



Red Sea-Dead Sea Water Conveyance Study Environmental and Social Assessment

Preliminary Scoping Report

December 2008

Preliminary Scoping Report

Red Sea-Dead Sea Water Conveyance Study Environmental and Social Assessment

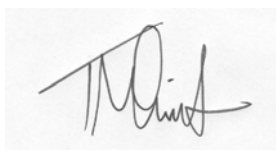
December 2008

Reference: 0084840

Prepared by: ERM in association with BRL
Ingenierie and EcoConsult

For and on behalf of
Environmental Resources Management

Approved by: Tim Smith



Signed:

Position: Project Director

Date: 24 December 2008

This report has been prepared by Environmental Resources Management the trading name of Environmental Resources Management Limited, with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own risk.

TABLE OF CONTENTS

1	INTRODUCTION	4
1.1	PREAMBLE	4
1.2	PURPOSE OF THIS PRELIMINARY SCOPING REPORT	4
1.3	METHODS USED IN SCOPING OF THIS ESA	5
1.4	RELEVANT ENVIRONMENTAL LEGISLATION AND PERMITTING	6
1.5	THE ESA PROCESS	9
2	DESCRIPTION OF THE FEASIBILITY STUDY PROPOSALS	11
2.1	CONTEXT	11
2.2	PROJECT COMPONENTS	11
3	ENVIRONMENTAL AND SOCIAL BASELINE	14
3.1	INTRODUCTION	14
3.2	PHYSICAL ENVIRONMENT	14
3.3	SOCIO-ECONOMIC BACKGROUND	17
3.4	ECOLOGY AND SENSITIVE AREAS	20
3.5	ARCHAEOLOGY AND CULTURAL HERITAGE	21
3.6	HYDROLOGY AND WATER RESOURCES	26
4	PUBLIC CONSULTATION AND COMMUNICATION	28
4.1	INTRODUCTION	28
4.2	PHASING OF CONSULTATION	28
4.3	STAKEHOLDERS TO BE CONSULTED	28
4.4	THE CONSULTATION PROCESS	29
4.5	OUTCOME OF PHASE 1 CONSULTATION	30
5	IDENTIFICATION OF IMPACTS AND KEY ISSUES	31
5.1	ACTIVITIES THAT GIVE RISE TO IMPACTS	31
5.2	DEFINING THE SIGNIFICANCE OF ENVIRONMENTAL AND SOCIAL IMPACTS	31
5.3	MITIGATION OF ENVIRONMENTAL AND SOCIAL IMPACTS	32
5.4	CONSTRUCTION IMPACTS	32
5.5	OPERATIONAL IMPACTS	33
5.6	INDUCED IMPACTS	34
5.7	SUMMARY OF KEY IMPACT AREAS AND ISSUES	34
6	IMPACT ANALYSIS AND PRESENTATION	38
6.1	ORGANISATION OF INFORMATION	38



6.2	<i>REGIONAL IMPACTS</i>	38
6.3	<i>IMPACTS ON UPPER GULF OF AQABA/EILAT AND COASTAL REGION</i>	41
6.4	<i>IMPACTS ON THE WADI ARABA/ARAVA VALLEY</i>	42
6.5	<i>IMPACTS ON THE DEAD SEA AND SURROUNDING AREA</i>	43
6.6	<i>IMPACTS OF THE DESALINATION PLANT AND ASSOCIATED FACILITIES</i>	44
7	<i>STUDIES TO BE UNDERTAKEN TO IDENTIFY AND ASSESS IMPACTS</i>	46
7.1	<i>OVERVIEW</i>	46
7.2	<i>THE SUB-STUDIES</i>	47
7.3	<i>THE ESA THEMATIC REPORTS</i>	49
8	<i>PROPOSED TABLE OF CONTENTS OF THE ESA REPORT</i>	53
	<i>ANNEX A – Stakeholders in Each Beneficiary Party</i>	61



1.1

PREAMBLE

1.1 The Dead Sea water level has been dropping at an increasing rate for the last 30 years. Major environmental damage has resulted including changes to the landscape due to the loss of water surface, the development of sinkholes and increased incidence of dust storms. If the current situation is allowed to continue unchecked the changes may become so great that the Dead Sea region might lose much of its value as a tourism and recreational area, in addition to the threats to its status as a world cultural and religious symbol.

1.2 A Feasibility Study is underway to study the implications of constructing a water conveyance that would carry water from the Red Sea to the Dead Sea and, in so doing, stabilise or increase its water level (the “base case”). In addition the Feasibility Study will examine the provision of desalination and electricity generation capacity that, in conjunction with the conveyance, could be used to supply fresh water to users in Jordan, Israel and the Palestinian Authority (the “base case plus”).

1.3 In parallel with the Feasibility Study a full Environmental and Social Assessment (ESA) is being undertaken. This will involve a comprehensive review and assessment of all of the potential environmental and social impacts of the proposals generated by the Feasibility Study (both positive and negative) at both the regional and project-specific level.

1.4 The studies will together examine the technical, economic, financial, environmental and social factors that concern the project, and will provide an opportunity for a diverse range of both governmental and non-governmental stakeholders (including civil society, regional and international parties) to provide their views. In so doing, the FS and ESA will provide a sound basis for future decision making.

1.2

PURPOSE OF THIS PRELIMINARY SCOPING REPORT

1.5 Scoping is the process of identifying the issues to be addressed by an impact assessment. It is a method of ensuring that the impact assessment focuses on the important issues and avoids those that are considered to be less significant. It thereby improves the efficiency of the impact studies, focusing attention on key issues for project design and decision-making and on the concerns of stakeholders.

1.6 This *Preliminary Scoping Report* is intended for internal and stakeholder review and as a basis for confirming agreement on the purpose and approach



for the ESA and its interface with the rest of the Project. The aim is to ensure that all the impacts, issues, concerns, alternatives and mitigation which interested parties believe should be considered in the ESA are addressed. It is not a formal document required under the ESA Terms of Reference, but has been produced by the ESA team as a discussion and clarification document to assist the early stages of the ESA process.

1.7 The results and outcomes of this Scoping exercise and any subsequent discussions or clarifications will inform the development of the formal *Interim Assessment Report* that is due for submission in May 2009.

1.3

METHODS USED IN SCOPING OF THIS ESA

1.8 The basic idea of using water from the Red Sea to stabilise the Dead Sea and as feedstock for a desalination plant has a long history. In 1996 - 1998, Harza Engineering Company International led a team that conducted a pre-feasibility study of what was then called "the Red Sea Dead Sea Canal Project." That study (henceforth referred to as "Harza") included an Interim Environmental Assessment. The areas and ecosystems potentially impacted by the scheme have also individually been the subject of a number of studies over the past 25 years, carried out by scientific or research organisations, specialised interest groups, local authorities and by prospective developers. As a result, there exists a large amount of information and data that are available on the baseline conditions in the study area. Together these constitute a wealth of information that is far more detailed than that usually available for Environmental Assessment studies.

1.9 The available materials from past studies have been supplemented with information generated for the Feasibility Assessment and by consultations with stakeholder groups including:

- Government ministries and departments;
- Local authorities;
- NGOs and interest groups;
- Research institutions and universities;
- Local communities/landowners; and
- Business/private sector groups.

1.10 Finally in some cases (archaeological and cultural property, social and economic status), studies have been conducted to gather certain pieces of information.

1.11 The information has been analysed by the appropriate subject specialists, taking into account the concerns of the consultees to prepare a table of potential interactions between the project proposals and the environment and to inform the Terms of Reference of Sub-Studies and other



analyses to ensure that key issues are addressed with appropriate methods and in sufficient detail.

1.12 Note that the list of key impacts and study methods produced is not necessarily final. During the course of the Feasibility study new information may come to light, or new proposals may be suggested. As a result new issues may arise, or the potential significance of other impacts increase. The ESA will be adjusted to identify and address any such effects.

1.13 The purpose of this report is to set out how the ESA studies will be directed towards the issues and potential impacts which need the most thorough attention and to provide a means for public discussion of impact identification and assessment.

1.4 *RELEVANT ENVIRONMENTAL LEGISLATION AND PERMITTING*

1.4.1 *Legal Background*

1.14 The current RSDSC study programme will assess the feasibility of a conveyance and several variants. No permissions will be sought to apply for financing, acquire land or undertake any construction and so no formal Environmental Impact Assessment will be submitted to any of the permitting authorities at this stage.

1.15 As currently envisioned, the proposed project would be sited entirely or almost entirely on Jordanian territory, possibly with only minor constructions (associated with the fresh water conveyance) in areas controlled by Israel and the Palestinian Authority. Even so, the permitting requirements of the other beneficiary authorities must be considered because the Red Sea and the Dead Sea are both the subject of existing and pending conventions and international agreements.

1.16 Also, since the project would require funding from multiple donors and financing agencies, comprehensive safeguard procedures such as those of the World Bank would apply. Were the scheme to be found feasible and to proceed, therefore, environmental clearance would be needed under several national and international jurisdictions. The following sections outline the environmental planning and procedures of the beneficiary authorities and the World Bank.

1.4.2 *Israeli Requirements*

1.17 Environmental Impact Assessments have been used in Israel from the mid-1970s, although regulations governing the requirements of EIA documents were only promulgated under the Planning and Building Law in 1982 and revised in 2003.



1.18 The EIA process provides for a review of siting and planning alternatives and for identification of measures to prevent environmental deterioration and treat landscape disturbances. The Ministry of Environmental Protection is responsible for issuing guidelines on the preparation of each specific assessment document and for reviewing the EIA. Experts from the ministry evaluate each EIA and issue an opinion which includes a summary of the main findings of the EIA, conclusions and recommendations for the planning authority. Both the EIA and the ministerial opinion are open to the public along with the project documents. The planning authority is responsible for giving consent.

1.4.3 *Jordanian Requirements*

1.19 Jordan's Environmental Impact Assessment Regulation No 37, 2005 requires EIA to be carried out before permission to construct or operate is given. A scoping session is required, where potentially affected stakeholders and statutory bodies are consulted, and invited to comment on the draft terms of reference for the assessment. The process is governed by the Ministry of Environment, which convenes a technical committee to review the study and results and make recommendations to the Ministry. The EIA study must describe the pre-project baseline, examine project alternatives, identify and assess potential impacts, and develop an Environmental Management Plan (EMP) which includes mitigation and monitoring measures which should be agreed and implemented. There is presently no requirement for disclosure of the study results other than to the Ministry's technical committee, although this committee includes both technical and statutory members.

1.20 However, the Aqaba Special Economic Zone (ASEZ) is a separate jurisdiction, and has a separate environmental permitting regime. Here, the EIA study has a particular focus on protection of the marine environment. There is a similar requirement for stakeholder consultation during scoping, but in the ASEZ, the study results must also be disclosed and discussed with the stakeholders. The Aqaba Special Economic Zone Authority (ASEZA) governs this process, and can involve any party it sees fit to be involved in the study review process.

1.4.4 *Palestinian Authority Requirements*

1.21 Palestinian Environmental Law establishes the legal background for EIA. The Environmental Policy of 2000, then sets out administrative procedures. Basically, these stipulate that EIA is triggered after a project proponent has applied for and been granted outline planning permission. The proponent then applies to the Ministry of Environment for environmental approval. When EIA is required the Ministry itself prepares Terms of Reference that set out the minimum scope of the EIA studies. The proponent



then undertakes the study and the Ministry reviews the completed report, hiring consultants as necessary.

1.22 The Policy stipulates detailed requirements for stakeholder consultation including requiring proponents to consult stakeholders during the scoping and conduct of EIA studies; empowering the Ministry to conduct its own stakeholder consultation to verify the information provided, or extend the proponent's consultations; and, requiring the Ministry to coordinate EIA consultations with consultations by other authorities involved in the permitting process.

1.23 After the review of the EIA report is completed the Ministry either issues an approval, which may have conditions attached, or declines to approve, in which case the project can proceed no further.

1.4.5 *World Bank Group Operation Policies*

1.24 Environmental Assessment is one of the 10 environmental and social "Safeguard Policies" that the World Bank uses to examine the potential environmental risks and benefits associated with World Bank lending operations. During project preparation, the World Bank examines the implications of a proposed project for a series of 'safeguard' policies. These are:

- Environmental Assessment;
- Natural Habitats;
- Forestry;
- Pest Management;
- Cultural Property;
- Revised Draft Operational Policy 4.10: Indigenous People (replaces Operational Directive 4.20 on Indigenous Peoples)
- Involuntary Resettlement;
- Safety of Dams;
- Projects in International Waters; and
- Projects in Disputed Areas.

1.25 This ESA is being carried out in conformity with the World Bank Environmental Assessment (EA) policy which aims to ensure that projects are environmentally sound and sustainable.

1.26 EA evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation.



1.27 EA takes into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and physical cultural resources); and transboundary and global environmental aspects.

1.28 In addition, the ESA will conform to a Sustainability Policy and set of Performance Standards on Social and Environmental Sustainability released by the International Finance Corporation (IFC), the division of the World Bank Group that lends to private investors . These “Equator Principles “⁽¹⁾ reflect environmental and social best practice guidelines for the financing of large projects. The Performance Standards are listed in *Box 1.1*.

Box 1.1

International Finance Corporation Performance Standards

- Performance Standard 1: Social and Environmental Assessment and Management System;
- Performance Standard 2: Labour and Working Conditions;
- Performance Standard 3: Pollution Prevention and Abatement;
- Performance Standard 4: Community Health, Safety and Security;
- Performance Standard 5: Land Acquisition and Involuntary Resettlement;
- Performance Standard 6: Biodiversity Conservation and Sustainable Natural Resource Management;
- Performance Standard 7: Indigenous Peoples; and
- Performance Standard 8: Cultural Heritage.

1.29 IFC has also issued Environmental, Health and Safety (EHS) Guidelines which provide general and industry-specific examples of good international practice in environmental management. They represent the performance standards normally considered acceptable by the IFC, and generally considered to be achievable in new facilities at reasonable costs by existing technology. All IFC EHS Guidelines considered relevant to this Project will be consulted during the ESA, and their guidance reflected in the report and the Environmental and Social Management Plan.

1.5

THE ESA PROCESS

1.30 Four complementary Sub-Studies are being prepared that will provide detailed information for the following elements of the proposed scheme:

- Sub-Study A; Gulf of Aqaba/Eilat;
- Sub-Study B; Water Conveyance;
- Sub-Study C; Dead Sea;
- Sub-Study D; Hydropower Facilities and Desalination Plant.

(1) The Equator Principles are a financial industry benchmark for determining, assessing and managing social & environmental risk in project financing. As of 01/11/2007, they had been adopted by 56 major banking institutions. The Equator Principles reflect a common set of international, IFC-inspired best practices guidelines to manage social and environmental risks related to the financing of large projects.



1.31 These studies are being managed by the Feasibility Study Team and are supplemented, in some cases, by “additional studies”, i.e. research assignments commissioned from specialised institutions with particular expertise in key aspects of the study area. (e.g. the Red Sea ecology and currents, the Dead Sea chemistry, Dead Sea coastal environment, the Wadi Araba/Arava Valley ecology, the Geology and Seismology of the Rift Valley). The Sub-Studies and the additional studies’ Terms of Reference are being informed by the scoping exercise. The outputs of these studies will serve as key inputs to the ESA. The timing of the ESA stages is, therefore, to some extent dependent on the timely delivery of the sub-studies and the additional studies. The process, with indicative dates, is as set out below.

Activities and Outputs	Indicative Dates
Issue Scoping Report for Consultation	31/01/09
Scoping Consultations	01/02/09 - 01/03/09
Receive Draft Sub-Studies Reports	31/03/09
Issue Initial Assessment Report	28/05/09
Supplementary Analyses	1/6/09 - 30/11/09
Issue Preliminary ESA Report and Environmental and Social Management Plan	15/12/09
Public Meetings on Draft Reports	21/12/09 - 10/01/10
Issue Draft ESA Report and Environmental and Social Management Plan	31/01/10
Period for Disclosure and Comment	01/02/10 - 04/05/10
Final Draft ESA Report and Environmental and Social Management Plan	31/05/10



2.1 CONTEXT

2.1 The Feasibility Study is underway and will shortly (in January 2009) produce a Screening Report in which a description of the viable options for a conveyance will be presented. This *Preliminary Scoping Report* is being produced in advance of that report. It relies on a generic description of project components. When the Screening Report is available, and before the *Initial Assessment Report* is finalised, a more detailed description of the engineering proposals and key variants will be prepared.

