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Tetra Tech International Development

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## Task 1.12: AAWDC Project Environmental and Social Management Plan

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# Glossary of Terms and Abbreviations

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|---|---|
| **AAWDC** | Aqaba-Amman Water Desalination and Conveyance |
| **ASEZA** | Aqaba Special Economic Zone Authority |
| **BOT** | Build-Operate-Transfer |
| **CESMP** | Construction Environmental and Social Management Plan |
| **CFMP** | Chance Finds Management Plan |
| **CIP** | Cleaning-in-Place |
| **E&S** | Environmental and Social |
| **EIB** | European Investment Bank |
| **EPRP** | Emergency Preparedness Response Plan |
| **ERI** | Economic Resilience Initiative |
| **ESIA** | Environmental and Social Impact Assessment |
| **ESMP** | Environmental and Social Management Plan |
| **EU** | European Union |
| **GHG** | Greenhouse Gas |
| **GBVH** | Gender-based Violence and Harassment |
| **GRM** | Grievance Redress Mechanism |
| **GRP** | Glass Reinforced Plastic |
| **HDPE** | High Density Polyethylene |
| **H&S** | Health and Safety |
| **HSMP** | Health and Safety Management Plan |
| **ILO** | International Labour Organization |
| **IPS** | Intake Pumping Station |
| **Km** | Kilometre |
| **MCM** | Million Cubic Meters |
| **MoEnv** | Ministry of Environment |
| **MWI** | Ministry of Water and Irrigation |
| **MF** | Microfiltration |
| **OD** | Outside Diameter |
| **OESMP** | Operation Environmental and Social Management Plan |
| **O&M** | Operation and Maintenance |
| **OPEX** | Operational Expenditure |
| **PAP** | Project Affected Person |
| **PPE** | Personal Protective Equipment |
| **PPMP** | Pollution Prevention Management Plan |

| | |
|---|---|
| **PREN** | Pitting Resistance Equivalent Number |
| **PS** | Pumping Station |
| **RGT** | Regulating Tank |
| **RO** | Reverse Osmosis |
| **ROV** | Remotely Operated Vehcile |
| **SEP** | Stakeholder Engagement Plan |
| **SWRO** | Sea Water Reverse Osmosis |
| **ToR** | Terms of Reference |
| **TTMP** | Traffic and Transport Management Plan |
| **UF** | Ultrafiltration |
| **USAID** | United States Agency for International Development |
| **WET** | Whole Effluent Toxicity |
| **WMP** | Waste Management Plan |

# 1. Rationale

## 1.1. Project Background

Jordan has limited surface and groundwater resources, which are significantly less than the international threshold of 500 cm per capita, which is considered "absolute scarcity"[1]. As a result, the only remaining option that can provide an entirely in-country and Jordan-controlled new water supply source is the desalination of Red Sea seawater.

The Ministry of Water and Irrigation (MWI), on 26th February 2020, announced the launch of the Aqaba-Amman Water Desalination and Conveyance National Project (AAWDC), describing it as "the largest water generation scheme to be implemented in the history of the Kingdom". This came during a consultation workshop organised by the USAID to launch the Project's first phase. In accordance with the relevant water strategy and projections, the Project will generate from the outset 300 MCM/y of product water and will be implemented through a build-operate-transfer (BOT) scheme.

The AAWDC Project aims at reducing the deficit in the country's crucial water resources by providing a safe and reliable freshwater supply for Amman and other governorates in Jordan and areas along the Project pipeline route by developing a water supply infrastructure entirely within Jordan's boundaries and control starting from the Southern Red Sea coast in Aqaba at the industrial zone and ending in the capital city of Amman.

In outline, the AAWDC Project concept involves the development of seawater abstraction, desalination and water conveyance infrastructure comprising the following technical components:

- Offshore seawater intake system and on-shore Intake Pump Station (IPS);
- Seawater Pipeline from IPS to the sea water reverse osmosis (SWRO) Desalination Plant;
- SWRO Desalination Plant;
- Brine pipeline from the SWRO Desalination Plant to the IPS and offshore brine outfall system; and
- Pump Stations, Regulating Tanks and Conveyance Pipelines from the SWRO Desalination Plant to Amman.

