temporal analysis of climatological data in Jordan. *International Journal of Climatology* 28/4: 521–535.

Fujii S. 2011. 'Lost Property' at Wadi Qusayr 173: Evidence for the Transportation of Tabular Scrapers in the Jafr Basin, Southern Jordan. *Levant* 43/1: 1–14.

Fujii S. 2013. Chronology of the Jafr prehistory and protohistory: A key to the process of pastoral nomadization in the southern Levant. *Syria* 90: 49–125.

General Department of Antiquities 2005. *Protection of Architectural and Urban Heritage Law No. 5.*

General Department of Antiquities 2015. *Regulations for Archaeological Projects in Jordan.*

General Department of Antiquities. 2024. *Law of Antiquities: the amending Law No. 23 for the year 2024 promulgated in the Official Gazette, issue No. 4662 dated 1/6/2024.* : 16.

Gidding A.D. 2023. Cultural continuity and asymmetry through the Levantine Early Bronze Age: a view from the desert. *Levant* 55/1: 46–60.

Goudie A., Migon P., Allison J.R., & Rosser N. 2002. Sandstone geomorphology of the Al Quwayra area of south Jordan. *Zeitschrift für Geomorphologie N. F.* 46: 365–390.

Graf D.F. 1983. The Nabataeans and the Hisma: in the footsteps of Glueck and beyond. Pages 647–664 in Meyers, C. L., & M. P. O'Connor (eds.) *The Word of the Lord Shall Go Forth: Essays in Honor of David Noel Freedman in Celebration of His Sixtieth Birthday,*. Winona Lake, Indiana: Eisenbrauns

Graf D.F. 2004. Nabataean identity and ethnicity : the epigraphic perspective. *Studies in the History and Archaeology of Jordan* 9: 145–154.

Graf D.F., Sidebotham S., Dolinka B., Erickson-Gini T., & Wasse A. 2022. The Hellenistic Petra Project: Excavations along the Colonnaded Street. Preliminary Report of the Third Season 2007. *Annual of the Department of Antiquities of Jordan* 61: 437–472.

Hauptmann A. 2007. *The Archaeometallurgy of Copper Evidence from Faynan, Jordan*. Berlin: Springer

HCV Network. 2025. We work to protect nature and support local people where it matters most2025. 9 October 2025. https://www.hcvnetwork.org/

Henry D.O. 1995. *Prehistoric Culutral Ecology and Evolution: Insights from Southern Jordan*. New York: Springer Science + Business Media

Herr L. 2013. The Southern Levant (Transjordan) During the Iron Age I Period. Pages 649–659 in Killebrew, A. E., & M. Steiner (eds.) *The Oxford Handbook of the Archaeology of the Levant*. Oxford: Oxford University Press

Ibáñez J.J., Ortega D., Campos D., Khalidi L., Méndez V., & Teira L. 2016. Developing a complex network model of obsidian exchange in the Neolithic Near East: Linear regressions, ethnographic models and archaeological data. *Paléorient* 42/2: 9–32.

ICOMOS 2011. Guidance on heritage impact assessments for Cultural World Heritage Properties.

International Finance Corporation [IFC] 2012. Performance standards on environmental and social sustainability. IFC

International Finance Corporation [IFC]. & World Bank Group [WBG]. 2007a. Environmental, Health, and Safety (EHS) general guidelines.

International Finance Corporation [IFC]. & World Bank Group [WBG]. 2007b. Environmental, Health, and Safety (EHS) guidelines for electric power transmission and distribution.

International Finance Corporation [IFC]. & World Bank Group [WBG]. 2007c. Environmental, Health, and Safety (EHS) guidelines for water and sanitation.

International Union for Conservation of Nature [IUCN]. 2020. Wadi Rum Protected Area2020. 19 May 2025. https://worldheritageoutlook.iucn.org/explore-sites/wadi-rum-protected-area

Izdebski A., Pickett J., Roberts N., & Waliszewski T. 2016. The environmental, archaeological and historical evidence for regional climatic changes and their societal impacts in the Eastern Mediterranean in Late Antiquity. *Quaternary Science Reviews* 136: 189–208.