2.2 PROJECT COMPONENTS

2.2.1 Intake

2.2 Water will be abstracted from the Upper Gulf of Aqaba filtered and treated before entering the conveyance. There are several key decisions to be made, as follows:

- a. *Location of the intake site.* Three possible intake locations in the Gulf of Aqaba /Eilat are being considered as follows:
 - Aqaba north shore (close to Israeli border);
 - Aqaba east shore (old thermal power station site);
 - Eilat west shore
- b. *The type of intake:* Again three forms of intake are being considered
 - A submerged bell mouth on the end of a submarine pipeline.
 - A closed breakwater with pipes
 - An open channel
- c. *The distance of the intake from the shoreline*
- d. *The depth of the intake below the sea surface*
- e. *The transfer of water to the conveyance:*
 - Through an intake channel gravity feed (pipe, open channel, box culvert, etc);
 - Pumped (number, size and type of pumps source of power supply, water abstraction rates).

2.3 The major environmental concerns that should influence these decisions are as follows:

- The need to avoid damaging corals and/or sea grasses at the intake site;
- The need to minimise any effect on gulf circulation patterns(giving rise to changes that might affect corals and tourism/amenity value of the gulf);



- Avoidance of placement of visually intrusive structures that are out of harmony with the surrounds, especially in valuable cityscapes or scenic beauty;
- The need to avoid taking land that could be used in ways of greater value and more in keeping with the economic growth plans of this rapidly developing area.

2.2.2 *Water Conveyance*

2.4 There are many ways in which the sea water could be conveyed through the Wadi Araba/ Arava Valley to the Dead Sea basin. The Feasibility Study is considering the following:

- The type of conveyance (tunnel, open channel, pipeline, etc);
- The alignment of the conveyance; and
- The level profile and configuration.

2.5 The major environmental concerns that should influence these decisions are:

- The need to minimise impacts on sensitive receptors along the route alignment (ecologically protected areas, birds and desert flora and fauna, archaeological and cultural sites, sensitive land forms);
- The need to minimise impacts on the movements, livelihoods and lifestyles of the people who live, work and spend leisure time in the area;
- The need to minimise risks of major incidents (conveyance breaches, leakages of brine or chemicals into aquifers, land slips, road closures etc) to people and economic activity, whether these are caused by natural events (especially seismic activity), poor management and operation practises, or sabotage.

2.2.3 *Dead Sea Outfall*

2.6 The Dead Sea outfall will combine the water from the conveyance with any brine that may have been produced from the desalination plant and any water discharged from the hydro power plant. The outfall will then discharge the combined streams to a location in the Dead Sea. The Feasibility Study is considering various options, including:

- Several possible southern and two possible northern locations for the discharge to the Dead Sea;
- Discharge configuration including depth below the surface, distance from the shoreline, multiple discharge points, submarine pipeline with multiple diffusers.

2.7 The major environmental concerns that should influence these decisions are as follows:



- The need to minimise impacts on the Dead Sea caused by mixing the two waters;
- The need to minimise impacts on the chemical industries caused by changes in the level of the Dead Sea or by changes in the chemical composition of the water entering the plants' intakes.

2.2.4 *Desalination Plant and Hydro Power Plant*

2.8 Desalination and hydro power plants will be considered as part of the "base case plus", ie as part of the investigation into the feasibility of desalinating the Red Sea water and supplying drinking water to the beneficiary parties. The critical factors governing the location of the plant will be practical, engineering and economic (proximity to connecting networks, capacity, nature of the pre-treatment and desalination process, power supply) but environmental concerns to be considered will include the need to minimise impacts on the site area (ecologically protected areas, archaeological and cultural sites, farms, areas of scenic beauty).

2.2.5 *Potable Water Transmission*

2.9 It is not yet clear whether potable water will be generated, nor, if it is, how much or where it will be conveyed. The feasibility study will determine these matters and then propose designs for potable water pumping and transmission systems. Matters to determine will include the numbers and configurations of pumping stations along the transmission main alignments, and the arrangements for power supply to the water transmission configurations. The transmission systems will be located within already substantially developed areas and will not involve major engineering works. The potential environmental effects are, therefore, unlikely to be of major significance. Nevertheless, the environmental concerns to be considered will include the need to minimise impacts on the transmission route (homes, movements of people, archaeological and cultural sites, farms, areas of scenic beauty).



3.1 INTRODUCTION

3.1 The purpose of defining a baseline environment ⁽¹⁾ is to describe projected future ⁽²⁾ environmental and social conditions in the Project area against which the Project effects can be contrasted. The baseline is therefore equivalent to the “no action” or “without project” alternative. Effective scoping enables the environmental and social descriptions to be focused on the potential impacts of the proposed Project. The intention is to avoid presenting a large volume of data that is not necessary for the prediction and assessment of impacts or the development of management and mitigation measures.

3.2 As described in *Section 1.3*, the RSDSC study area has been systematically studied previously in relation to the potential impacts of a conveyance. The following outline of baseline conditions is based on the previous description by Harza, updated, to some extent, by investigations undertaken as part of the current study programme. Focused studies will continue to complete an up-to-date baseline as an essential component of the ESA.

3.3 The study area covers a very large expanse of land within which a very wide range of environmental diversity occurs. For this brief overview of environmental conditions we have considered the area in three main divisions as follows:

- The upper Gulf of Aqaba/Eilat and surrounding area;
- The Wadi Araba/Arava Valley;
- The Dead Sea Basin.

3.4 The baseline conditions related to the freshwater conveyance pipeline(s) will be considered once outline routes have been proposed by the Feasibility Study.

3.2 PHYSICAL ENVIRONMENT

3.2.1 *The Gulf of Aqaba/Eilat and Surrounds*

3.5 The southern end of the RSDSC from where the sea water will be extracted starts at the Gulf of Aqaba/Eilat. This gulf is unique for its great

(1) The term 'environment' is herein used to describe both physical and social conditions.

(2) Projections apply to the expected economic life of the Project (i.e., 50years after start date).



depth in proportion to a narrow width. Around much of it, coastal plains are virtually absent and the steep rocky topography continues into the deep basins. Both above and below sea level, numerous wadis traverse the slopes forming submarine canyons. At the northern end, however, there is a wide and gently sloping coastal plain which extends into the sea. The sea in this area has comparatively high salinity (41ppm compared to 35ppm average for sea waters) due to a combination of the high evaporation rate and limited freshwater inflow.

3.6 The area lies within the Saharan Mediterranean Bioclimatic Zone, and the Gulf of Aqaba is known for its warm arid climate. The area is characterized by a hot summer and a warm winter with mean monthly air temperature ranging from 14°C in January to 32°C in August. The prevailing winds are northerly and north-easterly and usually calm at an annual average wind speed of 4.0 ± 0.5 m/sec greatest during the summer season and calmer during the winter.

3.7 The relative humidity ranges from 45% in April to 57% in December with monthly averages ranging from 40% in May-July to 52% in August-December. Rainfall is low, averaging 35 mm/year, short spanned and occurring mostly between November and May. Evaporation is high and can reach up to 4 m/year.

3.8 The shore extends for some 41 km, 27 km on the Jordanian side and 14 km on the Israeli. The area has national significance for both Jordan and Israel since the sea provides cooling water and port access that has become a focus for industrial development. This is particularly true for Jordan the area contains the nation's only sea port plus a major industrial zone geared largely to exports. The area is also important for tourism as it provides the sole, limited area of coral reef in these two countries. As a result, much of the shoreline on both sides has been artificially modified the limited areas remaining are consequently more valuable.

3.2.2 *The Wadi Araba/Arava Valley*

3.9 The stretch of land between the Gulf of Aqaba and the Dead Sea basin is known in Jordan as the Wadi Araba, and in Israel as the Arava Valley. Part of the Jordan Rift Valley (JRV), it consists of a valley running approximately north-south, which separates ranges of sandstone hills to the east and west. The valley floor is characterized by a sandy dune-field over much of its length, which becomes more stony in some areas, with varied vegetative cover.

3.10 The climate is mostly hyperarid, with annual average rainfall in the valley bottom below 50 mm. To the east, however, rainfall increases steadily as the steep eastern wall is ascended, until at the top, the climate is Mediterranean, with precipitation (sometimes including snowfall) of 300-400 mm.



3.11 The Jordan – Israel border lies approximately along the lowest point of this valley, with an important trunk route serving each state, running north-south along each side of the borderline. In the north the WAA valley is some 20 km wide between the flanking mountain walls, narrowing to about 10 km in the south.

3.12 Elevation rises gently from the Gulf coast until in the northern section of the Wadi Araba/ Arava Valley, it descends gradually before plunging steeply into the Dead Sea basin, just south of Fifa.

3.13 A major land issue in the context of the RSDSC is seismic activity, due to the valley's position on the major fault system which originally formed it.

3.14 Landscape values in WAA are very high. Scenic views along WAA are impressive, as are views from the eastern wall down into WAA along the major deeply-incised side-wadis.

3.2.3

The Dead Sea Basin

3.15 The Dead Sea Basin is the southerly continuation of the Jordan valley and lies wholly within the Rift. It extends from the northern shoreline of the Dead Sea to the northern end of WAA. The climate here is arid to hyperarid, with average annual rainfall decreasing from 100mm in the north to 50 mm in the south. Relative humidity is low throughout the year. Virtually no rain falls during the very hot summer months, when temperatures exceeding 50°C are sometimes recorded.

3.16 The Dead Sea itself is a hypersaline water body with an average 340 grams dissolved solids per litre (over eight times that of normal seawater). It is some 730 sq. km in extent and more than 300m deep. At present, the surface level of the Sea is at -421m, the lowest surface level of any natural water body in the world. The level is declining such that it has fallen more than 25 metres during the last 50 years and the rate of decline has been greatest in recent years, currently reaching more than 1.0 metre per year.

3.17 The phenomenon of declining level is explained by the decrease in fresh water input. The most important tributary to the Dead Sea is the River Jordan. Further inputs of water, in addition to the annual 100 mm or so of rainfall on the lake, are provided by perennial and seasonal rivers draining from the east and west escarpments and by springs including subterranean sources. Water abstraction from these sources has increased significantly over the past 40 years. Industrial abstractions by DSW and APC also account for a substantial proportion of water lost annually to the Dead Sea, up to 40% according to calculations done for the feasibility study.



3.18 The basin is within an area of exceptional landscape values and considerable ecological interest. Immediately surrounding the Dead Sea is a landscape characterized by vertical walls of rock incised by steep and narrow river gorges and there are impressive views both east and west. However, scenic quality in the Dead Sea Basin is threatened. To the south the chemical works together with the associated facilities and air pollution, detract from landscape quality. The plastic used for vegetable production on irrigated fields is also unsightly and solid waste from week-end local leisure activity often litters roadsides and wadi beds. A major and developing threat to the scenic value is the continuing exposure of unsightly hypersaline mud flats along many stretches of the shoreline.

3.3 *SOCIO-ECONOMIC BACKGROUND*

3.3.1 *Aqaba/Eilat and Surrounds*

3.19 The northern coastline of the Gulf of Aqaba contains the Jordanian city of Aqaba, with 115,100 inhabitants (figures for Aqaba Governorate in 2005), and the Israeli resort of Eilat with 53,000 inhabitants (in 2005). Both cities service a mixture of ports, port-related industries and tourism-related industries. Jordan created the Aqaba Special Economic Zone (ASEZ) to encourage economic development in the area, and is undergoing significant investment in ports, light industry, the service sector and particularly in tourism development. The Aqaba Special Economic Zone Authority (ASEZA) acts both as a municipal government regulator and regional development agency for the area. ASEZA foresees the population of the Governorate growing to 250,000 by 2020.

3.20 The gross regional product for the Aqaba Zone in 2004 (\$540 million) represented 4.5% of the national total (from 2.1% of the population). Aqaba has the most economically active population in Jordan: an estimated 36% of Aqabawis are employed - 6.1 % more than the average. Jordanians workers make up 73% of the workforce and around 22% of these are female, compared with only 4% of the non-Jordanian workers. Workers may be categorised as skilled agricultural and fishery workers (1.4%), legislators, senior officials and managers (0.9%), professional workers (9.3%), and service workers (8.9%). Rapid population and economic growth imply great stress on land, municipal housing, infrastructure and public services.

3.21 The workforce in Eilat is estimated at around 25,000 people, 52% of which work in the tourism and related services. 18% work in public service, with only 3% in industry. The city is an important resort for international and Israeli tourism, with currently 12,000 hotel rooms. The population of Eilat is predicted to rise to 100,000 people by 2025.



3.22 **Jordan:** The Jordanian side of the valley is sparsely populated, with small villages of settled herdsmen dotted along the line to the east side of the desert road. These villages include Qatar, Rahma, Rishe, Bir Mathkour, Greigera and Finan. However, the low lying areas of the Dead Sea basin are much more populated, with the villages of Fifa and Safi serving significant agricultural populations. The total population of the Jordanian side of the Wadi Araba (excluding Aqaba, and the villages of the Dead Sea Basin) is around 7,000 people. The population in the villages on the Jordanian side of the Dead Sea basin (ie Ghor Safi, Ghor Fifa, Ghor Assal, Ghor Mazra'a, Ghor Haditha, etc) is around 27,700.

3.23 **Israel:** The Arava Valley in Israel stretches from the Gulf of Eilat in the south to the Dead Sea in the north. The extent of the valley is approximately 180km. The valley is extremely arid with an annual average rainfall of approximately 25mm. Temperatures can be as high as 40°C in the summer and average in the mid-twenties (°C) in the winter. The valley is divided into two governmental districts, the Central Arava Regional council and the Southern Arava Regional council. These districts are responsible for providing the residents of the regions with services (schools, clinics, cultural activities etc.) and utilities (water, electricity, etc.).

3.24 The Israeli side contains two main types of communities:

- Moshav communities are collective communities with a basis in farming. Each family farms privately but certain activities are managed collectively such as irrigation management and marketing of produce. There is a total of seven moshav communities in the central Arava with a total population of around 2,300;
- Kibbutz communities are collective communities, where most property is shared and many services are done locally by members. There are a total of ten kibbutz communities in the southern Arava with a population of around 3,000 people.

3.25 The area is sparsely populated with around 25 people per square kilometer (in contrast, population density in central Israel is 600 people/square km). The area is rural and both types of communities are heavily invested in agriculture. The primary crop in the southern Arava is dates grown primarily for export to Europe. Vegetable and root crops are also grown.

3.26 In the central Arava, sophisticated and intensive greenhouse agriculture is dominant. The produce, peppers, tomatoes and cucumbers, are for local consumption although high-value crops such as cherry tomatoes are also grown for export. All of the agriculture in the valley is irrigated agriculture



and the source of water is brackish groundwater. The groundwater is desalinated for domestic purposes and also for irrigation. The valley is the only region in Israel that is not connected to the National Water Carrier.

3.27 Tourism in the valley is the next most important economic activity and most of the communities engage in it. Many have small hotels or bed and breakfasts that cater to desert and ecotourism. The proximity to Eilat on the gulf also attracts tourists. Some residents are also employed in services such as in education and health services.

3.28 The ethnic make-up of the valley is mostly Israeli of European origin although many of the communities also have immigrant populations from North America and the Former Soviet Union. Most agricultural labour however is made up of foreign workers and most of the communities house a small population of Thai workers. Invariably these workers are male. For the most part there is little gender differentiation in employment although mostly males are involved in agriculture and mostly females are involved in tourism.

3.29 The region is remote and access is mainly via a single highway (route 90) that runs down the middle of the valley all the way to Eilat.

3.30 The planned future economic development of the area is to increase and develop the tourism potential of the valley both for economic purposes and also as a means to attract new residents. Because of the region's remoteness and its rural nature, population growth is virtually flat. Both regional authorities are working on initiatives to attract new residents to the region but for now these initiatives have not proven very successful. The southern Arava has also plans for attracting renewable energy initiatives to the region, especially that of solar energy and biofuels from agricultural products. The hope is that a strong economic base in renewable energy will attract new residents and companies to the region.

3.3.3

The Dead Sea Basin

3.31 The southern part of the Dead Sea basin also contains the industrial areas (on both sides), and a significant tourist resort at Ein Bokek on the Israeli side. Industrial areas have been established on the east and west side of the Dead Sea basin – near Sedom on the Israeli side, and along a stretch between Ghors Safi and Mazra'a on the Jordanian side. These host the extractive industries which produce salts from evaporation of the Dead Sea water. The entire southern basin of the Dead Sea consists of evaporation basins controlled by the industries, and is elevated with respect to the natural level of the northern basin.



3.4 ECOLOGY AND SENSITIVE AREAS

3.4.1 *The Gulf of Aqaba/Eilat and Surrounds*

3.32 The Aqaba Marine Park was established by Jordan as a specially protected marine reserve. Activities are strictly controlled along this 7 km stretch of coastline.