## 1.2. Purpose and Need for the Project

Jordan is classified as being a semi-arid to arid region with annual rainfall of less than 200 mm over 92% of the land. According to the "2016-2025 National Water Strategy of the Ministry of Water and Irrigation of Jordan", Jordan has one of the lowest levels of water availability per capita in the world (about 123 $m^3$/capita/year) that is anticipated to decline even more during the next few years (projections for 90$m^3$/capita/year by 2025).

Existing water resources in Jordan cannot sustain the increasing water demand. During the last few decades, the Jordanian Government has invested billions of dollars to utilise all available conventional and nonconventional water resources and technologies to bridge the gap between water supply and demand which is, evidently, widening with time.

The unfolding of the Syrian refugee crisis since 2011 has created real emergency conditions, especially in Northern Jordan. Water demand has jumped by additional 21% across Jordan and 40% in the Northern Governorates. Therefore, the provision of water and sanitation services has become lately a serious challenge and a significant axis of Jordan's water and wastewater management planning.

Despite Jordan's severe water scarcity, more than 97% of Jordanians have access to improved water sources in urban areas and 91% in rural areas; whereas sewerage and wastewater treatment services cover 58% of the population.

In this context, the AAWDC Project as launched by the MWI is aligned with the objectives and targets of the National Water Strategy 2016-2025 and will drastically contribute to the improvement of water scarcity facing the country through the provision of a reliable and sustainable non-conventional source of drinking water.

[1] MWI (2018). Jordan Water Sector – Facts and Figures 2017.

## 1.3. Overview of the AAWDC Project ESMP

This Project Environmental and Social Management Plan (ESMP) has been developed as a stand-alone document appended to the Project ESIA study at the request of the European Investment Bank and pursuant to the ToR related to '*Preliminary Risks Assessment and Environmental and Social Impact Assessment (ESIA) for the Aqaba-Amman Water Desalination and Conveyance (AAWDC) Project*'. Its purpose is to set a framework ensuring that the social and environmental safeguards are effectively considered by the Project Promoter and the BOT Developer during the detailed design, construction, and operation of the AAWDC Project.

Subsequently, this Project ESMP complements and forms an integral part of the ESIA as presented in the Project ESIA study and provides all appropriate mitigation/management measures to be implemented by the BOT Developer during the pre-construction, construction, and operation phases of the AAWDC Project as well as overarching principles, guidelines, and procedures related to the incorporation of said mitigation/management provisions into the BOT Developer's detailed design and required Construction and Operation ESMPs. It also describes the institutional setup and capacity building necessary for implementing this ESMP, including the role of the Project Promoter (MWI).

More specifically, this Project ESMP has integrated all proposed mitigation measures for the prevention and minimisation of the Project related adverse environmental and social impacts, as detailed in Chapter 8 of the Project ESIA study related to Impact Assessment and Mitigation, and further strived to supplement said mitigation measures with best practice environmental, social, health and safety (ESHS) aspects management in an effort to effectively cover any potential adverse impacts that cannot be fully assessed at the present state of AAWDC Project preliminary design and in fulfilment of national laws and regulations and EIB/USAID environmental and social (E&S) principles and standards. It has been structured to include the required monitoring plans/programs to be undertaken by the BOT Developer during the construction and operation phases of the AAWDC Project so that the predictions of the Project ESIA study are validated and that the effectiveness of mitigation measures is appropriately monitored.

This Project ESMP (as well as the Project ESIA study) will be appended to of the BOT Tender Documents since both said documents set out the Project E&S impacts and risks and proposed abatement thereof that the BOT Developer shall duly consider in his detailed design and associated Construction and Operation ESMPs.

The Project ESIA study and this ESMP will be submitted to the competent Jordanian Regulators, namely the Ministry of Environment (MoEnv) and Aqaba Special Economic Zone Authority (ASEZA) for their respective approvals.

The BOT Developer will bear the overall responsibility for any foreseeable adverse environmental and social impacts arising from the construction and operation activities and for putting in place any necessary measures to avoid, or if not possible, mitigate them as part of his detailed design and ESMP.

# 2. AAWDC Project Environmental and Social Management Plan

## 2.1. E&S Management Policy Statement at Project Promoter's Level

The following statement sets out the Project Promoter's (MWI) management commitment regarding the environmental and social management of aspects related to the Ministry's operations.