Jawabreh O., Al Fahmawee E.A.D., Al-Ansari R.W., Mahmoud R., & Nassar U.A. 2025. Geomorphological structure of landform characteristics as a reference for development recommendations in Wadi Rum Protected Area. *GeoJournal of Tourism and Geosites* 58/1: 433–445.

Jobling W. 1984. The fifth season of the 'Aqaba Ma'an survey 1984. *Annual of the Department of Antiquities of Jordan* 28: 191–202.

Jobling W.J. & Tangri D. 1991. A Prepottery Neolithic Site in the Hisma Basin, Southern Jordan. *Paléorient* 17/2: 141–148.

Jones I.W.N. 2018. Rural Communities and Labor in the Middle Islamic-Period Southern Levant. Pages 478–491 in Yasur-Landau, A., E. H. Cline, & Y. Rowan (eds.) *The Social Archaeology of the Levant*. Cambridge University Press

Jones I.W.N. 2021. The southern Levantine earthquake of 418/419 AD and the archaeology of Byzantine Petra. *Levant* 53/1: 107–121.

Jones I.W.N., Ben-Yosef E., Lorentzen B., Najjar M., & Levy T.E. 2017. Khirbat al-Mana'iyya: an early Islamic-period copper-smelting site in south-eastern Wadi 'Araba, Jordan. *Arabian Archaeology and Epigraphy* 28/2: 297–314.

Jones M.D., Maher L.A., & Richter T. 2016. Human-Environment Interactions Through the Epipalaeolithic of Eastern Jordan. Pages 121–140 in Contreras, D. (ed.) *The Archaeology of Human-Environment Interactions: Strategies for Investigating Anthropogenic Landscapes, Dynamic Environments, and Climate Change in the Human Past*. London: Routledge

Jordan Tourism Board 2025. The Hejaz Railroad2025. 1 November 2025. https://international.visitjordan.com/page/20/railroad

Kadowaki S. & Henry D.O. 2019. Renewed Investigation of the Middle and Upper Paleolithic Sites in the Jebel Qalkha Area, Southern Jordan. Pages 23–41 in Nakamura, S., T. Adachi, & M. Abe (eds.) *Decades in Deserts: Essays on Near Eastern Archaeology in honour of Sumio Fujii*. Japan: Rokuichi Syobou

Kadowaki S., Suga E., & Henry D.O. 2021. Frequency and production technology of bladelets in Late Middle Paleolithic, Initial Upper Paleolithic, and Early Upper Paleolithic (Ahmarian) assemblages in Jebel Qalkha, Southern Jordan. *Quaternary International* 596: 4–21.

Kaniewski D., Marriner N., Cheddadi R., Guiot J., & Van Campo E. 2018. The 4.2 BP event in the Levant. *Climate of the Past* 14/10: 1529–1542.

Kennedy D. 2004. *The Roman Army in Jordan*. London: Council for British Research in the Levant

Kennedy D.L. 2012. The Cairn of Hani: Significance, Present Condition and Context. *Annual of the Department of Antiquities of Jordan* 56: 486–505.

King G.R.D. 1987. The distribution of sites and routes in the Jordanian and Syrian deserts in the early Islamic period. London: ArchaeoPress: 91–105.

Klimscha F. 2010. Long-range Contacts in the Late Chalcolithic of the Southern Levant. Excavations at Tall Hujayrat al-Ghuzlan and Tall al-Magass near Aqaba, Jordan. Prague: Charles University in Prague

Knapp A.B. 1993. *Society and Polity at Bronze Age Pella: An Annales Perspective*. Sheffield: Sheffield Academic Press

Kouki P. 2009. Archaeological Evidence of Land Tenure in the Petra Region, Jordan: Nabataean-Early Roman to Late Byzantine. *Journal of Mediterranean Archaeology* 22/1: 29–56.