3.33 A bird observatory has also been set up near the ponds of the Aqaba wastewater treatment plant to monitor migratory birds. The Aqaba/Eilat area is a focal point for the seasonal migration of birds between Europe and Asia to Africa. Estimates of as many as one billion birds pass through the area twice a year. More than 280 species of birds reportedly use the area as a resting and feeding point en route. In Eilat, there is considerable concern regarding the further depletion of salt marsh area and its significance for migrating birds.

3.4.2 *The Wadi Araba/Arava Valley*

3.34 The Jordan Rift Valley in general is widely regarded as an important flyway for migratory birds.

3.35 In terms of ecology, a number of areas of particular interest have been identified along the valley. The most southerly is the mudflat area at Qatar. Lying mostly on the Jordanian side around 25 km north of the coast, this is an area of flat mudflat wetland with palm trees and acacia habitat, including a sandy dune-field. This area is of interest due to the mudflat vegetation. There is an Acacia woodland to the east of the highway which is regarded as the most representative example of this habitat in Jordan. There is also a significant palm community, including a palm oasis. This vegetation provides a habitat for various reptiles and some birds. The area is fed by groundwater flowing off the hills to the east. Part of this area is being proposed as a protected area in Jordan.

3.36 Further north – around 40 km from the coast, a second area – Jabal Masuda - is also being proposed as a protected area. This area lies to the east of the Jordanian highway and extends over an altitude range from 180 m to 1,500 m, moving from west to east. It extends over 3 biogeographical zones and consists of rugged sandstone landscapes with varying plant cover and vegetative growth including Juniper trees. There are Bedouin grazing and some villages on the eastern side. The area is significant because of particular types of flora in the upland and western lowlands, which provide some of the last remaining habitats for large mammals such as hyenas, wolves, hares, etc.

3.37 Moving towards the north of the Wadi, the protected nature reserve of Dana extends from the highlands and encompasses some of the valley floor close to the highway.



3.38 There are also a number of nature reserves along the Israeli side of the valley, including Yotvata Wai Bar, Ketura, Nahal Sheizaf and Ne'ot Hakikar along the valley floor, with other reserve areas in the western hills.

3.4.3 *The Dead Sea Basin*

3.39 To the south of the southern basin of the Dead Sea lie the plains of Fifa – an agricultural area with sand and silt dunes. The agricultural is irrigated by water supplied by the Jordan Valley Authority (JVA) from reservoirs in the highlands. Part of this area has been proposed as a protected area. The conservation interest includes the unique oasis ecosystem, which serves as an important location for migratory birds, and including specific species which are nationally or regionally threatened. Large mammals also inhabit the area, and it is also a site for some restricted-range and some globally threatened birds.

3.5 *ARCHAEOLOGY AND CULTURAL HERITAGE*

3.5.1 *Introduction*

3.40 At present, it appears likely that the viable alternative RSDSC configurations will involve significant construction only on the eastern side of the Wadi Araba/ Arava Valley. The main focus of the archaeological survey will therefore be on the land that lies within Jordan. Any impacts of construction work (for example, on the fresh water conveyance) or environmental hazards, that might affect the western side, will also be considered during development of impact management procedures.

3.41 An initial assessment of archaeologically sensitive areas was carried out, based on the review and mapping of over 540 sites that have been published, with co-ordinates, between Aqaba and the southern end of the Dead Sea, and many more that do not have co-ordinates. The existing field data was prepared by different teams during various projects over the years, leading to some variances in the definition of sites and their interpretation. When more details of the conveyance route become available, this list will be refined with the aid of discussions with relevant ministries and individual scholars, and, where necessary, supplemented with a field-based survey undertaken specifically for the Project. It is also noted that, although there has been considerable archaeological work carried out in the Wadi Araba and Dead Sea area, there remain large stretches that are unexplored.

3.42 From the initial review, certain clusters of human occupation are clear; in an arid landscape the most predictable clusters tend to occur around water sources. Many of the wadis have traces of early water-harvesting installations in the form of channels, aqueducts and reservoirs. Ancient roads and tracks also tended to follow water sources, for the use of the travellers and their pack



animals. One category of site, however, is not constrained by the availability of water, that is the numerous cemeteries, found particularly along the south eastern edges of the Dead Sea basin.

3.5.2

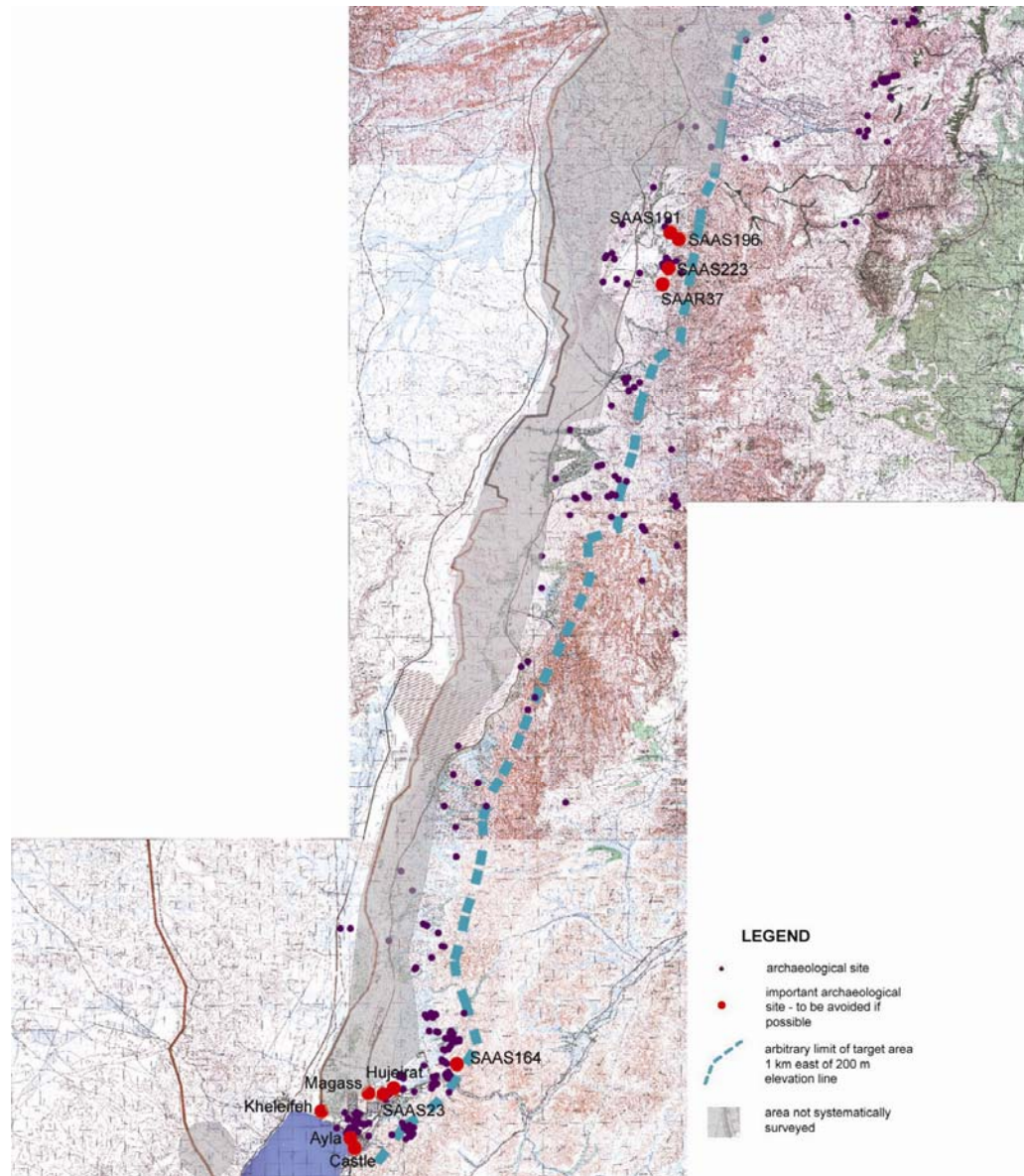
Brief description of main sites and concentrations of sites

Aqaba/Eilat

3.43 In Aqaba, there has always been much activity. The remains of the Roman town have been partly excavated, as has the early Islamic town, closer to the present day shore line. The latest archaeological site is the castle, which was in use until the late Ottoman period, and around which the modern settlement of Aqaba grew. The modern city has been built on and around these ancient remains.

3.44 On the modern border is the Iron Age (copper smelting) site of Tell el Khalifeh, excavated in the 1930s. Further north, are the two major excavated sites of Hujairat al Ghuzlan and Tell Magass (Maquss). They are large settlements with substantial depth of cultural deposits, dating to the late Chalcolithic and Early Bronze Age, and the former is associated with some intricate water-harvesting systems. There is also a large unexcavated site between these two sites, that seems to date to the Late Neolithic/Chalcolithic.





Wadi Araba/Arava Valley

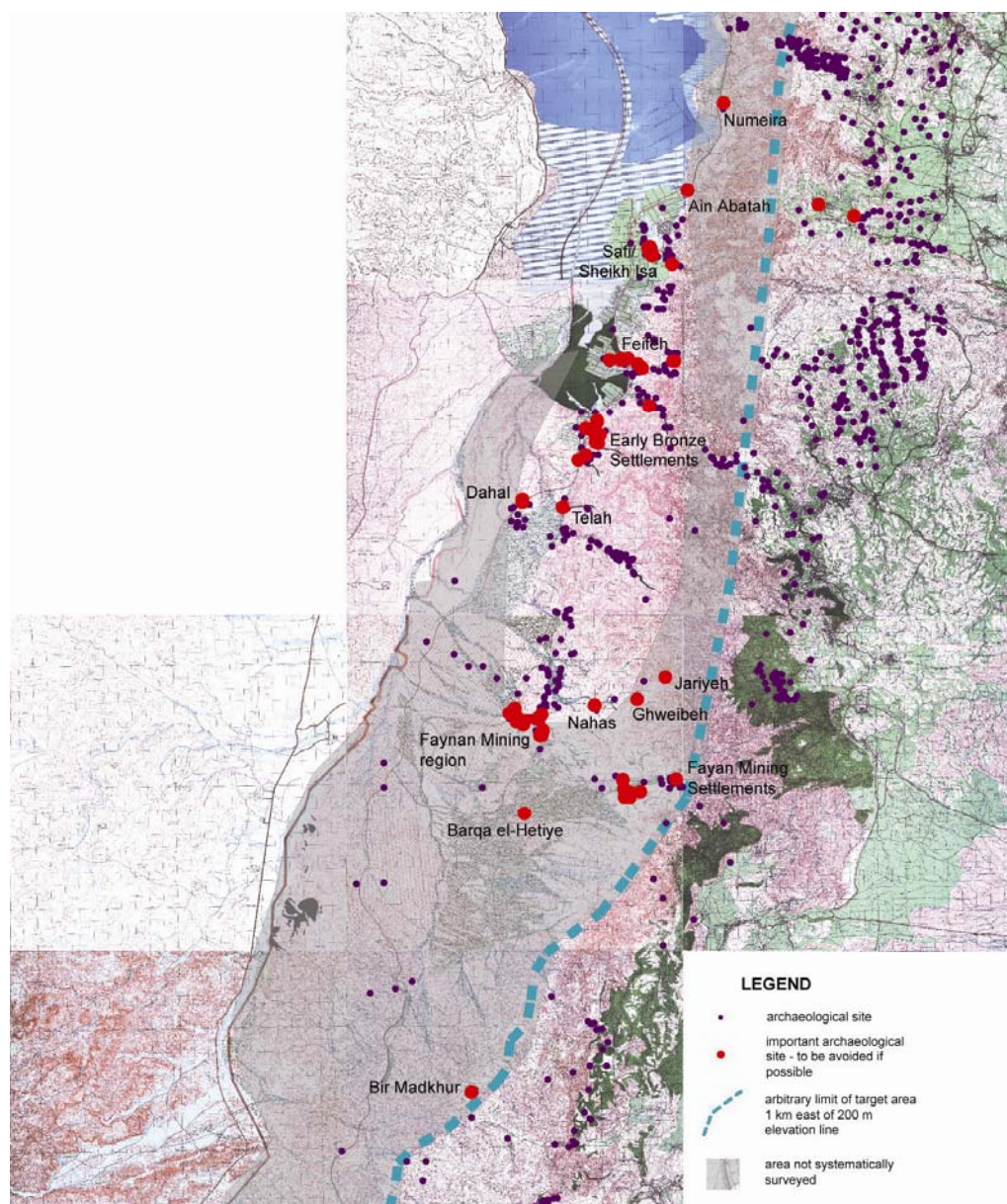
3.45 In the southern part of the area, all the side wadis that feed into the Araba will have been used, more or less densely in the past, and this has been confirmed by a number archaeological surveys that show clusters of Late Neolithic, Chalcolithic and Early Bronze sites. Further north, in the centre of WAA the Roman fort of Bir Madhkur is located on one of the routes up to Petra and has a number sites surrounding it, including an earlier settlement and cemeteries, along with evidence of extensive agricultural activity.

3.46 Because of its permanent water and significant copper deposits, the area of Faynan/Fidan has been the focus of almost continuous human activity from at least the Neolithic to the early Islamic period, with many different sites, covering an area of over 10 km². From the early copper smelting sites (Chalcolithic/Early Bronze Age) in the west, eastwards past the extensive field system in Wadi Faynan (Chalcolithic to Nabataean) and the major

Byzantine (and earlier) settlement of Khirbat Faynan to the Neolithic sites in the mouth of the Wadi Ghuweir there are many sites of all types and ages. To the north are major mines and Iron Age smelting sites and to the south a major Roman mine.

3.47 North of Faynan, there are many small sites along the lower hill slopes and the margins of the WAA. One wadi system that has been surveyed has produced a cluster of sites along its length, leading from Buseira (the Iron Age capital of Edom) at the top of the hills, down to the bottom of the WAA.

3.48 To the north, the next major structures are at the mouth of the Wadi Tilah, where there is fort, Qasr al-Telah, a large reservoir and an associated field system, probably dating from the Nabataean to Roman periods. Slightly to the west is cluster of Early Bronze Age sites around Dahal, where there are remains dating to the Roman period. There is another cluster of Early Bronze settlements and cemeteries just before the drop down into the Dead Sea basin.



The Dead Sea and Surrounding Area

3.49 From the edge of the Dead Sea basin, northwards to Mazra'a there are many Bronze Age cemeteries. Some have been largely destroyed by past robbery but several have had small scale excavations, which have produced abundant dating evidence. The majority date to the Early Bronze Age, although the extensive area of burials at Dhra' include an area of Nabataean graves and others, such as Naqa', have Byzantine graves.

3.50 Aside from the cemeteries there are a number of settlement sites, often on adjacent hill spurs directly above the valley floor, such as the remains of a walled town at Feifa, (stretching from the Neolithic to the Iron Age) associated with the cemetery, and remains of an aqueduct and other water-harvesting installations. Further north is the relatively extensively walled Early Bronze III settlement at the mouth of Wadi Numeira.

3.51 At the mouth of the Wadi Hasa, near Safi, is an area that has many sites, notably the early Islamic settlement of Khirbat Sheikh 'Isa and the associated Tawahin es-Sukkar (sugar processing mills), which are adjacent to the Bronze Age Byzantine cemetery of Naqa' (mentioned above), to the south of modern Safi. Slightly further west there is a small Iron Age settlement, while to the east is a fort on a hilltop overlooking the wadi, dated mainly to the Nabataean period. There are also other small Islamic sites and a reservoir in the area. Just to the north of the modern town, clinging to the hillside, is the Byzantine church and monastery of Deir Ain Abata.

3.52 The area at the foot of the modern Kerak-Dead Sea road reaching across to the Lissan peninsula is another zone that has many different sites of different periods: the large and important Early Bronze settlement of Bab al Dhra' just north of the road which separates it from the extensive cemetery mentioned above. To the east of the site of Bab al Dhra' is the major Neolithic site of Dhra' at the very foot of the mountains with a standing stone up above it. There are Palaeolithic sites in these foothills and a later fort. The Lissan itself was home to early Christian hermits, living in small cells cut into the marl cliffs, and there are the remains of a small church and associated buildings on one hilltop.

3.53 The eastern shores of the northern Dead Sea basin consist mostly of steep cliffs running straight down into the sea, except at the mouths of wadis. Thus the remaining area with significant archaeological remains is on the northern shore, around Ain Zara, with the Roman harbour and associated buildings up above, known as Callihroe in ancient times, and this is reputed to have been the place where King Herod came to take the waters shortly before he died. At the north eastern end of the Dead Sea, on the first 'terrace' above the sea, there are many burials and small sites of different periods.