*Effective environmental and social management is a priority to the Jordanian MWI and its mission. We are committed to protect the environment and social welfare through strict compliance with environmental and social laws, regulations, and efficiency in the conduct of our operations.*

*As part of our ongoing efforts, we will:*

- *Comply with national environmental laws and regulations and international agreements.*
- *Seek and strive to minimize the environmental impact of our operations through regular evaluation, restoration, and efficient use of natural resources.*
- *Implement sustainable environmental practices, including the acquisition of bio-based, environmentally friendly, energy-efficient, water-efficient, and recycled-content products, whenever possible.*
- *Conduct audits to measure environmental performance and establish accountability to correct deficiencies.*
- *Continuously improve environmental performance through appropriate policies, procedures, training, and recognition of excellence.*
- *Prepare for emergencies in order to minimize environmental and social impacts.*
- *Emphasize on pollution prevention, environmentally preferred products, and sustainable business practices with our building managers, contractors, and suppliers.*
- *Incorporate and enforce appropriate performance clause(s) in contracts with concessionaires and contractors that specify environmental protection and compliance.*
- *Keep our workplace free of health and safety hazards and prevent injuries and illnesses.*
- *Continually evaluate our safety performance and make improvements where necessary to maintain a safe workplace. Through routine and effective training and diligent implementation of our safety program, including all policies and procedures of the MWI, we will maintain the safety of our employees and full compliance with all applicable health and safety laws and regulations.*
- *Implement and maintain this Environmental and Social Management Plan developed for the AAWDC Project as the primary management tool related to our operations and activities for the Project and strive to expand it in the overall spectrum of our operations and activities.*

*All managers and employees, including those involved in the implementation of the AAWDC Project, will strive to carry out these tasks.*

A corresponding policy statement shall be adopted in the Construction and Operation ESMPs to be developed and implemented by the BOT Developer, their Engineering, Procurement and Construction (EPC) Contractor and the Project Operator throughout the AAWDC Project contract duration.

## 2.2. Scope, Objectives and Targets of the Project ESMP

### 2.2.1. Scope

Pursuant to the preceding E&S Management Policy, it is considered that the MWI shall endeavour, in all of its operations, including the implementation of the AAWDC Project, to prevent personal injuries and ill health for its direct and indirect employees and the public, as well as damage to the environment, social welfare, existing utilities, and property.

To this effect, the detailed Construction and Operation ESMPs shall be informed by and form an integral part of the AAWDC Project detailed design and shall be designed and implemented by the BOT Developer as a means of integrated management of Project-related construction and operation activities and providing a planning approach to prevent associated adverse environmental and social impacts associated with Project implementation. Both Construction and Operation ESMPs are meant to be live documents that shall be reviewed on a regular basis and updated when necessary throughout the AAWDC Project contract duration.

Furthermore, this Project ESMP is, as shall be the BOT Developer's Construction and Operation ESMPs, developed in compliance with the national legal requirements and associated provisions and the EIB and USAID E&S standards as applicable.

It is noted that the BOT Developer is obliged by the Jordanian legislation to abide by all local laws and regulations addressing environmental protection, pollution prevention, health and safety matters at his construction sites both during construction and after the commencement of Project operation activities. In all construction cases, the legal responsibility and liability shall lie with the site construction manager and the legal representative of the BOT Developer. Similarly, during Project operation, the legal responsibility and liability shall lie with the site operation manager and the legal representative of the BOT Developer (Operator).

Given the above, this Project ESMP aims to provide a systematic approach to environmental management and a framework to protect the physical and social environment and respond to changing environmental conditions in balance with socio-economic needs by unifying and highlighting Project related construction and operation related key ESHS management aspects for seawater abstraction, desalination, and product water conveyance, which the BOT Developer shall incorporate into his Construction and Operation ESMPs and to which MWI shall be especially alert in its continuing effort to ensure optimal ESHS management performance and promote environmental sustainability. During the detailed design of the AAWDC Project, this Project ESMP will be updated as needed, and will include the roles and responsibilities elaborated within the structure established by the BOT Developer.

### 2.2.2. Objectives and Targets

The following ESHS objectives and targets are developed for the AAWDC Project for adoption by the BOT Developer (Table 2-1 below refers).