Lehmann G. 2013. The Levant During the Persian Period. Pages 841–851 in Killebrew, A. E., & M. Steiner (eds.) *The Oxford Handbook of the Archaeology of the Levant*. Oxford: Oxford University Press

Levy T.E. 1998. Cult, metallurgy and rank societies—Chalcolithic period (ca. 4500–3500 BCE). Pages 226–244 in Levy, T. E. (ed.) *The archaeology of society in the Holy Land*. Leicester: Leicester Uniersity Press

Levy T.E., Higham T., Bronk Ramsey C., Smith N.G., Ben-Yosef E., Robinson M., Münger S., Knabb K., Schulze J.P., Najjar M., & Tauxe L. 2008. High-precision radiocarbon dating and historical biblical archaeology in southern Jordan. *Proceedings of the National Academy of Sciences* 105/43: 16460–16465.

Liss B., Howland M.D., Lorentzen B., Smitheram C., Najjar M., & Levy T.E. 2020. Up the Wadi: Development of an Iron Age Industrial Landscape in Faynan, Jordan. *Journal of Field Archaeology* 45/6: 413–427.

von Löwenstern A.B., Al-Eisawi D.M., & Garbari F. 2000. Studies on the Flora of Jordan 14. The species of the Hisma Basin (Wadi Rum desert). *Webbia* 55/2: 195–277.

Mahasneh M.A. no date. Groundwater Quality of Disi-Aquifer in Southern Jordan. *American Journal of Water Resources* 5/5: 152–161.

al-Manaser A. 2018. Traditional Music or Religious Ritual? Ancient Rock Art Illumined by Bedouin Custom. Pages 81–95 in Nehmé, L., & A. Al-Jallad (eds.) *To the Madbar and Back Again*. Leiden: Brill

McQuitty A. 2001. The Ottoman Period. Pages 561–594 in *The Archaeology of Jordan*. Sheffield: Sheffield Academic Press

Milwright M. 2006. Central and Southern Jordan in the Ayyubid Period: Historical and Archaeological Perspectives. *Journal of the Royal Asiatic Society of Great Britain & Ireland* 16/1: 1–27.

Modrý P., Rifai L., Abu Baker M., & Amr Z. 2004. Amphibians and reptiles of the Hashemite Kingdom of Jordan. *Denisia* 14: 407–420.

Nabataea.Net 2020. Wadi Rum Trains2020. 1 November 2025. https://nabataea.net/travel/other_me_railroads/wadi-rum-trains/

Nadel D., Bar-Oz G., Perevolotsky A., & Malkinson D. 2024. The V-shaped desert kites and their contribution to the Timnian economy. *Journal of Arid Environments* 220: 105120.

Nigro L. 2012. Khirbet al-Batrawy: Rise, Flourish and Collapse of an Early Bronze Age City in Jordan. London: Harrassowitz Verlag: 609–628.

Nigro L. 2015. The Copper Axes Hoard in the Early Bronze Age IIIb Palace of Batrawy, Jordan. Pages 77–83 in Rosinska-Balik, K., A. Ochal-Czarnowicz, & M. Czarnowicz (eds.) *Copper and Trade in the Southeastern Mediterranean: Trade routes of the Near East in Antiquity*. Oxford: BAR Publishing

Oleson J.P. 1997. Landscape and Cityscape in the Hisma: The Resources of Ancient Al-Humayma. *Studies in the History and Archaeology of Jordan* 6: 175–188.

Oleson J.P. 2010. *Humayma Excavation Project, 1: Resources, history, and the water-supply system*. Boston: American Schools of Oriental Research

Olszewski D.I. 2001. The Palaeolithic Period, Including the Epiplaeolithic. Pages 31–66 in MacDonald, B., R. Adams, & P. Bienkowski (eds.) *The Archaeology of Jordan*. Sheffield: Sheffield Academic Press

Parker S.T. 1997. Preliminary Report on the 1994 Season of the Roman Aqaba Project. *Bulletin of the American Schools of Oriental Research* 305: 19–44.