3.5.3 *Potential for sites in unexplored areas*

3.54 In the southern WAA, there is a possibility of buried sites dating to the Neolithic or earlier, buried under mid and late Holocene accumulations of sediments.

3.55 Most of the central stretch of the WAA has not been surveyed, particularly the area from south of Faynan to south of Petra. This area is certainly not devoid of sites, although there are probably few sites with major structural remains. Cemeteries are ubiquitous, so there will inevitably be burials of different dates and density of graves. Also some ancient field systems are to be expected in some of the more frequently flowing wadis, systems that might be similar to those in Wadi Faynan. A number of forts, watchtowers and way stations are to be expected.

3.56 The general under-representation of prehistoric (flint) sites is partly a reflection of the interests and knowledge of the field archaeologists who conducted the surveys and partly the result of local geological conditions rather than a real absence of humans during those periods.

3.57 Evidence from unpublished surveys of the southern WAA suggests that there are many early (Chalcolithic to Bronze Age) sites to be found in the lower hill slopes.

3.6 *HYDROLOGY AND WATER RESOURCES*

3.6.1 *The Gulf of Aqaba/Eilat and Surrounds*

3.58 The run off from the eastern and western wadis flows to the Gulf. On the east side, the Wadi Yutum drainage system delivers sediment onto an extensive alluvial fan area to the north of Aqaba. The drainage systems that pass through the urban centres discharge via outfalls into relatively shallow area of the upper end of the Gulf, while the coastal wadis that either discharge directly into deep water in the Gulf or pass through relatively short drainage channel or closed drainage systems in route to the Gulf. In addition, there is a significant sediment input to the northern Gulf from wind-blown sediment during sandstorms. However, there is some evidence that increasing urbanization is reducing natural sediment discharges to the Gulf, either from wind-borne or water-borne sources, leading to a reduction in the natural replenishment of beaches near the urban areas.

3.6.2 *The Wadi Araba/Arava Valley*

3.59 The main water resources in the WAA at present is groundwater occurring in aquifers, in springs where the upland water table intersects the ground surface at the base of the uplands, and in wadi beds where it comes intermittently to the surface. Current use of this water is extremely limited in



the Jordan side but widespread in the Israeli agricultural communities. Recharge occurs when rainfalls on the upland aquifers to the west and specially the wetter east.

3.60 Aquifer salinity in Jordan is in the range of 800-2,500 in Wadi Arava/Araba, i.e., from more or less fresh to moderately brackish

3.6.3

The Dead Sea Basin

3.61 Practically the whole surface and subsurface drainage of the JRV and adjacent upland areas is into the Dead Sea, which thus constitutes the hydrological base level for this entire region.



4.1 INTRODUCTION

4.1 A Public Consultation and Communications Plan (PCCP) is being implemented as part of the scoping phase of the study program and to guide the study team and beneficiary parties in undertaking a robust public consultation program that fully supports and informs the detailed technical, economic, environmental and social analyses that will be carried out.

4.2 The PCCP provides a framework to manage effective and meaningful engagement with key stakeholders. In summary, the goals of the PCCP are to:

- Generate a good understanding of the proposed project;
- Manage expectations and misconceptions;
- Understand potential significant impacts;
- Develop effective mitigation measures and management plans;
- Optimise any local benefits that can be delivered through the proposed project; and
- Enable affected communities to be involved in the design process.

4.2 PHASING OF CONSULTATION

4.3 There will be 3 Phases of consultation. Phase 1 will be completed at the same time as scoping. The key objectives were to introduce the proposed Project and inform stakeholders about the draft project design, the ESA approach and methodologies; and understand key issues and concerns of stakeholders.

4.4 Phase 2 will be after scoping and before the production of the draft ESA Report. The main aims will be to provide key stakeholders with information on the baseline for the assessment and obtain feedback; inform stakeholders about the preferred option(s) for the proposed project; and to discuss key issues and their proposed management.

4.5 Phase 3 consultation activities will mainly be to disclose the Draft Final ESA and gain feedback on issues raised and mitigation and management measures proposed.

4.3 STAKEHOLDERS TO BE CONSULTED

4.6 Stakeholder profiling and mapping was initiated during the planning and scoping phase ESA. For each of the three beneficiary parties (Israel,



Jordan and the Palestinian Authority), a small group of knowledgeable parties or individuals was assembled to assist with the stakeholder profiling and mapping. A diverse range of stakeholders was identified and different types of stakeholder were grouped based on their connections to the project (see *Table 4.1*), for the groups and types on stakeholders. The names and functions of the stakeholders in each beneficiary party are presented as Annex A.

Table 4.1 *Stakeholder Groups and Connections to the Proposed Project*

Stakeholder Groups and Types	Connections to the Project
Government	
Government – National	National, regional and local government individuals of primary political importance to the project.
Government – Local	
Communities/landowners	
Local Communities	Communities and other land owners that will receive impacts (positive or negative) as a result of the Project.
Community Based Organisations (CBOs)	
Land Owners/Users	
Private Sector	
Business organisations	Individuals or organisation with direct economic interest in the project. This may be through gaining contracts or other benefits or due to economic impacts caused by the project. They may also be potential business partners and finance institutions.
Companies - potential suppliers and contractors	
Companies – other	
Labour unions	
Financial community	
Tourism organisations	
Non-governmental Organisations/Research Institutions	
International NGOs	Organisations with a direct interest in the project and might influence it directly or through public opinion. Such organisations often have useful data and insight and may become project partners in areas of common interest.
Local NGOs	
Research/Academic Institutions	
IFIs and Donors	
Multilateral and Bilateral Organisations	Potential financiers with requirements for international best practice.
Other (political parties, religious groups, media)	
Political Parties	Other international, regional and local groups with direct interest in the project.
Religious Organisations	
International and National Media	

4.4 THE CONSULTATION PROCESS

4.7 Meetings were held between the study team and stakeholders in 3 levels of meeting, as follows:

- At central level there were open meetings, advertised in advance, in each beneficiary party, hosted by the beneficiaries themselves;



- Bilateral meetings were held between interested parties and members of the study team with expertise in the particular issue(s) to be discussed;
- At local level meetings were held with communities, local businesses and NGOs whose direct interests may be affected.

Except for bilateral meetings, representatives of both the Feasibility Team and the ESA Team were present at meetings where the project design or configuration issues were to be discussed.

4.5

OUTCOME OF PHASE 1 CONSULTATION

4.8 Public concerns during the first phase of consultation varied markedly between the three beneficiary parties. The key concerns may be summarised as follows:

- **Palestinian Authority:** There were technical concerns related to the mixing of the two waters and the impacts on ecology and of seismic/flood risk in the Wadi Araba/ Arava. However, most concerns related to the current lack of Palestinian access to the Dead Sea, and on Palestinian water rights and control of water resources, and on the implications of this study and the project on those.
- **Israel:** By far the most consistent issue was the lack of a study of alternatives which would address whether other strategic solutions were preferable to the RSDSC. Technical concerns related to the mixing of the two waters and induced development of the desert areas. There was also interest in the governance and control of the proposed project, and in the cooperation of the three beneficiaries during the study phase.
- **Jordan:** A key interest in Jordan is in the freshwater to be produced – the quantities and its distribution and allocation. There was interest in the precise route; the nature and duration of disturbance during construction; resumption of land distribution halted in anticipation of this project; local employment opportunities from this project; leakage risks, and Jordan’s role in a joint project.



5.1 This section describes the broad principles of the impact assessment methodology. It describes the approach that has been used during scoping and also the one that will be used to identify, evaluate and mitigate environmental and social impacts during the main ESA.

5.1

ACTIVITIES THAT GIVE RISE TO IMPACTS

5.2 Development activities may give rise to environmental and social impacts when physical changes caused by construction, operation or decommissioning of facilities interact with sensitive aspects of the receiving environment, where the receiving environment comprises human beings and human systems plus biological organisms and biological systems.

5.3 In the case of the RSDSC there is potential for significant impacts to arise during construction and operation. Concern has also been expressed that the proposals could give rise to cumulative impacts and to induced impacts. The potential causes of each of these impact categories are described in the following sections.

5.4 The social and environmental impacts of the Project will be predicted for each relevant environmental and social topic (e.g. ecology, protected areas, waste etc.) by comparing baseline conditions (i.e. the situation without the Project) with the conditions that would prevail were the Project to be constructed and operated.

5.5 The environmental and social impacts of the Project will be predicted in relation to environmental and social receptors, that is, natural resources (e.g. protected areas and species) and people (e.g. residents of communities, land use, etc.).

5.2

DEFINING THE SIGNIFICANCE OF ENVIRONMENTAL AND SOCIAL IMPACTS

5.6 The primary purpose of identifying the significant impacts of a Project is to inform the decision-maker (i.e. the beneficiary parties) such that an informed and robust decision can be reached on whether, and under what conditions, to proceed with the scheme. On this basis, a significant impact has been defined for the purpose of this Project, as an impact that, either in isolation or combination with others, should (in the opinion of the ESA team, after due consultation with stakeholders) be taken into account in the decision-making process. For the purposes of this assessment, therefore impacts that are minor, moderate or high could all be significant depending



on the circumstances under which they occur. It is noted that impacts may be either positive or negative.

5.7 There are two stages required to enable the significance of impacts to be identified as follows:

- i. The impact extent: how large or widespread is the impact or the level of benefit? The extent of an impact is a function of a range of considerations including:
 - impact magnitude;
 - impact areal extent;
 - number of people affected
 - impact likelihood of occurrence and
 - impact duration.
- ii. The impact characteristics: What are the characteristics of the impact in terms of:
 - complexity or rarity;
 - ease or difficulty of mitigation or management;
 - irreversibility;
 - stakeholder acceptability; and,
 - receptor sensitivity. (1)

5.8 Assessment of the impact significance is the product of a combination of the above two variables.

5.3 *MITIGATION OF ENVIRONMENTAL AND SOCIAL IMPACTS*

5.9 The ESA process will focus on those potential impacts that are deemed to be most important. Where significant impacts are identified, this will be identified to the Feasibility Team. Mitigation will be developed that can be incorporated into the Project in order to avoid, reduce or compensate for the impacts. A description of these mitigation measures will be included within the full ESA Report, and measures will be incorporated in the Environmental and Social Management Plan (ESMP) as appropriate. Residual impacts (assuming mitigation options are applied) will be assessed as appropriate.

5.4 *CONSTRUCTION IMPACTS*

5.10 Construction of the RSDSC would be a major engineering undertaking lasting up to eight years, involving hundreds of workers and many items of heavy equipment. Depending on the character of the receiving environment,

(1) Particularly for social impacts, it is additionally important to take account of the perception of those affected by the impact.



the area of land effected and the duration of the change, there may be significant social, biological and economic effects. At the current stage of design, the major aspects of RSDSC construction that will give rise to temporary or permanent physical changes in the environment include the following.

- i. **Influx of workers:** Hundreds of manual workers will be needed for the construction. Recent precedent suggests that many of these will be foreign migrants who will be accommodated in temporary workers' villages outside towns. Potential impacts arise from social and health effects (including HIV/AIDS) effects of locating the workers' community amongst local residents; taking land for workers' facilities and, effects of the wastes etc from workers' habitations on the surrounding locations.
- ii. **Use of Roads and Sea Lanes:** Construction of the RSDSC will require the import of large items of machinery and equipment, which may be carried on specialised wide, slow-moving vehicles. Construction will also involve large numbers of heavy vehicle movements to transport materials and remove spoil. There is potential for congestion, safety issues, and disturbances (noise, dust, disruption of leisure activities). At the Red Sea coast, construction of the intake, particularly if it extends far into the channel, may disrupt normal shipping or movement of small boats and leisure craft.
- iii. **Physical Presence in the Environment:** Construction will require land for worksites, equipment and materials storage, construction of roads, parking and offices and accommodation. Some land will be vacated after construction is completed and some will be needed for the lifetime of the project. There may also be effects on landform and hydrology, due to the need to excavate, or build temporary and permanent structures
- iv. **Residues and emissions associated with activities:** Construction of the RSDSC will involve much tunnelling and excavation with the use of heavy machinery generating noise, emissions to air, spoil, and other wastes and residues arising from maintenance of the machinery and the workforce.
- v. **Storage and use of fuel and chemicals:** Apart from the land needed for storage, fuel and chemicals will be stored for use during construction. These present hazards such as fire, explosion and groundwater contamination.

5.5

OPERATIONAL IMPACTS

5.11 The principal activities that will be ongoing throughout the operation of the conveyance will be the extraction and pumping of water from the Red Sea; the mixing of Red Sea and Dead Sea Waters; the desalination of water and



discharge of brine to the Dead Sea; the generation of electricity to pump desalinated water to end users; and, the transfer of fresh water from the desalination plant to end users in Jordan, Israel and the Palestinian Authority.

5.12 Each of these will give rise to the type of impact mentioned above under construction impacts. In addition these will be impacts associated with:

- Permanent landtake;
- Risk associated with breaches or failure of the conveyance;
- Inputs needed to operate and maintain the conveyance and other facilities;
- Physical presence of the conveyance and other structures;
- Residues and emissions associated with operation.

5.5.1 *Cumulative Impacts*

5.13 Cumulative impacts are those which are not necessarily significant when considered in isolation, but may become important if, when considered alongside other activities impacting the same receiving environment, combine to produce a more severe effect. In the case of RSDSCP the potential for cumulative impacts arises where there increased activity is predicted in areas already subject to rapid development (Gulf of Aqaba/Eilat coastal zone) or where increased pressure may be put on vulnerable ecosystems that are already significantly degraded (Wadi Araba/Arava Valley).

5.6 *INDUCED IMPACTS*

5.14 Induced impacts may be experienced where the construction or operation of one development encourages the siting or growth of other developments in the same area. In the case of RSDSCP a concern are that, simply as a result of its presence, a precedent may be set for permitting more development of the Wadi Araba/Arava Valley. It may also be that greater availability of fresh water may promote development of tourism infrastructure in the Valley, especially close to the Dead Sea

5.7 *SUMMARY OF KEY IMPACT AREAS AND ISSUES*

5.15 The ESA study will consider all types of impact potentially arising from the construction and operation of the conveyance and associated facilities. The assessment will provide predictions of direct and indirect, temporary short term, long term and permanent impacts on the physical, natural, cultural and human environment and society arising from construction, commissioning and operation including cumulative impacts across the Project as they affect regional systems. Impacts will cover those normal planned operations and those arising from external factors such as the occurrence of



natural hazards (e.g. seismic activity) and from non-routine and abnormal/emergency conditions (e.g. arising from catastrophic failures and accidents).

5.16 Previous Studies, consultations with stakeholders and field work carried out as part of scoping suggests that the following are key issues which will demand special attention in the study.

- i. **Impacts on corals and the marine environment.** The coral reefs in the Gulf of Aqaba/Eilat represent the only areas of coral available to Israel or Jordan. They have very high biodiversity and are the northernmost reefs of this type in the world. The continuous withdrawal of seawater from the Red Sea may affect local circulation patterns and has the potential to impact the coral reefs in the north end of the Gulf. Differences in evaporation rates in the shallower parts of the gulf cause small local variations in salinity. Changes in circulation patterns may therefore change salinity over part of the reefs. Such alterations may affect the health of the coral reefs. Circulation changes may redirect inflowing water, including effluents. Any change in water quality that significantly affects algal growth, in nutrient levels for example, may in turn affect the corals.
- ii. **Impacts on the ecology of the Wadi Araba/Arava Valley.** caused by the construction of the conveyance with the associated disturbance, landtake and influx of workers, plus the long-term impacts of the physical presence of the conveyance, which will vary with the form of the final design. The conveyance will extend for approximately 180 km through the Wadi Araba/Arava. Areas of land will be taken temporarily, for construction sites and activities, and permanently for the conveyance as well as structures needed for access and maintenance. The area includes important conservation areas and sites used by migratory birds. Recent degradation of the environment and encroachment into sensitive habitats has left the remaining areas more fragile and relatively more valuable. Any landtake inside protected areas risks fragmenting habitats beyond their capacity to persist. The effect on movement of people and animals and on east-west ecological connectivity depends greatly on the alignment and form of the conveyance. Designs with large stretches of above surface pipeline or canal present more serious ecological dangers than do solutions involving mainly tunnel.
- iii. **Impacts on the social fabric of the Region:** The project will create many jobs in the region, during construction and, potentially throughout its operational lifetime and beyond. Jobs will benefit the local and national economies but the presence of numerous workers additional, some of who may be non-nationals, may cause social stresses. It is expected that the project will assist the drive to expand tourism in the area and indirectly promote the construction of tourist facilities and associated infrastructure



(water supply, wastewater treatment, roads, electricity supply etc.). Residents of the areas are concerned variously that the social and economic character of the area will change for the worse, that traditional lifestyles will be threatened, and that they will not benefit fully from the economic opportunities. Particular attention will be paid to the Bedouin who are in any case struggling to reconcile tradition pastoralism with the political and natural resource constraints prevalent in the region.