***Table 2-1: ESHS Objectives and Targets for the AAWDC Project***

| R.n. | Objective | Target | Target Date |
|---|---|---|---|
| 1. | Prevent or minimise to insignificant levels any pollution to seawater, surface water, groundwater, air, and soil receptors | Provisions of appropriate pollution prevention measures to all Project related sites during construction and operation and detailed in the Construction and Operation ESMPs | End of each calendar year throughout the Project's contract duration |
| 2. | Prevent or minimise to insignificant levels any impacts/disruptions to existing utilities, and community livelihood and mobility | Appropriate socioeconomic impacts mitigation measures to all Project related sites during construction and operation and detailed in the Construction and Operation ESMPs | End of each calendar year throughout the Project's contract duration |
| 3. | Avoid environmental non-conformances | Appropriate environmental monitoring and reporting to all Project related sites during construction and operation and detailed in the Construction and Operation ESMPs | End of each calendar year throughout the Project's contract duration |
| 4. | Develop and implement hazardous materials and waste management procedures | Appropriate hazardous materials and waste management procedures in place to all Project related sites during construction and operation and detailed in the Construction and Operation ESMPs | End of each calendar year throughout the Project's contract duration |
| 5. | Develop and implement emergency response procedures | Appropriate emergency response procedures in place to all Project related sites during construction and operation and detailed in the Construction and Operation ESMPs | According to milestones set out the approved Construction and Operation ESMPs |

| R.n. | Objective | Target | Target Date |
|---|---|---|---|
| 6. | Develop and implement social engagement procedures | Appropriate social engagement procedures and related grievance mechanism in place to all Project related sites during construction and operation and detailed in the Construction and Operation ESMPs | End of each calendar year throughout the Project's contract duration |
| 7. | Provide ESHS training | Project BOT Developer provides ESHS training based on his approved Construction and Operation ESMPs | According to milestones set out the approved Construction and Operation ESMPs |
| 8. | Conduct Risk Assessments | Risk Assessments (RAs) are done for each Project related construction site during construction and to each Project site during operation | RA conduct and review according to the Project contract implementation schedule and approved Construction and Operation ESMPs comprising Health and Safety (H&S) Management Plans |
| 8. | Avoid fatality | Zero fatalities to all Project related sites throughout the Project's contract duration (construction and operation) | End of each calendar year throughout the Project's contract duration |
| 9. | Prevent falls from heights | Use inspected, fit for purpose scaffolds Encourage the use of safety harnesses throughout the Project lifespan | End of each calendar year throughout the Project's contract duration |
| 10. | Minimise lost time injuries | Lost time injuries: Maximum of 1 lost time injury per Project related site at the end of each calendar year during construction and operation | End of each calendar year throughout the Project's contract duration |
| 11. | Minimise minor injuries | Maximum of 3 minor injuries per Project related site at the end of each calendar year during construction and operation throughout the Project lifespan | End of each calendar year throughout the Project's contract duration |
| 12. | Minimise near misses | Maximum of 4 near misses per Project related site at the end of each calendar year during construction and operation throughout the Project lifespan | End of each calendar year throughout the Project's contract duration |

## 2.3. Institutional Arrangements

### 2.3.1. General Considerations

Abiding by environmental and social safeguards and implementation of mitigation measures and management provisions for the AAWDC Project is the responsibility of the assigned BOT Developer throughout the Project's contract duration. The Project Promoter has the overall responsibility of ensuring the Project is being implemented in line with this Project ESMP and the subsequent Construction and Operation ESMPs that will be developed. The Project Promoter is also responsible for the implementation of certain aspects including the Land Acquisition and Resettlement Planning Framework (LARPF), as well as some elements of the Stakeholder Engagement Plan (SEP) and Grievance Redress Mechanism (GRM) that are appended to the ESIA Report.

Both parties shall acknowledge and ensure that the Project related activities during construction and subsequent operation comply with the Project agreements and covenants and the Project ESMP that incorporates the ESIA commitments, regulatory provisions, and legal obligations emanating from national laws as well as IFI's E&S policies and standards.

To this effect, the likely organisational structure for implementation of the AAWDC Project ESMP and associated E&S mitigation/management and monitoring provisions is illustrated below showing the relationship between the BOT Developer (Project Company), the EPC contractor and the contractors for the SWRO and conveyance system.