Petersen A. 2008. The Ottoman Hajj Route in Jordan: Motivation and Ideology. *Bulletin d'études orientales* Supplément LVII: 31–50.

Pola L., Hejduk V., Winkelhöfer T., Zíka A., Baker M.A.A., & Amr Z.S. 2020. Recent observations on amphibians and reptiles in the Hashemite Kingdom of Jordan. *Jordan Journal of Natural History* 7: 11–29.

Porter B.W. 2013. *Complex Communities: The Archaeology of Early Iron Age West-Central Jordan*. Tuscon: The University of Arizona Press

Porter B.W. 2018. Moving Beyond King Mesha: A Social Archaeology of Iron Age Jordan. Pages 324–336 in Yasur-Landau, A., E. H. Cline, & Y. Rowan (eds.) *The Social Archaeology of the Levant*. Cambridge University Press

Portillo M., Albert R.M., & Henry D.O. 2009. Domestic activities and spatial distribution in Ain Abū Nukhayla (Wadi Rum, Southern Jordan): The use of phytoliths and spherulites studies. *Quaternary International* 193/1: 174–183.

Prag K. 1991. Preliminary Report on the Excavations at Tell Iktanu and Tell al-Hammam, Jordan, 1990. *Levant* 23/1: 55–66.

Pratico G.D. 1985. Nelson Glueck's 1938-1940 Excavations at Tell el-Kheleifeh: A Reappraisal. *Bulletin of the American Schools of Oriental Research* 259: 1–32.

Protected Planet. 2025. Wadi Rum Protected Area2025. 22 May 2025. https://www.protectedplanet.net/555542337

Quintero L.A. & Wilke P.J. 1998. Archaeological Reconnaissance in the al-Jafr Basin, 1997. *Annual of the Department of Antiquities of Jordan* 42: 113–122.

Rast W.E., Schaub R.T., Maloney P.D., & Johnston R.H. 2003. *Bāb edh-Dhrāʿ: excavations at the town site (1975-81)*. Winona Lake, Ind: Eisenbrauns

Rech J.A., Ginat H., Catlett G.A., Mischke S., Winer Tully E., & Pigati J.S. 2017. Pliocene-Pleistocene Water Bodies and Associated Deposits in Southern Israel and Southern Jordan. Pages 127–134 in Enzel, Y., & O. Bar-Yosef (eds.) *Quaternary of the Levant: Environments, climate change, and humans*. Cambridge: Cambridge University Press

Reeves M.B. 2019. A Nabataean and Roman shrine with civic and military gods at Humayma, Jordan. *Arabian Archaeology and Epigraphy* 30/1: 134–155.

Republique Francaise. & Agence Française de Développement (AFD) Group. 2022. Exclusion List: AFD Group.

Richter T., Arranz-Otaegui A., Yeomans L., & Boaretto E. 2017. High Resolution AMS Dates from Shubayqa 1, northeast Jordan Reveal Complex Origins of Late Epipalaeolithic Natufian in the Levant. *Scientific Reports* 7/1: 17025.

Rollefson G. 2001. The Neolithic Period. Pages 67–106 in MacDonald, B., R. Adams, & P. Bienkowski (eds.) *The Archaeology of Jordan*. Sheffield: Sheffield Academic Press

Rollefson G.O. 1992. A Neolithic game board from ʿAin Ghazal, Jordan. *Bulletin of the American Schools of Oriental Research* 286: 1–5.

Rollefson G.O. 2011. The Greening of the Badlands: Pastoral Nomads and the 'Conclusion' of Neolithization in the Southern Levant. *Paléorient* 37/1: 101–109.

Rollefson G.O., Quintero L.A., & Wilke P.J. 2005. The Acheulian Industry in the al-Jafr Basin of Southeastern Jordan. *Journal of the Israel Prehistoric Society* 35: 53–68.

Rose J.C., El-Najjar M., & Burke D.L. 2007. Trade and the Acquistion of Wealth in Rural Late Antique North Jordan. *Studies in the History and Archaeology of Jordan* 9: 61–70.