- iv. **Adverse impacts on the Dead Sea:** caused by the mixing of the Red Sea and Dead Sea Waters and, depending on the outcome of mixing and the level of the Dead Sea, the assortment of positive and negative consequences of stabilising the level of the Dead Sea on the ecological, heritage and tourism value of the Dead Sea the shoreline, the aquifers, the micro-climate and the social values.
- v. **Impacts on Groundwater:** Under current conditions, the groundwater aquifers are being drained at an accelerated rate due to the falling water level of the Dead Sea. There is evidence that freshwater springs on the hill slopes around the Dead Sea have dried up due to the fall of the groundwater level. Furthermore, dewatering of these aquifers seems to result in collapse of surface and subsurface geological structures, causing numerous sinkholes and general land subsidence, with accompanying destruction of roads, culverts, buildings, etc. A major issue to be evaluated is the specific hydrogeological relationship between the water level of the Dead Sea and the behavior of groundwater aquifers around it.
- vi. **Impacts on Archaeological and Cultural Assets:** The proposed project area has a long history of human occupation and activity. The project components could all encroach upon sites with cultural and religious significance and on sites that hosted byzantine, roman and pre-historic towns and villages, miners and travellers. The ESA will produce maps showing the most sensitive areas, but even after the selection of worksites has taken these into account sites or artefacts of archaeological significance are almost certain to be encountered during construction. exploration be done in advance of construction to ensure that valuable cultural resources are not damaged or destroyed. Induced impacts from the Project could also have significant adverse impacts on archaeological and historical sites in the area around the Gulf of Aqaba/Eilat, Wadi Araba/ Arava and Dead Sea. In addition, procedures need to be put in place to address “archaeological chance finds” if buried sites are uncovered during the course of construction activities.

5.17 In addition to the above issues, the assessment will also address the general and wider impacts on:

- Coastal fisheries, navigation, recreation, tourism and marine waste disposal;



- Local and regional air quality and visibility – energy and traffic emissions, construction dust, and dust, aerosol and other emissions from the Dead Sea;
- Carbon dioxide and other greenhouse gas emissions;
- Geology, land stability and soils;
- Hydrogeology, groundwater quality and use of groundwater resources;
- Surface watercourse hydrology, sedimentation and erosion, water quality, ecology and uses of water resources;
- Dead Sea hydrology, limnology, water quality, ecology and uses of water resources (including therapeutic uses);
- Land use and effects on communities, agriculture, tourism and industry;
- Terrestrial habitats and species, including ecological connectivity;
- Genetic, population and species diversity;
- Material assets – buildings and infrastructure;
- Landscape resources and the aesthetic/visual environment;
- Local population demographics, community fragmentation and severance;
- Indigenous peoples and their resources, local practices and traditions;
- Public and community health and welfare;
- Economic activities (including impact on commercial and subsistence agriculture, local businesses, tourism and recreation, and the Dead Sea chemical industries);
- Regional development;
- Natural resources – water, soils, energy and materials;
- Natural hazards;
- Occupational health and safety.



6.1 ORGANISATION OF INFORMATION

6.1 An undertaking as large as the proposed RSDSC, is a strategic development with the potential to effect transformations in the economy, social situation and environment of the entire region. The ESA will consider these. At the same time, however, with work spread over an area more than 200km long very diverse physical, social and ecological settings will be encountered, giving rise to effects that concerns stakeholder group who will have widely differing interests. Rather than organise information on the potential impacts thematically across the whole area, therefore, the study will present results in two main sub-divisions, as follows.

- *A regional assessment* that will examine the environmental implications of the project proposals in the broader context of the social, economic and political development of the Jordan Valley.
- *An assessment of site specific effects* with information grouped around the major environmental compartments of the study area (the Upper Gulf of Aqaba/Eilat, the Wadi Araba/Arava Valley, the Dead Sea Area, the Northern Jordan Valley). Note that the environment could have been subdivided in several different ways but these divisions have the advantage that they each largely coincide with a different component of the RSDSC (respectively, the water intake, the conveyance, the water outfall and the facilities associate with desalination and freshwater conveyance).

6.2 Impacts to be identified and addressed therefore are grouped in the following five headings. Each of which is addressed in the sections below.

- i. Regional Impacts
- ii. Impacts on Upper Gulf of Aqaba/Eilat and Coastal Region
- iii. Impacts on the Wadi Araba/Arava Valley
- iv. Impacts on the Dead Sea and Surrounding Area
- v. Impacts of the Desalination Plant and Associated Facilities

6.2 REGIONAL IMPACTS

6.3 There is a potential for regional impacts where the influence of the proposed project might extend over a wide area or where they impact strategic resources or assets that may be shared by multiple users. Cumulative effects and induced effects must receive particular attention at the regional level as the proposed project activities may interact with activities, ongoing or planned, outside the immediate locality.



6.4 Key issues and the impacts associated with them that have been identified so far are listed in the table below along with a brief description of the investigations that will be undertaken to characterise them fully and develop mitigation or management measures.

Table 6.1 Summary of Potential Regional Impacts

Issue/ Receptor	Potential Impacts	Study Method(s)
Large scale alteration to water circulation patterns, salinity, evaporation rates and water quality in the Gulf of Aqaba/Eilat and coastal region	Effects on tourism and leisure, navigation, fisheries, other economic users of the Gulf	Modelling of the circulation in the area of the gulf that might be influenced by the proposed water abstraction, supplemented by the Social Assessment, the Economic Assessment (Feasibility Study) and a socio-economic survey of the area (Sub-study A)
Social and political consequences of undertaking a multi-billion dollar construction project in the region.	Promotion of peace process through technical cooperation, institutional arrangements to implement and administer the project. Job creation and economic development Social impacts of an influx of construction workers Potential effect on Palestinian Authority water rights issues	The Social assessment, and the Feasibility Study, supplemented with desk research and communications with stakeholders in accordance with the PCCP
Cumulative outcome of addition disturbances in highly stressed areas that are already developed or being considered for future development	Further fragmentation of vulnerable ecosystems Interference with the routes of migratory birds Impacts on the character and appearance of urban and natural landscapes Further loss of cultural and archaeological sites	An ecological survey of the WAA (Sub-study B) Visual impact assessment of the RSDSC (Feasibility Study) Archaeological and Historical Sites Survey



Issue/ Receptor	Potential Impacts	Study Method(s)
Major hazards or risks of large scale damage to human health and wellbeing, security or the environment	<p>Risks of conveyance breach due to seismic activity, natural disaster, flash floods or sabotage (and, as a consequence, sudden cessation of water supply, spill of seawater into agricultural or domestic aquifers)</p> <p>Ongoing sea water leakage from conveyance</p> <p>Contamination due to leakage from stored fuel and chemicals</p>	Assessment of major environmental, social, and security risks (desk study by ESA Team), informed by risk assessments in Sub-Studies.
Induction of further development in the Wadi Araba/ Araba Valley as a result of additional water availability	<p>Disruption to traditional lifestyles</p> <p>Further degradation of the ecology</p> <p>Employment and income generation</p>	Desk study of development plans, supplemented by the Social Assessment, the Economic Assessment (Feasibility Study) and a socio-economic survey of the area (Sub-study B)
Physical changes associated with the construction and continuing presence of large physical structures in the environment	<p>Destabilization of the land surface</p> <p>Aesthetic and landscape impacts</p> <p>Displacement of and access restrictions on people</p> <p>Impacts on natural habitats, animal movement and behaviour</p>	<p>Desk study by ESA Team informed by construction impact assessments in the Sub-Studies</p> <p>Social Assessment</p> <p>An ecological survey of the WAA (Sub-study B)</p>
Construction activities taking place at locations throughout the study area for periods of up to eight years	<p>Pressure on the transport link between Amman and Aqaba due to vehicle movements and road closures</p> <p>Social and environmental impact of construction workers activities and camps (pollution, pressure on services, impacts on tourism, social disturbance, disturbance of flora and fauna)</p>	<p>Sub-study B</p> <p>Social assessment, informed by the sub-studies</p>
Regional issues related to stabilisation of the dead Sea with Red Sea water and brine from desalination	Impacts on tourism industry in Jordan, Israel, and potential future impacts on Palestinian Authority	Economic assessment in the Feasibility Study, supplemented with desk research and communications with stakeholders in accordance with the PCCP
Risks to tourism and heritage values from changes to the characteristics of Dead Sea	<p>Changes in appearance of the Dead Sea (whitening, algal blooms), Reduced density of the surface layer</p> <p>Increased turnover rate, with possible turbidity, odours.</p>	Economic assessment in the Feasibility Study, supplemented with desk research and communications with stakeholders in accordance with the PCCP



Issue/ Receptor	Potential Impacts	Study Method(s)
Mixing the sea waters or raising the water level impacts the operations and profitability of the chemical extraction industry	Impacts on the economies of Jordan and Israel	Economic assessment in the Feasibility Study, supplemented with desk research and communications with stakeholders in accordance with the PCCP
The hydrology of the area around the Dead Sea caused by stabilising of raising the water level	Changes in ground water flows Prevention on sinkhole formation Raised water table benefits ecology of the surrounding wadis and oases	Sub-study C supplemented with desk research and communications with stakeholders in accordance with the PCCP
Increased demand on electricity supply and network depending on how the project meets its power requirements	Potential power shortages in population centres Extension of the supply network Impacts from additional power generation, including resource depletion and air emissions	Sub-study D supplemented with desk research and communications with stakeholders in accordance with the PCCP
Risks and benefits to health and social and economic development, related to the availability of additional potable water	Additional water availability in urban areas Change in cost of potable water	Health Impact Assessment (ESA) informed by sub-studies
Impacts from growth in the tourism industry	Expansion of tourism infrastructure, impacts from the movement and provisioning of additional tourists, social impacts of additional tourism (particularly increased non-national work force)	ESA desk and field studies informed by Economic Assessment in the Feasibility Study, supplemented by communications with stakeholders in accordance with the PCCP

6.3

IMPACTS ON UPPER GULF OF AQABA/EILAT AND COASTAL REGION

6.5 Potential Impacts on Upper Gulf of Aqaba/Eilat and Coastal Region arise from the construction of the sea water intake and the continuous removal of water throughout the life of the project. Potential impacts vary with the technical proposals for delivering water to the conveyance including: the land site and configuration of the intake, the placement and characteristics of the ingress into the Red Sea, the nature of abstraction (pipe or canal), the rate of abstraction and the height to which abstracted water is pumped.

6.6 Key issues and the impacts associated with them that have been identified so far are listed in the table below along with a brief description of the investigations that will be undertaken to characterise them fully and develop mitigation or management measures.



Table 6.2 Summary of Potential Impacts on Upper Gulf of Aqaba/Eilat and Coastal Region

Issue/ Receptor	Potential Impacts	Study Method
Physical changes caused by locating project components at the intake locations	Construction disturbances (noise, dust, congestion, visual and amenity), damage to corals, loss of biota, effect on Aqaba and Eilat landscapes and views	Sub-study A supplemented with field studies and desk research
Changes in the water quality and circulation patterns of the gulf that may result from large-scale abstraction of seawater	Changes in concentrations of polluting inputs, including plant nutrients, changes in water temperature and salinity, changes in water currents and sedimentation patterns	Sub-study A supplemented with desk research
The marine ecology of the northern Gulf of Aqaba/Eilat	Impacts on mobile flora and fauna, coral connectivity, coral health	Sub-study A supplemented with desk research
Navigation, fishing, recreation, and tourism associated with the mix of unique coastal, mountain and desert environments	loss of marine biodiversity, effect on coral quality, dive sites, interference with shipping and leisure craft	Sub-study A supplemented with desk research and the Economic assessment in the Feasibility Study
The social fabric of the rapidly expanding urban areas of Aqaba and Eilat	Land acquisition and access during construction, permanent landtake at the intake site and beginning of the conveyance, job creation, secondary effects of other impacts on economic development activities	Sub-study A supplemented with the social Assessment and the Land use and constraints mapping tool

6.4 IMPACTS ON THE WADI ARABA/ARAVA VALLEY

6.7 Potential Impacts on the Wadi Araba/ Araba Valley arise from the construction and operation of the conveyance, including the roads and access areas that will be needed for maintenance. The types of impact depend heavily on the form of conveyance, (in particular the balance between tunnel, pipeline and canal; and various forms of pipeline: pressurised versus gravity fed; surface or buried, etc). It is likely that much of the conveyance will be buried or in tunnel, in which case the greatest potential for impact will be during construction, but the ESA will consider the impacts of all forms of conveyance being considered in the Feasibility Study.

6.8 Much of the study area is arid sparsely populated land, or mountains. Potential impacts are however made more significant due to the fragility of the desert ecosystems and the vulnerability of the towns and villages in the area.

6.9 Key issues and the impacts associated with them that have been identified so far are listed in the table below along with a brief description of the investigations that will be undertaken to characterise them fully and develop mitigation or management measures.



Table 6.3 Summary of Potential Impacts on the Wadi Araba/Araba Valley

Issue/ Receptor	Potential Impacts	Study Method
Geological and seismic hazards along conveyance and other hazards or actions that could breach the conveyance	Risk of failure of the conveyance resulting in physical damage and pollution of groundwater	Sub-study B supplemented with the Assessment of major environmental, social, and security risks
Physical consequences of construction and operation along the conveyance route	Construction disturbances (noise, dust, congestion, visual and amenity), affect on landscapes and views	Sub-study B supplemented with the Social Assessment and the Land use and constraints mapping tool
Natural habitats and biodiversity along the conveyance route.	Destruction of habitat during construction, movement of plant, disposal of spoil, operational impacts	Sub-study B supplemented with the Land use and constraints mapping tool
Degradation of valuable environmental resources at specific areas of particular interest along the conveyance route	Aesthetic and landscape impacts and impacts of encroachment onto existing and proposed Protected Areas, Special Conservation Areas and Important Bird Areas, tourist attractions, cultural and heritage sites.	Sub-study B supplemented with the Archaeological and Historical Sites Survey and the Land use and constraints mapping tool
Destabilization of the land surface	Effect of excavations or vehicle movements on the desert crust, or on the erodability of land formations	Sub-study B
Water leakage and infiltration on groundwater resources	Rising salinity of groundwater, effects on agricultural and domestic water supply from wells	Sub-study B supplemented with the Assessment of major environmental, social, and security risks
The Bedouin and their herds	Displacement, access restrictions at times and specific points	Sub-study B supplemented with the Land use and constraints mapping tool and the Social Assessment

6.5

IMPACTS ON THE DEAD SEA AND SURROUNDING AREA

6.10 In this section the impacts on the Dead Sea and surrounding area of the RSDSC “base case” are considered, that is the impacts of stabilising or raising the level of Dead Sea water, but not including any impacts of hydroelectricity generation or desalination (the impacts of these, ie of “base case plus”) are considered in the following section).

6.11 Potential impacts arise mainly because of the effects of introducing the Red Sea water and/or brine into the Dead Sea and the consequent changes over time in the level of the Dead Sea. The mixing of the waters will change the physical, chemical and biological characteristics of the water body in ways which may affect the use and the aesthetic and cultural value of the Dead Sea. At the same time, the changes in levels of the water in the Dead Sea and the interface between the sea water and inflowing ground waters will impact the surrounding shores and hydrology.

6.12 Key issues and the impacts associated with them that have been identified so far are listed in the table below along with a brief description of



the investigations that will be undertaken to characterise them fully and develop mitigation or management measures.