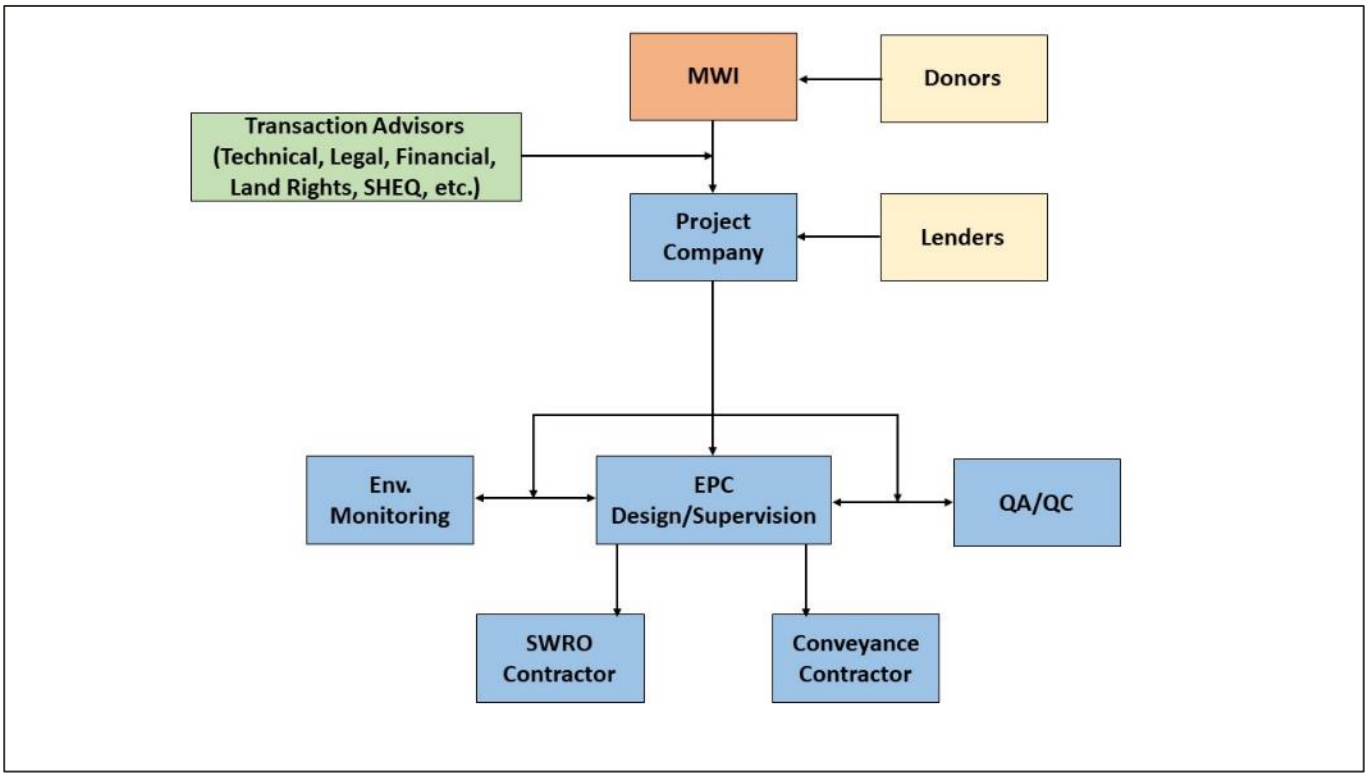


***Figure 2-1: Organisational Structure for the AAWDC Project ESMP***

### 2.3.2. Project Promoter

MWI under the Government of Jordan is the Promoter for the AAWDC Project. As such, MWI is responsible for the overall governance and contract administration and management of the AAWDC Project implementation and the management of the BOT Developer (Contractor & Operator)through the contractual provisions and requirements, including those related to ESHS matters.

MWI will be responsible for enforcement of all contract provisions, including those related to ESHS conditions and requirements, the implementation of the LARPF and relevant aspects of the SEP and GRM. MWI will also be responsible for necessary inter-ministerial coordination with the regulators (i.e., MoEnv and ASEZA), as well as with other competent national authorities concerned with the implementation of the AAWDC Project as the case may be.

For ensuring effective integration and implementation of the Project ESMP and associated monitoring programs during the construction and operation phases, MWI shall designate an ESHS Officer, who, on behalf of MWI, will follow up on ESHS matters through the lifespan of the Project and ensure that the Project ESMP is being implemented through the developed Construction and Operation ESMPs by conducting regular audits and through regular communication with the BOT Developer to this effect, on Project related ESHS aspects. MWI shall regularly report the findings of these audits to the IFIs.