Rosen S.A. 2025. The Timnian culture complex in the southern Levantine deserts: A rationale. *Journal of Arid Environments* 226: 105294.

Rowan Y.M. & Golden J. 2009. The Chalcolithic Period of the Southern Levant: A Synthetic Review. *Journal of World Prehistory* 22/1: 1–92.

Schick R. 2007. Al-Humayma and the Abbasid Family. *Studies in the History and Archaeology of Jordan* 9: 345–355.

Schmid S.G. 2008. The Hellenistic Period and the Nabateans. Pages 353–411 in Adams, R. (ed.) *Jordan: An Archaeological Reader*. London: Equinox

Simmons A.H. & Najjar M. 2006. Ghwair I: A Small, Complex Neolithic Community in Southern Jordan. *Journal of Field Archaeology* 31/1: 77–95.

SLR Consulting 2025. Jordan Aqaba-Amman Water Desalination and Conveyance Project - AAWDCP: lenders' environmental & social advisor: environmental and social due diligence: interim assignment report.

Sperveslage G. & Eichmann R. 2012. Egyptian cultural impact on north-west Arabia in the second and first millennia BC. *Proceedings of the Seminar for Arabian Studies* 42: 371–384.

Stantis C., Maaranen N., Kharobi A., Nowell G.M., Macpherson C., Schutkowski H., & Bourke S. 2022. Jordanian migration and mobility in the Middle Bronze Age (ca. 2100–1550 BCE) at Pella. *International Journal of Osteoarchaeology* 32/2: 339–357.

Stein M., Goring-Morris N., Ben Dor Y., & Erel Y. 2025. Environmental setting of the Neolithic Agricultural Revolution across the Fertile Crescent. *Quaternary Science Reviews* 355: 109265.

Steiner M. 2013. Moab During the Iron Age II Period. Pages 770–781 in Killebrew, A. E., & M. Steiner (eds.) *The Oxford Handbook of the Archaeology of the Levant*. Oxford: Oxford University Press

Strange J. 2001. The Late Bronze Age. Pages 291–323 in *The Archaeology of Jordan*. Sheffield: Sheffield Academic Press

Strange J. 2004. Jordan between Mesopotamia and Egypt in the Bronze and Iron Ages. *Studies in the History and Archaeology of Jordan* 8: 427–432.

Taifour H., Dexter K.G., Al-Bakri J., Miller A., & Neale S. 2022. A State-of-the-Art Vegetation Map for Jordan: A New Tool for Conservation in a Biodiverse Country. *Conservation* 2/1: 174–194.

Tarawneh M.S. 2009. *Sedentarization and tourism: the case of the Zalabia Bedouin tribe of the Southern Jordan*. Ph.D thesis Thesis, Montreal: McGill University

Tarawneh Q. & Kadıoğlu M. 2003. An analysis of precipitation climatology in Jordan. *Theoretical and Applied Climatology* 74/1: 123–136.

Tebes J.M. 2020. Beyond Petra: Nabataean Cultic and Mortuary Practices and the Cultural Heritage of the Negev and Edom. *Jordan Journal For History and Archaeology* 14/4: 333–347.

Tetra Tech International Development. 2022a. *Economic resilience initiative - infrastructure technical assistance TA2017141 R0 ERI: AAWDC project: executive summary of the ESIA*. Amsterdam, Netherlands: Tetra Tech International Development

Tetra Tech International Development. 2022b. *Economic resilience initiative - infrastructure technical assistance TA2017141 R0 ERI: task 1.14: AAWDC project environmental and social impact assessment report*.

Tetra Tech International Development. 2025. *Economic resilience initiative - infrastructure technical assistance AA-000907 - ERI-ITA. 21-MSK-JOR-ENV - preliminary risks assessment and ESIA for the Aqaba-Amman water desalination and conveyance (AAWDC) project (Jordan) - renewable energy component. Comprehensive environmental and social impact assessment*.