Table 6.4 Impacts on the Dead Sea and Surrounding Area

Issue/ Receptor	Potential Impacts	Study Method
The dynamic limnology of the Dead Sea (depth and stability of stratification, density profile, the rate of evaporation, internal currents)	The effect of discharge of sea water and brine on the frequency of turnover, decrease in density and buoyancy of the Dead Sea, changes in evaporation rates thermal properties and associate effects	Sub-study C supplemented with desk research
The chemical and microbiological composition of the Dead Sea	Salts precipitation, changes in appearance (especially “whitening”), microbiological blooming, sulphide production, anti-fouling agents, other	Sub-study C supplemented with desk research
The operations of Arab Potash Company and Dead Sea Chemical Works	Effect on siting of their water intakes and shoreline facilities, effect on chemical composition of intake water, effect on the use of land at present and for expansion	Sub-study C supplemented with desk research
Groundwater levels and locations of the interfaces between inflowing groundwater and Dead Sea Water	Effect of stabilising or raising the Dead Sea level on the interface with in-flowing groundwater and the secondary effects on aquifer levels, ground stability, and groundwater salinity	Sub-study C supplemented with desk research
The ecology on the wadis and oases surrounding the Dead Sea basin	Effects of changes in aquifer levels on the fresh water availability in hydraulically connected wadis and oases and therefore on the plant and animal life of these fragile ecosystems	Sub-study C supplemented with desk research
Construction and physical presence of the sea water outfall and the brine outfall	Visual and amenity effects leading to the lessening of tourism and leisure activities	Sub-study C supplemented with desk research
Encouragement of greater tourism and consequent social impacts	Income generation, social effects of changing the character of the area and of an influx of service industry workers.	Economic Assessment (Feasibility Study) supplemented by the Social Assessment

6.6

IMPACTS OF THE DESALINATION PLANT AND ASSOCIATED FACILITIES

6.13 The “base case plus” of RSDSC includes the desalination of Red Sea water to provide fresh water supply to the three beneficiary parties. This will involve the construction and operation of the following project components.

- A desalination plant
- Provision of electric power
- Conveyances through which water can be pumped to end users

6.14 Sites of the additional components are yet to be determined but will clearly be in the area close to the southern end of the Dead Sea. Key issues and the impacts associated with them that have been identified so far are listed in the table below along with a brief description of the investigations



that will be undertaken to characterise them fully and develop mitigation or management measures.

Table 6.5 Impacts of the Desalination Plant and Associated Facilities

Issue/ Receptor	Potential Impacts	Study Method
The construction and physical presence of the desalination plant	Landscape values, and visual disamenity Cultural values and tourism archaeology, land use, ecology and habitat destruction, disturbance and nuisance Social impacts of temporary and permanent landtake	Sub-study D supplemented with the Social Assessment; the Land use and constraints mapping tool; the Archaeological and Historical Sites Survey; and, the Assessment of major environmental, social, and security risks
The operation of the desalination plant including provision of supplies and removal of wastes	Disturbances and nuisances, indirect economic impacts on membrane supply chain, landtake (for waste disposal), social impacts of job creation and worker accommodation	Sub-study D supplemented with the Land use and constraints mapping too; and, the Assessment of major environmental, social, and security risks
Desalination plant failure and/or water (raw, desalinated and brine) leakage	Risks to groundwater and agricultural activity in the area	Sub-study D supplemented with the Assessment of major environmental, social, and security risks
Generating electricity (by hydropower or thermal or a mixture of both and supplying power to project components)	Landscape values, and visual disamenity Cultural values and tourism archaeology, land use, ecology and habitat destruction, disturbance and nuisance Social impacts of temporary and permanent landtake	Sub-study D supplemented with the Social Assessment, the Land use and constraints mapping tool, the Archaeological and Historical Sites Survey, the Assessment of major environmental, social, and security risks
Construction and physical presence of the drinking water pumping and conveyance systems	Landscape values, and visual disamenity Cultural values and tourism archaeology, land use, ecology and habitat destruction, disturbances and nuisances Social impacts of temporary and permanent landtake	Sub-study D supplemented with the Land use and constraints mapping too; and, the Assessment of major environmental, social, and security risks
Operation of the drinking water pumping and conveyance systems	Disturbances and nuisances, social impacts of job creation and worker accommodation	Sub-study D supplemented with the Land use and constraints mapping too; and, the Assessment of major environmental, social, and security risks



7.1 OVERVIEW

7.1 As part of the RSDSC study programme, four sub-studies will be undertaken that are intended to constitute the building blocks for the overall Feasibility Study and the Environmental and Social Assessment. The sub-studies will analyse existing studies and supplement them with new investigations to provide detailed information on the project effects. The four sub-studies, A to D, will examine respectively:

- Gulf of Aqaba/Eilat;
- Water Conveyance;
- Dead Sea;
- Hydropower Facilities and Desalination Plant.

7.2 The Feasibility Study will use information from the sub-studies and from its engineering and technical specialists to produce various analyses that will be of use to the ESA study, particularly a study on overall economic and financial aspects of the project proposals.

7.3 In addition, using based on their own investigations, or using the Feasibility Study and sub-study information, supplemented with additional field investigations and analysis, the ESA team will produce the following thematic reports:

- Social Assessment;
- Archaeological and Historical Sites Survey;
- A Health Impact Assessment;
- Socio-economic, land use and constraints mapping tool;
- Assessment of major environmental, social, and security risks;
- Occupational Health and Safety Assessment;
- Public Consultation and Communication Report.

7.4 These will be used to prepare the ESA Report including the Environmental and Social Management Plans.

7.5 The content of each of these documents is outlined in the following sections.



7.2.1

Sub-Study A: Gulf of Aqaba/Eilat

7.6 Sub-Study A will identify and assess environmental and social impacts in the Gulf of Aqaba/Eilat and the Aqaba/Eilat region including the following:

- i. Assess the impacts of the construction and operation of the conveyance on the water quality and current patterns in the upper Gulf of Aqaba/Eilat.
- ii. Identify and assess possible impacts on the marine environment and coastal zone in the upper Gulf of Aqaba/Eilat from the construction and operation of the Project.
- iii. Evaluate the potential short-term and long-term impacts of the Project on coral reefs and other elements of the marine ecosystem of the upper Gulf of Aqaba/Eilat.
- iv. Identify and assess impacts of the construction and operation of the Project on the coastal zone of the upper Gulf of Aqaba/Eilat including impacts on navigation, fishing, recreational and tourism activities.
- v. Assess air quality impacts from the generation of power for the pumping station and its operation. Review potential changes to the transport network in marine and terrestrial areas due to the construction and operation of the sea water intake and associated infrastructure.
- vi. Identify and assess social impacts of construction and operation of the Project in the Aqaba/Eilat region, including the temporary influx of construction workers.

7.2.2

Sub-Study B: Wadi Araba/Arava Valley

7.7 Sub-Study B will identify and assess environmental (including geological and hydrological aspects) and social impacts in the Wadi Araba/Arava, including the following:

- i. Assess the geological and seismic hazards and define geologically sensitive areas on maps.
- ii. Identify and assess environmental impacts of construction and operation of the Project in the Wadi Araba/Arava, including impacts related to loss of ecological connectivity across the conveyance and associated risks to natural habitats and biodiversity.
- iii. Identify and assess environmental impacts associated with the potential need to have the conveyance cross a number of wadis, which could have an impact on their hydrology, sediment transport, and erosion characteristics.
- iv. Identify and assess environmental and social impacts on the limited vegetation in Wadi Araba/Arava due to construction and operation of the conveyance along with the potential for successful stabilization of the land surface and re-vegetation where appropriate.



- iv. Identify and assess aesthetic impacts associated with the construction and operation of the conveyance and associated structures, which will cross through an area viewed by many as a semi-natural setting of significant beauty.
- v. Assess impact of unidentified water leakage on groundwater resources and undertake mapping of leakage sensitive areas. • Assess impact of a failure of the water conveyor, such as from an earthquake or other major event, on groundwater resources.
- vi. Identify and assess social impacts of construction and operation of the Project in the Wadi Araba/Arava, including the impact of a temporary influx of construction workers and the impacts on the Bedouin and their herds.

7.2.3 *Sub-Study C: The Dead Sea*

7.8 Sub-Study C will identify and assess environmental impacts of expected changes to the Dead Sea and impacts of construction and operation in the Dead Sea area including the following:

- i. Effects on the dynamic limnology of the Dead Sea and the evolution of the Dead Sea with and without the project by investigating:
 - a. the dynamics of stratification due to mixing.
 - b. the chemical impact of water mixing.
 - c. Potential micro-biological blooming.
 - d. the impact of inflow on the rate of evaporation.
- ii. Impacts of the introduction of seawater and/or reject brine to the Dead Sea, with particular attention to the changes in the chemical composition of the Dead Sea, salts precipitation, stratification of water column turnovers, and/or changes in ecology and appearance.
- iii. Impacts on the chemical extraction industry of the introduction of seawater and brine into the Dead Sea.
- iv. The impact of sinkholes and changes in underground water flows.
- v. Impact on the chemical facilities in Jordan and Israel.
- vi. The impact of a temporary influx of construction workers.
- vii. The impacts on the residents and businesses adjacent to the Dead Sea.
- viii. Impacts on the Bedouin and their herds.

7.2.4 *Sub-Study D: Hydropower Facilities and Desalination Plant*

7.9 Sub-Study D will: Identify and assess environmental and social impacts of site selection, construction and operation of the hydropower facilities and desalination plant including the following:

- i. Analyze geological conditions for proposed hydropower facilities and desalination plant site.
- ii. Identify and assess environmental and social impacts of construction and operation of the hydropower facilities for electricity generation and desalination plant for drinking water production. This will include



impacts related to the hydropower and desalination facilities as well as their support Red Sea facilities, storage yards, housing facilities, and the necessary electric transmission lines.

- iii. Identify and assess social impacts of construction and operation of the hydropower facilities and desalination plant. Particular attention should be given to the effect of these facilities on the landscape aesthetics/values, cultural values, and tourism.
- iv. Conduct sensitivity analysis of water (raw, desalinated and brine) leakage on groundwater resources at the proposed site for the desalination plant. This includes the mapping of leakage sensitive areas.
- v. Evaluate the potential impact of desalination plant failure (major break-down scenario) on groundwater resources.
- vi. Identify and assess environmental impacts of construction and operation of the desalination phase of the Project in the areas adjacent to drinking water transmission facilities. This includes a review of potential alignment alternatives and/or adjustments to alignments for these facilities, as well as impacts related to the pipelines themselves, including the pumping stations, storage tanks, and the necessary electric transmission lines.
- vii. Identify and assess social impacts of construction and operation of the desalination phase of the Project in areas adjacent to drinking water transmission facilities. Particular attention should be given to the effect of these facilities on the landscape aesthetics/values, cultural values, and tourism.

7.3 *THE ESA THEMATIC REPORTS*

7.3.1 *Social Assessment*

7.10 The ESA team will prepare a social assessment, as part of the Environmental and Social Assessment, to determine how the Project will affect local communities and to serve as a broader analysis of Project related social issues beyond those concerning potential impacts and risks. The assessment will be used to detail how communities are affected by the current conditions of the Dead Sea and how they would be influenced by Project construction and implementation. Key elements of the assessment will include the following:

- Population characteristics including migratory patterns and presence of indigenous peoples;
- Gender and age characteristics;
- Forms of livelihood (local employment, subsistence agriculture, tourism);
- Informal and illegal economic activity;
- Income, skill and education levels;
- Social institutions, networks and decision-making structures;
- Ethnicity, religion, language and levels of social cohesion;
- Land ownership and patterns of occupation;



- Local price levels, particularly for subsistence goods;
- Community safety and security;
- Local social infrastructure and services;
- Local heritage; and
- Health characteristics and infrastructure.

7.3.2 *Archaeological and Historical Sites Survey*

7.11 The following existing work has been used to provide a starting point for constructing a baseline:

- Southeast Araba Archaeological Survey (foothills of the eastern Wadi Araba);
- Southeast Araba Archaeological Reconnaissance (as above);
- Southern Ghors and Northern Araba Survey (north of Dana Reserve to the desalination plant - the Feifa area);
- Ghor es-Safi project (desalination plant to Dead Sea);
- Archaeological Survey of Israel Project and Wadi Araba Project (western pipeline route);
- Archaeological Survey of the Kerak Plateau and Limes Arabicus project (eastern pipeline route).

7.12 Additional field work is being undertaken to allow appraisal of alternatives and detailed assessment of the preferred scheme. In locations that have not previously been systematically surveyed or where data is partial, teams will systematically walk the study area and record (using GPS equipment) any surface finds. Existing data and satellite imagery will be used to focus work on areas of archaeological potential. Areas highlighted as of particular importance are the section of about 20 km west of Petra, and south of Wadi Feinan. These have seen intensive occupation in various periods and have not been subject to previous systematic study.

7.13 The results of the non-intrusive and any intrusive surveys will be analyzed, mapped and evaluated in terms of their archaeological, historic and cultural significance and any finds will be brought to the attention of the appropriate authorities in accordance with local legislation.

7.14 The assessment of impacts will involve predicting the effect of each Project component on known and inferred buried archaeology, and on buildings, structures and sites of historic or cultural importance. Impacts may include complete or partial loss, physical damage, fragmentation of assemblies of sites, or change in setting and context. Each site or feature will be described in terms of its current condition, history and significance to local, regional and global heritage. The impact on each site or feature will then be described and evaluated taking into account its local, regional and international significance. Account will be taken of relevant protective designations where these are in place.



7.3.3 *Health Impact Assessment*

7.15 The health impact assessment will be conducted as part of the Social Assessment. Initial data gathering will identify possible health determinants that may be influenced by Project activities, in the context of the living conditions and vulnerabilities of populations that may be affected. Potential health outcomes will then be predicted include those arising from changes in incidence and severity:

- Communicable diseases associated with human behaviour (e.g. HIV and sexually transmitted infections) especially those arising from changes in economic status, increased mobility, movement of populations and migrant workforces, and those associated with sanitation and related infrastructure such as vector borne and childhood diseases; and
- Non-communicable diseases associated with changes in economic status, food and nutrition, accidents and injuries, and general wellbeing.

7.3.4 *Socio-economic, land use and constraints mapping tool*

7.16 A Geographic Information System (GIS) will be used to hold and display spatially referenced environmental and social data. Having prepared the required topographic base map and the overlaid mapping data, (i.e. property ownership, municipal boundaries, all related permanent and temporary facilities) a set of topographic maps will be prepared for the assessments as follows:

- A map set to illustrate all key spatially referenced environmental and social baseline data and all major constraints that will come up according to the studies;
- A map set to clearly indicate the nature and locations for all site-specific mitigation measures and all other recommended site-specific actions.

7.3.5 *Assessment of major environmental, social, and security risks*

7.17 The Sub-Studies will address some risks including of occurrence of natural events such as earthquakes, and other geological hazards along the route of the Project and of unintended consequences and external events such as sudden deterioration in Dead Sea conditions, health events affecting multiple employees, social unrest, intentional interference.

7.18 The ESA study will extend these findings into an analysis of the potential environmental and human consequences of such events. The analysis will also assess the consequences of breakdown, accidental and catastrophic events that could affect the project infrastructure e.g. pipeline



failure, breakdown of pumps, spills and leaks, fire and explosion scenarios, releases of hazardous materials such as chlorine at desalination plant, failure in water quality control, flooding, transport related major events, risks from unexploded ordnance, etc.

7.19 By applying quantitative methods to the assessment of probability of occurrence and consequences, the analysis will provide predictions of the risk to environmental resources, material assets, social conditions and human life during each stage of the Project.

7.3.6 *Occupational Health and Safety Assessment*

7.20 A study will be undertaken of the occupational health and safety (OHS) risks to workers during the construction, commissioning and operation of the project. This analysis will use worldwide empirical evidence on health, injury and fatality risks in the relevant sectors to predict risks to Project workers for input to development of the project specification and the system for management of health and safety during implementation of the Project. Specific OHS issues to be investigated will include security risks, unexploded ordnance, land stability, construction safety, exposure to chemicals, medical risks, exposure to the elements while at work, fatigue, manual handling and transport.