### 2.3.3. BOT Developer

The BOT Developer will be assigned by the Project Promoter and will be responsible for ensuring that all contract provisions are being achieved through their EPC Contractor. Construction of the project will be financed through the BOT Developer, with co-financing from the Government of Jordan and potential loan financing from International Financing Institutions (IFIs). For the purpose of the AAWDC Project, the BOT Developer will establish a Project Company for the Project.

The Project BOT Developer shall ensure that the Project ESMP is effectively integrated into the Construction and Operation ESMPs to be developed by the EPC Contractor and subsequently strictly implemented to safeguard the environment and social welfare and abide by national legislations and international commitments.

Through his EPC Contractor, the BOT Developer shall be responsible for incorporating this Project ESMP into the Construction ESMP (CESMP) that reflects the detailed design and methodology that will be used to deliver the Project associated works. The Construction ESMP will include all site specific and sub-plans as required. The EPC Contractor shall engage a full-time ESHS Manager, who will be responsible for reviewing, approving and reporting implementation of the CESMP developed by the various Project contractors.

The ESHS management responsibilities of the BOT Developer through his EPC Contractor shall, in minimum, include:

- Recruiting a suitably qualified and full-time ESHS Manager.
- Coordinating with the Project Promoter and/or the CSC, if appointed, for updating the CESMP as/when required.
- Implementing the approved CESMP including addressing and resolving corrective action requests issued by the Project Promoter and/or the CSC, if appointed.
- Monitoring the implementation of the required monitoring plans comprised in the Construction ESMP and subsequent reporting to the Project Promoter and/or the CSC, if appointed, and the regulatory authorities as/when needed.
- Coordinating with the Project Promoter and/or the CSC, if appointed, regarding continued community consultation, implementation of the GRM, and Project information disclosure.
- Applying for permits/licenses as required for new materials sources and preparing and submitting respective extraction and management plans.
- Ensuring that all imported material and equipment is subject to quarantine clearance and receives appropriate phyto-sanitary certificates.
- Participating in joint inspections with the Project Promoter and/or the CSC, if appointed, as required.
- Maintaining a site diary and GRM register (including actions taken to resolve the issue and close-out dates).
- Providing status of CESMP (including issue and response to corrective action requests), consultation activities and GRM implementation in the monthly progress reports.

For ensuring effective integration and implementation of the Project ESMP and associated monitoring programs during the construction and operation phases, the BOT Developer (through his EPC Contractor) shall designate an ESHS Manager, who will follow up on ESHS matters through the lifespan of the Project and ensure that the Project ESMP is being implemented through the developed undertake the review and approval of the Construction and Operation ESMPs to be developed by the BOT Developer, supervise and inspect their implementation and communicate with the Contractors and Operator to this effect, and report on Project related ESHS aspects. The ESHS Manager shall demonstrate the following proposed qualifications:

- BSc in engineering degree, preferably with postgraduate degree in environmental science or engineering, proven track record in construction related environmental and health and safety aspects for public infrastructure projects, ability to manage multiple sites will be an advantage, excellent communication skills, excellent understanding of the Jordanian legislation and IFI policies and standards for environmental protection and health and safety requirements, very good command in English and Arabic.
- Minimum of 10 years total working experience in environmental, social health and safety assessment and/or management, preferred in construction and operation of water supply projects, at least 5 years of senior level specific experience in monitoring, control and reporting of construction and operation related environmental and health and safety aspects; experience in design, review and supervision/inspection of ESHS Management Plans.

The EPC Contractor will likely hire a Construction Supervision Consultant (CSC) whose mandate would be to ensure that high quality construction is achieved and that all works are carried out in full compliance with the detailed engineering design, the technical specifications, and all other relevant provisions of the Project contract documents. The CSC will be responsible for the day-to-day supervision of works and the approval of the materials and workmanship related to the works according to the provisions of the Project contract documents. Further, the CSC will have the mandate to check the on-site conditions and verify that the construction works, plant and materials, as well as the health and safety and environmental protection controls conform to the provisions of the Project contract documents and applicable laws and regulations in accordance with the Construction ESMP.

After the commissioning of the Project, the BOT Developer will assign an Operator for the AAWDC Project who will be responsible to develop and implement the Project's Operation Environmental and Social Management Plan (OESMP). The BOT Developer will be responsible to ensure proper operation and maintenance of the Project related facilities comprising the monitoring of operational condition and performance of Project facilities, as well as the monitoring of the implementation of the OESMP based on regular site audits.