The Jordan Heritage Revival Company (JHRC) 2025. The Jordan Heritage Revival Company (JHRC)2025. 1 November 2025. https://jhrc.jo/

The World Bank Group [WBG]. 2017. The World Bank environmental and social framework.

Tholbecq L. 1998. The Nabataeo-Roman Site of Wadi Ramm (Iram): A New Appraisal. *Annual of the Department of Antiquities of Jordan* 42: 241–254.

Twaissi S. 2007. Nabataean Edom: a demographic and archaeological approach to modelling sedentarisation and regional dynamics. *Levant* 31/1: 143–163.

UNESCO 1972. Convention Concerning the Protection of the World Cultural and Natural Heritage. Paris, UNESCO. UNESCO

UNESCO 2022. Guidance and Toolkit for Impact Assessments in a World Heritage Context. UNESCO, ICCROM, ICOMOS and IUCN

United Nations Development Programme [UNDP] 2020. Jordan's Second Biennial Update Report: Under the United Nations Framework Convention on Climate Change. United Nations Development Programme

United Nations Educational, Scientific and Cultural Organization [UNESCO] 2024. The operational guidelines for the implementation of the World Heritage Convention. Intergovernmental Committee for the Protection of the World Cultural and Natural Heritage, World Heritage Centre, WHC.23/01. UNESCO, Paris

United Nations Educational, Scientific and Cultural Organization [UNESCO] 2025a. Cultural space of the Bedu in Petra and Wadi Rum2025. 19 May 2025. https://ich.unesco.org/en/RL/cultural-space-of-the-bedu-in-petra-and-wadi-rum-00122

United Nations Educational, Scientific and Cultural Organization [UNESCO]. 2025b. Wadi Rum Protected Area2025. 19 May 2025. https://whc.unesco.org/en/list/1377

United Nations Educational, Scientific and Cultural Organization [UNESCO], International Council on Monuments and Sites [ICOMOS]., International Centre for the Study of the Preservation and Restoration of Cultural Property [ICCROM]., & International Union for Conservation of Nature

[IUCN]. 2022. Guidance and toolkit for impact assessments in a world heritage context. UNESCO, Paris

United States Agency International Development [USAID] 2025. *Task WA-14: ESIA for construction of Disi-Aqaba pipeline: Heritage Impact Assessment (HIA): USAID building water infrastructure activity*. Amman, Jordan: CDM International Inc.

Walmsley A. 2001. Fatamid, Ayyubid, and Mamluk Jordan and the Crusader Interlude. Pages 515–559 in *The Archaeology of Jordan*. Sheffield: Sheffield Academic Press

Watson P. 2001. The Byzantine Period. Pages 461–502 in *The Archaeology of Jordan*. Sheffield: Sheffield Academic Press

Whitcomb D. 1992. Reassessing the Archaeology of Jordan of the Abbasid Period. *Studies in the History and Archaeology of Jordan* 4: 385–390.

Wilkinson T.. J. 2003. *Archaeological landscapes of the Near East*. Tucson: University of Arizona Press

Yekutieli Y. 2005. The desert, the sown and the Egyptian colony. *Ägypten und Levante* 14/1: 163–171.

Younker R.W. 2013. Ammon During the Iron Age II Period. Pages 757–769 in Killebrew, A. E., & M. Steiner (eds.) *The Oxford Handbook of the Archaeology of the Levant*. Oxford: Oxford University Press

This page intentionally left blank.

Document Verification

Project Name: Aqaba Amman Water Desalination and Conveyance (AAWDC) Project

Type of Project: Heritage Impact Assessment Statement

Quality Control

	Figures Checked By	Peer Reviewed By	Approved For Use By
Signature			
Name	Katherine Crawford	Neil Andrew Fairburn	Helen Juergens
Role	Senior GIS Specialist	Project Manager	Team Lead
Date	11/11/2025	11/11/2025	11/11/2025

Revision History

Version	Date	Author	Figures	Copy Editor	Peer Review
001	11/11/2025	MK, AK	DP	GF	NAF