7.3.7 *Public Consultation and Communication Reports*

7.21 As described above, a PCCP will be carried out in three phases. At the end of each phase a report will be produced setting out findings, conclusions and next steps. The final, phase 3, consultation report will describe the final outcomes of the PCCP process, and propose a future program for consultation activities by the beneficiary parties following study completion



*Executive Summary***Part A: Overview**

- A1. Introduction
 - A1.1 How to use this document
 - A1.2 Methods
 - A1.3 Sources of information
- A2. Description of Proposed Project
 - A2.1 Summary of Project alternatives examined in the previous Pre-Feasibility Study
 - A2.2 Project elements and main variants - Base Case
 - A2.3 Project elements and main variants - Base Case Plus
 - A2.4 Project construction
 - A2.5 Sources of environmental and social impact
- A3. Policy, Legal and Administrative Framework
 - A3.1 International framework
 - A3.2 Jordan
 - A3.3 Israel
 - A3.4 Palestinian Authority
- A4. Approach & Methodology
 - A4.1 Approach
 - A4.2 Impact identification
 - A4.3 Impact assessment
 - A4.4 Mitigation Management

Part B: Regional Environmental and Social Assessment

- B1. Key Regional Environmental and Social Baseline Conditions
 - B1.1 Inflows, evaporation and water level changes at the Dead Sea
 - B1.2 The physical environment of the project area
 - B1.3 The natural environment at the Gulf of Aqaba/Eilat
 - B1.4 Economic activity at Aqaba/Eilat (ports, industry, tourism)
 - B1.5 The regional terrestrial environment in the Wadi Araba/Arava and Dead Sea area
 - B1.6 Protected areas and areas of special interest in the project area
 - B1.7 Avi-fauna in the region
 - B1.8 The socio-economic context in the Wadi Araba/Arava
 - B1.9 The Jordan River Valley ecosystem
 - B1.10 The tourism industry at the Dead Sea
 - B1.11 The chemical industry at the Dead Sea
 - B1.12 Development plans in the region, including Aqaba, Eilat, Wadi Araba (Jordan), Arava/Peace Valley (Israel), Northern Dead Sea



- Basin Master Plan (Jordan), Jordan Rift Valley Master Plan (Jordan)
- B1.13 Water demand in the region (master plans and demand projections)
 - B1.13.1 Jordan
 - B1.13.2 Israel
 - B1.13.3 Palestine
- B1.14 Agriculture and related water usage (and demand projections)
 - B1.14.1 Jordan
 - B1.14.2 Israel
 - B1.14.3 Palestine
- B1.15 The political context related to the project
- B1.16 Cultural & archaeological properties

- B2. Identification and Assessment of Regional Environmental and Social Impacts
 - B2.1 Tables of Impacts
 - B2.2 Identification of Key Issues

Key Regional Issues

- B3. Analysis of Impacts on Upper Gulf of Aqaba/Eilat and Coastal Region
 - B3.1 Large scale effects in the Gulf (including circulation, temperature, salinity, evaporation)
 - B3.2 Marine ecology – macro scale
 - B3.3 Economic, ports, industrial and tourism activity – macro scale
 - B3.4 Social impacts – macro scale
 - B3.5 Cumulative Impacts
 - B3.6 Transboundary impacts (with Egypt & Saudi Arabia)

- B4. Analysis of Impacts on the Wadi Araba/ Arava Valley – Regional Scale
 - B4.1 Geological and seismic hazards – high level (includes maps)
 - B4.2 Impacts on natural habitats and biodiversity, including connectivity issues.
 - B4.3 Restrictions related to Protected Areas - general
 - B4.4 Impacts associated with the hydrology of wadis (sedimentation, flash floods, etc),
 - B4.5 Risk of induced development of the Wadi Araba/ Arava Valley
 - B4.6 Impacts associated with destabilization of the land surface
 - B4.7 Aesthetic and landscape impacts
 - B4.8 Impact of water leakage on groundwater and agriculture
 - B4.9 Other construction related impacts, including disposal of spoil, transportation of plant, noise, vibration and dust)
 - B4.10 Impact of a temporary influx of construction workers
 - B4.11 Social impacts on the Bedouin and their herds in the Wadi Araba

- B5. Analysis of Impacts on the Dead Sea
 - B5.1 Discussion of issues related to water inflow
 - B5.1.1 The future water level of the Dead Sea
 - B5.1.2 Filling rate
 - B5.1.3 Amount of brine discharge



- B5.2 Impacts on tourism from the stabilization of the Dead Sea water level
 - B5.2.1 Jordan
 - B5.2.2 Israel
 - B5.2.3 Palestine
- B5.3 Risks to tourism and heritage value from changes to the characteristics of the Dead Sea
 - B5.3.1 From changes in appearance
 - B5.3.2 From changes in water quality
- B5.4 Other Impacts to the Dead Sea
 - B5.4.1 Changes to frequency of water column turnovers
 - B5.4.2 Changes in ecology

- B6. Analysis of Impacts on the Dead Sea Region and Beyond
 - B6.1 The impacts on the chemical extraction industry in Jordan and Israel
 - B6.1.1 From changes to the water level of the Dead Sea
 - B6.1.2 From changes to the water quality of the Dead Sea
 - B6.2 The impact on groundwater, changes in underground water flows, and sinkholes
 - B6.3 Impacts from electricity generation
 - B6.4 Impacts related to the provision of desalinated freshwater
 - B6.5 Social impacts of an influx of construction workers, impacts on tourism.
 - B6.6 Social impacts on the Bedouin and their herds

- B7. Climate Change
 - B7.1 The 'no-project' scenario
 - B7.2 Possible project-related effects

- B8. Evaluation of Induced Impacts
 - B8.1 Benefits, including health, social and economic development related to the availability of additional potable water
 - B8.2 Impacts from growth in the tourism industry
 - B8.2.1 Expansion of tourism infrastructure.
 - B8.2.2 Impacts of the movement and provisioning of additional tourists.
 - B8.2.3 Social impacts of additional tourism (particularly increased non-national work force)
 - B8.3 Risks from significant economic development in the Wadi Araba/Arava Valley as a result of additional water availability
 - B8.4 Increased political cooperation as a result of the project
 - B8.5 Other significant project-induced impacts

- B9. Special Risks
 - B9.1 Project-related environmental risks
 - B9.2 Project-related social risks
 - B9.3 Project-related security risks

- B10. Evaluation of Cumulative Regional Impacts
 - B10.1 Potential cumulative environmental and social benefits



- B10.2 Potential cumulative environmental and social risks
- B10.3 Management and monitoring plan to address cumulative impacts

B11. Analysis of Other Impacts

B12. Analysis of Regional Alternatives

B12.1 A summary report prepared by a third party, under a separate assignment will be inserted here

Part C: Project Specific Environmental and Social Assessment

C1. Introduction: Environmental and Social Baseline Conditions and Analysis

C1.1 Gulf of Aqaba/Eilat

C1.1.1 Water quality

C1.1.2 Marine ecology

C1.1.3 Physical conditions at the intake site(s)

C1.1.4 Conditions at the shoreline and adjacent terrestrial areas

C1.2 The Wadi Araba/Arava Valley

C1.2.1 The physical environment along the conveyance route

C1.2.2 Geology and groundwater

C1.2.3 Ecology and avi-fauna

C1.2.4 The socio-cultural environment along the conveyance route

C1.2.5 Cultural heritage along the conveyance route

C1.3 The Dead Sea

C1.3.1 Water quality

C1.3.2 Physical conditions at the outfall site(s)

C1.3.3 Land use adjacent to the Dead Sea shoreline

C1.3.4 Cultural properties close to the shoreline

C1.4 The Desalination, Electrical Generation and Pumping Infrastructure

C1.4.1 Physical & ecological conditions at the Desalination/Pumping Plant Site(s)

C1.4.2 Land use at the Desalination/Pumping Plant Site(s)

C1.4.3 Socio-cultural and socio-economic conditions at the Desalination/Pumping Plant Site(s)

C1.5 Freshwater Pipeline Route(s)

C1.5.1 Physical & ecological conditions along the Freshwater Pipeline Route(s)

C1.5.2 Land use along the Freshwater Pipeline Route(s)

C1.5.3 Socio-cultural and socio-economic conditions along the Freshwater Pipeline Route(s)

C2. Identification and Assessment of Project Specific Environmental and Social Impacts

C2.1 Tables of Impacts

C2.2 Identification of Key Issues



Key Project Specific Issues

- C3. Analysis of Impacts on the Upper Gulf of Aqaba/Eilat and Coastal Region
 - C3.1 Physical impacts at the intake location(s)
 - C3.2 Impacts on water quality from intake of seawater
 - C3.3 Impacts on marine ecology in the northern Gulf
 - C3.4 Impacts on
 - C3.4.1 navigation,
 - C3.4.2 fishing,
 - C3.4.3 recreation
 - C3.4.4 tourism
 - C3.5 Air quality impacts
 - C3.6 Social impacts

- C4. Analysis of the Wadi Araba/Arava Valley – Project Specific Level
 - C4.1 Geological and seismic hazards along conveyance route (includes maps)
 - C4.2 Impacts on natural habitats and biodiversity along the conveyance route
 - C4.3 Impacts related to specific areas of particular interest along conveyance route, for example
 - C4.3.1 Qatar Protected Area - Proposed
 - C4.3.2 Rahma Special Conservation Area – Proposed
 - C4.3.3 Masuda Protected Area – Proposed
 - C4.3.4 Dana Protected Area – Existing
 - C4.3.5 Fifa Protected Area – Proposed
 - C4.3.6 Important Bird Areas (Aqaba IBA, Wadi Araba IBA, Dana IBA, Fifa IBA)
 - C4.3.7 Other protected or sensitive areas of relevance (e.g.in Israel)
 - C4.4 Impacts associated with destabilization of the land surface – specific locations (if any)
 - C4.5 Aesthetic and landscape impacts – specific areas of interest
 - C4.6 Impact of water leakage and infiltration on groundwater resources (includes mapping of leakage sensitive areas).
 - C4.7 Other site-specific construction related impacts
 - C4.8 Impact of a major event on groundwater resources.
 - C4.9 Social impacts o the Bedouin and their herds

- C5. Impacts on the Dead Sea
 - C5.1 Description of the dynamic limnology of the Dead Sea.
 - C5.1.1 The dynamics of stratification due to mixing.
 - C5.1.2 Evaluation of the chemical impact of water mixing.
 - C5.1.3 Assessment of micro-biological blooming
 - C5.1.4 The impact of inflow on the rate of evaporation.
 - C5.2 The impacts of the introduction of seawater and reject brine to the Dead Sea
 - C5.2.1 The chemical composition of the Dead Sea,
 - C5.2.2 Salts precipitation,
 - C5.2.3 Changes in appearance,



- C5.2.4 Algal blooms, turnovers, sulphide production
- C5.2.5 Other
- C5.3 Recommendations for optimal design of the discharge system
 - C5.3.1 Proposed site for discharge of inflow
 - C5.3.2 Proposed depth below the surface of the inflow discharge
- C5.4 Impact on Groundwater at specific risk points (from construction and operation)

- C6. Analysis of Impacts in the Dead Sea Region
 - C6.1 Impacts related to desalination, pumping and electric generation facilities and the associated structures
 - C6.2 Impacts on the chemical facilities in Jordan and Israel
 - C6.2.1 From the discharge of sea water and the outfall
 - C6.2.2 From the discharge of brine and the outfall
 - C6.3 Social impacts of an influx of construction workers, impacts on tourism.
 - C6.4 Social impacts on the Bedouin and their herds in the Southern Ghors area.

- C7. Analysis of Impacts of the Desalination, Electrical Generation and Pumping Plants and Associated Facilities
 - C7.1 Landscape values, and visual disamenity
 - C7.2 Cultural values and tourism.
 - C7.3 Sensitivity analysis of water (raw, desalinated and brine) leakage
 - C7.4 Desalination plant failure impact on groundwater resources.

- C8. Analysis of Impacts of the Drinking Water Pumping and Conveyance
 - C8.1 environmental impacts of construction and operation
 - C8.2 social impacts of construction and operation

- C9. Social Assessment
 - C9.1 Effect on local communities and analysis of Project related social issues
 - C9.2 Identification of stakeholders and their most relevant issues
 - C9.3 How communities are affected by the Project

Other Environmental and Social Impacts

- C10. Impacts to Archaeological, Historical and Cultural Sites
 - C10.1 Inventory of sites of spiritual, archaeological, historical, social and touristic value.
 - C10.2 Sites with significant probability of future interest.
 - C10.3 Potential to avoid archaeological, cultural, or tourism sites
 - C10.4 Measures, to minimize the potential impacts
 - C10.5 Procedures to address “archaeological chance finds” during construction

- C11. Occupational Health and Safety

- C12. Health and HIV/ AIDS Risks

- C13. Evaluation of Induced Impacts



- C13.1 Growth in the tourism industry and expansion of tourism infrastructure.
- C13.2 Impacts of the movement and provisioning of the additional tourists.
- C13.3 Social impacts of the additional tourists, (particularly increased non-national work force)
- C13.4 Other significant Project-induced impacts

- C14. Special Risks
 - C14.1 Project-related environmental risks
 - C14.2 Project-related social risks
 - C14.3 Project-related security risks

- C15. Evaluation of Cumulative Project Specific Impacts
 - C15.1 Potential cumulative environmental and social benefits
 - C15.2 Potential cumulative environmental and social risks
 - C15.3 Management and monitoring plan to address cumulative impacts

- C16. Analysis of Project Specific Alternatives
 - C16.1 Seawater intake - location and design
 - C16.2 Saline water conveyance - route and design
 - C16.3 Desalination Plant - location and design
 - C16.4 Electrical generation plant - location and design
 - C16.5 Dead Sea discharge works - location and design
 - C16.6 Potable water transmission - route and design

Part D: Project Specific Environmental and Social Management Plan

- D1. Land Acquisition Framework and Plan
- D2. Involuntary Resettlement
- D3. Indigenous Peoples Development Framework and Plan
- D4. Plan for Control of Construction Activities
 - D4.1 Public Consultation and Communications
 - D4.2 Monitoring Arrangements
 - D4.3 Archaeology/Cultural Resources
 - D4.4 Construction Spoils Management
 - D4.5 Erosion and Sediment Control
 - D4.6 Fugitive Dust Control
 - D4.7 Noise Control
 - D4.8 Wadi Crossing
 - D4.9 Protected Areas
 - D4.10 Tree Planting and Restoration of Natural Habitats
 - D4.11 Traffic Control
 - D4.12 Occupational Health and Safety
 - D4.13 Health and HIV/AIDS Management

- D5. Plan for Operations Phase Mitigation and Monitoring
 - D5.1 Introduction: Monitoring activities, objectives and reporting
 - D5.2 The Upper Gulf of Aqaba/Eilat.
 - D5.3 The Ecological Status of the Wadi Araba
 - D5.4 Wadi Crossings



- D5.5 Protected Areas
- D5.6 Habitat Restoration Programme
- D5.7 Dead Sea Environmental and Social Mitigation
- D5.8 Desalination and Power Generation Sites
- D5.9 Freshwater Transmission Routes

- D6. Capacity Development and Training
 - D6.1 Assessment of the capability of environmental oversight
 - D6.2 Description of required institutional oversight
 - D6.3 Required enhancements/organizational changes and costs
 - D6.4 Draft ToR for Institutional Strengthening

- D7. Implementation Schedule and Cost Estimates

Annexes

- Annex I. Public Consultation and Communication Report
- Annex II. Report on Strategic Alternatives (to be provided from independent assignment)
- Annex III. EA report preparers
- Annex IV. References used in study preparation.
- Annex V. Record of Meetings (Governments, Agencies, etc.)
- Annex VI. Public Consultation and Disclosure Plan for the Implementation Period
- Annex VII. Archaeological and Historical Sites Survey
- Annex VIII. Archaeological Chance Find Procedures
- Annex IX. Social Assessment
- Annex X. Resettlement and Land Acquisition Policy Framework
- Annex XI. Resettlement and Land Acquisition Plan(s)
- Annex XII. Indigenous Peoples Development Framework
- Annex XIII. Indigenous Peoples Development Plan(s)
- Annex XIV. Occupational Health and Safety Plan
- Annex XV. Health and HIV/ AIDS Assessment and Management Plan
- Annex XVI. Detailed Corridor Location Maps (in ArcGIS or a compatible format) for Key Baseline Data and Constraints, including all Project Facilities and Water Conveyance Alignment
- Annex XVII. Detailed Corridor Location Maps (in ArcGIS or a compatible format) for All Mitigation Measures and Recommended Actions, including all Project Facilities and Water Conveyance



Annex A

Stakeholders in Each Beneficiary Party

Annex A - Stakeholders in Each Beneficiary Party

Category	Stakeholder	Description	Connections to/interest in the Project
Government			
Central Government	Office of the President	Head of Palestinian Authority	Final decision maker in Palestinian Authority
	Palestinian Water Authority (PWA)	Responsible for water resource and supply policy and planning (is the regulatory body).	Official appointed representative form the Palestinian Authority on the Technical Steering Committee (TSC).
	Ministry of Agriculture	Responsible for agricultural policy.	Only related if agricultural water is provided.
	Negotiations Support Unit	Peace negotiations unit (working to prepare the negotiation files on the final status issues).	Water is a major component of the peace negotiations.
	Ministry of Planning	Responsible for preparing the development plan (medium term) coordinate with donors.	The official signatory to the MOU for the Red Dead
	Palestinian Investment Promotion Agency	Consulting and information body related to donor support.	May be involved in financing discussions if project goes ahead.
	Ministry of Labour	Regulatory body that conducts monitoring and coordination for labour issues.	May be involved if construction labour is required.
	Ministry of Finance	Responsible for PA budgeting and financing.	Takes an interested in all major infrastructure projects.
	Environmental Quality Authority (EQA)	Regulatory body for the environment.	Responsible for protected areas management and for environmental permitting, to ensure compliance with National EIA guidelines.
	Ministry of Health	Responsible for all aspects of the health sector	Interested in potential health impacts (positive and negative) of project

	Ministry of National Economy	Body for registration, licensing and coordinating investments (only relevant for private sector?)	
	Ministry of Local Government	Governs the municipalities.	May have a role in land access permits, and routing access.
	Land registration department	Land ownership registration	Land acquisition a long the pipeline route
Local Government	Municipalities close to possible transmission route (to be determined once route is known)	Local municipal government.	Local level coordination, construction permits and access.
	West Bank Water Department	Involved in water supply planning and infrastructure in West Bank.	Involved if freshwater supplied to Palestinian Authority areas.
	Bethlehem Water Supply and Sanitation Authority (BSSA).	Involved in water supply infrastructure in Bethlehem.	Involved if freshwater supplied to Bethlehem area.
	Hebron Water Utility	Involved in water supply infrastructure in Hebron.	Involved if freshwater supplied to Hebron area.
	Other water distribution utilities	Involved in water supply infrastructure in other areas.	Involved if freshwater supplied to other areas.
	Governorates along transmission route (will be named once route is known)	Local authorities	Local level coordination.
Communities/ Land owners			
	Households and communities along freshwater pipeline route	Local communities.	May experience construction-related impacts.