### 2.3.4. IFIs

Should financing for the AAWDC Project be provided by IFIs (EIB, USAID, etc.), this means that said institutions will seek to ensure the economic viability, efficiency, and sustainability of the investments financed under the Project. To fulfil this, the IFIs may undertake various intermediate steps in the Project implementation cycle comprising coordination of implementation, granting No-Objection at various Project execution milestones (e.g., procurement), and ex-ante and ex-post control evaluations. The IFIs, under their respective mandates, may also monitor the implementation of the CESMP and OESMP by the BOT Developer through site inspections and subsequent reporting to their Boards.

### 2.3.5. Regulators (MoEnv, ASEZA)

The role of the regulators, MoEnv and ASEZA, into the implementation of the AAWDC Project will be to review and approve the Project ESIA study and appended Project ESMP, to review and approve the various Project related license/permit applications (e.g., for dredging activities and spoils management and disposal, materials borrow pits sitting, etc.) and to monitor/inspect the Project construction and operation activities for compliance against environment license/permit conditions.

## 2.4. Training and Awareness of the Project Promoter

Managed by MWI, a capacity building program tailored to the needs of the its personnel in support of its role as Project Promoter. This capacity building program will be built on existing gaps in capabilities and will target to improve the technical qualifications of the MWI personnel involved in planning, environmental permitting, environmental and social aspects management, implementation, operation and maintenance procedures for water supply and desalination projects and, thus, enhance the scale, quality, effectiveness, and responsiveness of the respective procedures.

The key target groups of the capacity building support will be all key MWI departments comprising the Planning, Procurement, O&M, ESHS and PR sectors, which will be involved in the implementation of the AAWDC Project. It is considered that provided training will result in establishing a pool of trainers within MWI on these aspects.

The envisaged training methodologies and the number of staff to be trained will be decided by MWI. However, the applied approach to the capacity building will be mainstreamed on two key premises, as follows:

- **Focus on transfer of knowledge and not (only) information:** The intention of capacity building support is to make relevant knowledge accessible to the professionals responsible for making the decisions in an organized manner and to increase their competence to apply this knowledge. It is noted that knowledge is not the same as information. Information can be stored in manuals and/or to the Project dedicated website if one is established. When information is used effectively, it becomes knowledge. Hence, the process of associating information from one training module with information from another training module in such a manner that the association gives the full dimensions of a complicated situation is (building) knowledge. Knowledge in this way is the basis for decision making.
- **Good decisions are based on knowledge and the competence to take the best action in a given situation:** Professionals can be trained on how to source knowledge within and outside their working area. Knowledge is then the basis for taking this best action. Professionals acknowledge that there is a best action for a given setting irrespective of the contextual environment.

It is also considered that the tailored capacity building program for the AAWDC Project shall combine layers of information for the given seawater abstraction – desalination – water conveyance project situation with information on available technologies and approaches. The MWI trainees shall perceive provided training as a source of aid to select the most suitable technology or approach. The training program will aid them in comparing and contrasting different solutions, including planning for construction, construction, operation and maintenance and management by also incorporating the geographical dimension, time scale, environmental and social, and health and safety impacts whenever applicable.

Subsequently, the envisaged work approach for the development of the tailored capacity building program for the AAWDC Project will be as follows:

a. Determination of the training objectives, which constitutes the most important element of the design of the training program since these objectives provide a clear guidance on how the training should be developed according to the identified needs.

b. Determination of the conditions under which the training will take place.

c. Selection of appropriate benchmarks against which the training performance will be measured.

d. Preparation of targeted training material in the light of the “Training of Trainers” approach.

Whereas in consideration of the AAWDC Project implementation needs, the curriculum of the tailored capacity building program will comprise the following key thematic areas:

1. Key operational practices within MWI
    - Investment strategy and planning
    - Operation and Maintenance
    - Service delivery
2. Key operational processes within MWI
    - Project management
    - Procurement and construction planning
    - Contract administration (monitoring of natural and financial progress of investments)
    - Improved operation of water supply infrastructure (marine works intake & outfall systems, SWRO desalination, water supply networks & associated infrastructure)
    - Communication and stakeholders’ management
    - Environmental and social safeguards management and monitoring related to the AAWDC Project
3.