Private Sector			
	Chambers of Commerce, Businessmen's Associations	Business associations.	Organisations with direct economic interest on the proposed Project. Either through gaining contracts or due to economic impacts of the proposed Project.
	Palestinian Wastewater Engineers Group	Private sector body representing wastewater engineers.	
	Engineers Union	Professional workers union.	
NGOs/Research Institutions			
NGOs	EWASH forum (Environment Water, Sanitation and Hygiene) PHG to list the members.	International NGOs and UN agencies with an interest in water and sanitation.	Technical expertise, consultation, .
	Environmental NGO Network (PENGON Members)	A network of environmental NGOs in PA.	Technical expertise, consultation.
	Palestinian Hydrology Group for Water and Environmental Resources Development	Research and development in the field of water and sanitation	Technical expertise, consultees, community work, lobby
	Applied Research Institute - Jerusalem, Bethlehem	Research centre with an interest in water issues.	Technical expertise, consultees
	Land Research Centre	Research in land use issues	Technical expertise
	Palestinian Agricultural Relief Committees	Research and development in agricultural related issues	Technical expertise, community work
	The Palestinian Association for Cultural Exchange	Interested in the cultural heritage	Technical expertise

	The Society for Environmental Protection (Jenin)	Environmental issues in Palestine	Technical expertise
	Palestinian Wildlife Society (Bethlehem)	Interested in wildlife	Technical expertise
	Union of agricultural work committees	Interested in agriculture	Technical expertise, community work
	Biodiversity Research center	Interest in Biodiversity	Technical expertise
	Water and Environmental Development Organisation (WEDO)	Sister NGO to Friends of the Earth (Middle East).	Published previous studies on RSDSC. Lobby group.
Research Institutions	Birzeit University – Institute of Water Studies	Educational & research establishment.	Has technical research capability.
	Al Najah University: Water and Environment Studies Center, and Earth Science and Seismic Engineering Center, Energy Research Center	Educational & research establishment.	Has technical research capability.
	Bethlehem University: Water and Soil Environmental Research Unit	Educational & research establishment.	Has technical research capability.
	Al-Azhar University: Faculty of Science, Environmental Protection and Research Institute (EPRI) (Gaza)	Educational & research establishment.	May be not relevant for the project
	Hebron University: Engineering Dept	Educational & research establishment.	Research capacity
	Hebron Polytechnic	Educational & research establishment.	Research capacity

IFIs and Donors			
	World Bank	International agency	Managing the RSDSC Study Programme
	JICA (Japan International Cooperation Agency)	Japanese development agency, donor.	Potentially interested donor. Supporting study programme.
	USAID	US donor agency.	Potentially interested donor. Supporting study programme.
	GTZ	Donor agency in water and sanitation.	Potentially interested donor.
	European Commission	Donor agency.	Potentially interested donor.
Other (political parties, religious groups, media)			
	The Independent Commission for Human Rights		Human right violation
Television media	Al Jazeera News Network	Local and international broadcast media.	Interested in reporting on project and implications on regional politics
	El Arabia TV		
	BBC Arabic		
	MBC		
Other media	Al Hayaa Al Jadida Newspaper	Local print media	Interested in reporting on project and implications on regional politics
	Al Quds Newspaper		
	Al Ayyam Newspaper		

JORDAN

Category	Stakeholder	Description	Connection to/interest in the Project
Government			
Central Government	Ministry of Water and Irrigation	Line ministry responsible for water policy.	Concerned with impacts on water policy.
	Jordan Valley Authority	Responsible for agricultural water supply, and acts as regional authority for areas f Rift Valley under 300 m above sea level, responsible for land use in Jordan Valley, Ghor Safi and Wadi Araba. Lead GOJ agency for RSDSC study programme.	Sits on TSC and Study Management Unit.
	Royal Court	Responsible, along with Council of Ministers, for national strategic policies.	Commissioned land use planning for Wadi Araba. Commissioned Water Strategy
	Water Authority of Jordan	Responsible for bulk water management and supply. JVA reports to Minister of Water.	Concerned with impacts on water supply.
	Ministry of Environment	Environmental regulator outside Aqaba Zone.	Concerned with all environmental impacts. Sits on TSC.
	Ministry of Planning and International Cooperation	Responsible for strategic development planning and foreign donor aid.	Sits on TSC.
	Ministry of Agriculture	Responsible for agricultural policy	Concerned with impacts on agricultural policy.
	Jordanian Armed Forces	Responsible for public security and border control	Concerned with security implications.
	Department of Antiquities	Responsible for antiquities protection	Concerned with impacts on archaeological and cultural heritage

	Ministry of Foreign Affairs	Foreign Ministry	Interested in impacts on foreign and regional relations and policy.
	Ministry of Municipal Affairs	Line ministry responsible for servicing municipal government. Includes Higher Planning Council.	Concerned with regional planning and land use issues.
	Ministry of Interior	Line ministry responsible for public security, police & intelligence services, local governorates, etc.	Interested in security implications, e.g.along border.
	Ministry of Public Works and Housing	Line ministry for public infrastructure, roads, schools, hospitals, etc.	Possibly involved with infrastructure planning and/or approvals.
Local Government	Aqaba Special Economic Zone Authority	Regional authority in Aqaba Zone. Environmental regulator for Zone. Has some transferred responsibility for Wadi Araba water issues.	Concerned with all social and environmental impacts in the Aqaba Zone, environmental clearance, intake location, land use, etc.
	Aqaba Development Corporation	Local development corporation in Aqaba Zone	Concerned with impacts on development and economic development, and infrastructure and utilities.
	Local Municipalities in project area (to be named once routing is known)	Local municipalities through which conveyance line or freshwater transmission line might pass.	Concerned with local land use and social and economic impacts.
	Local Governorates in project area (Aqaba, Tafila, Karak)	Local authorities through which conveyance line or freshwater transmission line might pass.	Concerned with local land use and social and economic impacts.
	Aqaba Water Company	Water utility in Aqaba	Concerned with impacts on water supply, resources and demand in Aqaba region

	Jordanian Maritime Authority	Responsible for shipping	Concerned with impacts on shipping traffic
	Aqaba Ports Corporation	Operates Aqaba ports	Concerned with effects on port operations
Communities/ Landowners			
	Farmers in Southern Ghors	Agricultural communities	Concerned with impacts to livelihood, water supply and land use
	Local communities along conveyance route (Qatar, Rahma, Rishe, Bir Mathjour, Greigera, Finan, Ghor Fifa, Ghor Safi, etc)	Communities – settled Bedouin and agricultural communities	Concerned with construction impacts, land take, resettlement, and potential benefits
	Local communities near desalination plant (Ghor Fifa)	Communities	Concerned with construction and operation impacts, land take, resettlement
	Local communities along transmission routes (names to be added once routes are known)	Communities	Concerned with construction impacts, land take, resettlement
Private Sector			
	Arab Potash Company (APC) and other industrial entities at Dead Sea	Industrial extraction enterprises along Dead Sea southern basin	Concerned with level changes and water quality changes to Dead Sea
	Dead Sea Hotels	Tourism entities along Dead Sea north-eastern shoreline	Concerned with level changes and water quality changes in Dead Sea
	Ayla Development in Aqaba	Tourism & residential development on Aqaba north shore	Adjacent to one possible pipeline route, riparian to north shoreline

	Jordanian Nuclear Agency	State Nuclear Agency	Possibly interested in energy requirements
	King Hussein International Airport (Aqaba)	Regional airport in Aqaba	Close to possible pipeline route
	Central Electricity Generating Company (CEGCO), & Aqaba Thermal Power Plant (ATPP)	Energy generation	Concerned with energy demand
NGOs/Research Institutions			
	Royal Marine Ecological Diving Society	Marine environmental NGO.	Concerned with impacts on marine ecology.
	Royal Society for the Conservation of Nature (RSCN)	Environmental NGO. Manages protected areas.	Concerned with impacts on social environment and ecology. Research capability.
	Friends of the Earth ME (Jordan)	Environmental lobby group and NGO	Concerned about environmental impacts and Dead Sea basin.
	Jordan University: Centre for Strategic Studies	Research centre, public opinion.	Capability in surveys and assessment
	Marine Science Station, Aqaba	Marine research centre	Concerned with marine environmental impacts. Capability in water quality monitoring, surveys and marine ecology.
	Jordan University: Water and Environment Research and Study Centre (WERSC)	Research centre	Technical capability in certain fields
	Jordan University of Science and Technology Queen Rania Al-Abdullah Centre for	Research centre	Technical capability in certain fields

	Environmental Science and Technology (QRACEST)		
	Mutah University Prince Faisal Centre for Dead Sea, Environmental and Energy Research (PFC-DSEER)	Research centre	Physical modelling of Dead Sea mixing
	The Hashemite University Centre of Environmental Studies	Research centre	Technical capability for ecological surveys
	Balqa Applied University	Research centre	Technical capability in certain fields
	Royal Scientific Society	Government research centre	Technical capability in certain fields
	Royal Jordanian Geographical Centre	Government agency providing maps	Provide maps and data
	National Centre for Agricultural Research and Technology Transfer	Agricultural research and education agency	No relevance
	The Higher Council for Science Technology: Jordan Badia Research and Development Centre	Research institution related to the Jordanian Badia	No relevance as the project will not impact the Badia regions
	Jordan River Foundation	Social development charity	Involved in social development in Wadi Araba.
IFIs and Donors			
	USAID	US donor agency	Support to study programme, potential donor to project
	GTZ	German donor agency	Potential donor to project
	JICA	Japanese donor agency	Support to study programme, potential donor to project
	EU	EU donor agency	Potential donor to project
	South Korean Embassy	South Korean Embassy	Potential donor to project

	other	Various other donors and development agencies	Potential donor to project
Other (political parties, religious groups, media)			
News Agencies	Petra News Agency	Government news agency	Provides official press releases
	Jordan Times	Print media	Interested in project details and implications/benefits to Jordan
	Al-Ghad		
	Al-Arab Al-Yawm		
	Al-Rai		
	Ad-Dustour		

ISRAEL

Category	Stakeholder	Description	Connections to/interest in the Project
Government			
Central Government	Water Authority of Israel	Water policy & planning	GOI designated contact agency for RSDSC. Member of TSC
	Ministry of Environmental Protection	Environmental regulator	Environmental concerns and management. Environmental permitting
	Ministry of Agriculture	Responsible for agricultural policy	Concerned if there are project implications on agriculture
	Ministry of Infrastructure	Responsible for infrastructure policy	Central policy for infrastructure advancement
	Ministry of Defence	Responsible for Defence	Concerned if border crossings are required, or infrastructure is adjacent to border. Concerned if infrastructure are overlapping to army land uses.
	Ministry of Tourism	Responsible for tourism policy	Concerned with impacts on tourism in Eilat and Dead Sea areas.
	Ministry of Interior	Responsible for statotoric planning.	Concerned with planning process.
	Ministry of Labour	Responsible for workers rights, health and safety in work.	Workers rights, health and safety.
	National Parks Authority (NPA)	Manages national parks.	Concerned with impacts on natural reserves and ecology
	Israel Antiquities Authority	Responsible for protection of archaeological sites.	Concerned with impacts on cultural heritage.
Authorities or Municipalities	Eilat Municipality	Local government for Eilat	Concerned with land use and impacts in Eilat (if any)
	Eilat Regional Council.	Regional government	Concerned with land use and impacts in the authority area

	Central Arava (Arava Tihona) Regional Council.	Regional government	Concerned with land use and impacts in the authority area
	Tamar Regional Council (of the Southern Dead Sea)	Regional government	Concerned with land use and impacts in the authority area
	Megillot Regional Council (of the Northern Dead Sea)	Regional government	Concerned with land use and impacts in the authority area
	Port in Eilat	Port Authority	Concerned with impacts on the port.
	Israel Airport Authority	Airport and border terminals Authority	Concerned with impacts on the airports and border terminals.
	NPA (Nature Rarks Authority) at the Dead Sea (Ein Gedi and Ein Fescha), Arava and Eilat erea (Masiv Eilat and more).	Protected areas management	Concerned with impact on protected areas
	Mekorot Israel Water Utility	Bulk water supplier	Would be responsible for freshwater distribution.
	Drainage Authorities (Dead sea, Arava)	Responsible drainage facilities and streams rehabilitation in the authority area.	Impacts on surface and groundwater
	KKL	Organization engaged in land preparation and management of forestry land	Concerned with impact on forest areas
Communities/ Landowners			
	Local Residents in Eilat	Residents	Concerned with land use and construction impacts, marine environment.
	Kibbutz Communities in the Arava	Agricultural collectives	Concerned with impacts on land uses, groundwater and environment
	Local communities in the project area	Local communities	Concerned with construction and environmental impacts

	Kibbutz and Moshav Communities at the Dead Sea	Agricultural collectives	Concerned with impacts on groundwater and environment, and impacts on sinkholes and Dead Sea
	Land owners – public or private	Land owners	Concerned with land use, access, construction impacts
Private Sector			
	Hotel Industry in Eilat	Tourism entities	Concerned with impacts on marine environment, tourism
	Local Tourism in the Arava Region (mostly bed & breakfasts)	Tourism entities	Concerned with impacts on tourism
	Hotel Industry and local tourism in Dead Sea	Tourism entities	Concerned with impacts on Dead Sea level, water quality and landscape
	Cosmetics and medicinal Industry at the Dead Sea	Industrial entities	Concerned with impacts on Dead Sea industries, water quality and tourism
	Dead Sea Works	Industrial entities	Concerned with impacts on water quality and climate, and impacts on industrial processes
NGOs/Research Institutions			
NGOs	Friends of the Earth ME (FOEME)	International environmental NGO	Concerned with impacts on environment and socio economics
	Society for Protection of Nature in Israel (SPNI)	Israeli environmental NGO	Concerned with impacts on environment
	Life and Environment	Umbrella organisation for other green NGOs (e.g. SPNI)	Concerned with impacts on environment
	Tzalul	Dedicated to protecting the seas and rivers of Israel	Concerned with impacts on the marine environment.
Research Institutions	Geological Survey of Israel (GSI)	Research institution	Technical capability related to geology, seismics, Dead Sea physics and chemistry

	Institute of Oceanographic & Limnological Research (IOLR)	Research institution	Technical capability related to Red Sea and Dead Sea physics and chemistry
	Tel Aviv University - Department of Geophysics and Planetary Sciences	Research institution	Technical capability related to climate change
	Dead Sea & Arava Institute for Environmental Studies	Research institution	Technical capability related to ecology and socio-economics
	Israeli Union for Environmental Defence (IUED)	One of the influential environmental organization.	Concerned with impacts on environment and community.
	Agricultural R&D Stations in the Southern and Central Arava Kibbutz and Moshav Communities (cooperative communities) in the Central Arava	Research institutions	Aiming to serve the development needs of the new communities at officially declared high priority regions along the Israeli borders.
	The Inter-University Institute for Marine Science in Eilat	Research institution	Technical capability related to Red Sea and Dead Sea physics and chemistry
	The Hebrew University of Jerusalem - The Institute of Earth Sciences	Research institution	Technical capability related to environment
Other (political parties, religious groups, media)			
Television media	Israeli Channel 1, 2, 10	Local broadcast media	Concerned with social, environmental and political implications of project
	Newspapers - Haaretz, Yediot-Hacharonot, Maariv	Local print media	Concerned with social, environmental and political implications of project