The execution of the tailored capacity building program in terms of timing, locations, participants, etc. is to be considered and defined by the MWI. To this effect, the work will comprise the organization of all necessary administration issues, such as renting of conference rooms and audio-visual equipment, provision of interpretation facilities, reproduction of training material for trainees, provision of catering facilities, etc. All these elements will be arranged and communicated prior to the anticipated start-up of any training session.

While the capacity building program will be a combination of introductory workshops, theory sessions, on-the-job training with hands-on instructions, and closing workshops on the training impact and results. A system for tracking

the progress and performance of trainees will be also developed as part of the capacity building program. More specifically, to assess the quality, impact, and effectiveness of the training after implementation, interim surveys of the trainees will take place at the end of each part of the training. These surveys can be undertaken by means of evaluation questionnaires addressed to the trainees, which will be linked to pre-selected benchmarks assisting the quantitative assessment of performance. The selected performance indicators can be then graphically represented, while the qualitative assessment can be based on the analysis of observations on behalf of the trainers relating to the execution of the training program and reasoning provided by the trainees.

The following training approaches may be effected:

*Training-of-Trainers (ToT)*

A key training approach for the AAWDC Project may be to select a number of middle management staff at MWI, who will then receive highly targeted training on areas in their respective field of competence and responsibility. The selected staff will, in return, be expected to carry out training sessions to their colleagues, thereby facilitating the transfer of know-how throughout the MWI organization. An obvious advantage of the 'training-of-trainers' is that the know-how acquired from the training is swiftly transferred to other colleagues, thereby reducing the risk of institutional memory loss in case the trained staff decides to leave his/her position or the company altogether. Further, in a sense the 'training-of-trainers' approach is based on the well-known saying, "give a man a fish and you feed him for a day; teach a man to fish and you feed him for a lifetime", as the actual outcome of the training provided will become clear when the trained staff will be asked to take charge of their own training sessions.

To ensure that the trained staff will be in a position to efficiently transfer their acquired knowledge it is not sufficient to only provide specific training on technical issues, but the entity assigned with the provision/execution of the training will need to also provide them some insight on how to efficiently carry out a training session and also provide them with some suitable training tools/material. Under the AAWDC Project, in close coordination with the MWI and in consultation with the trainees, it will be ensured that the needed training tools/material are prepared so that the various technical components of the Projects are effectively covered.

*On-The-Job Training*

This represents continuous Project-Driven Know-How Transfer. The second key approach to training and capacity building for the MWI staff shall be built into the individual Project implementation activities. This offers considerable benefits and opportunities to spread best-practice and know-how. Success very much depends on the manner in which interaction with MWI is handled at the level of Project implementation activities.

## 2.5. Regulatory ESHS Requirements and IFIs E&S Principles and Standards

ESHS legislation and other relevant regulatory requirements in Jordan comprising also the IFI's E&S principles and standards are detailed in the Project ESIA study (refer to Chapter 3 'Legal and Administrative Framework'). Applicable legislation and standards include national, EIB and USAID requirements.

To ensure legal compliance throughout the Project contract duration, the BOT Developer shall undertake the following activities:

- Review these laws, regulations, and standards every [*Twelve (12) months*] along the Project contract duration to make sure that there are no changes (i.e., legal amendments, modifications, updates), which may affect this Project ESMP;
- Communicate the legal review results to the Project Promoter for advice; and
- Revise accordingly its Construction and Operation ESMPs.

## 2.6. Project ESMP Communication Requirements

### 2.6.1. Internal Communication

Internal communication related to the AAWDC Project shall include as a minimum:

- Monthly ESHS meetings between the BOT Developer and the Project Promoter. These meetings can be dedicated to ESHS issues or ESHS issues can be one part of the agenda. Additional ESHS meetings will be organised when needed.
- Monthly ESHS aspects inspections undertaken by the Project Promoter. The results of said inspections shall be communicated to the BOT Developer for necessary actions
- ESHS Semester Report. The ESHS Semester Report shall be part of the Semester Progress Report prepared by the BOT Developer through his EPC Contractor and communicated to the Project Promoter. The Semester Report shall be a collation of monthly inspections findings and associated corrective actions taken by during Construction. This report shall be also prepared by the Operator of the AAWDC Project during operation.
- Toolbox talks on ESHS aspects undertaken .

### 2.6.2. External Communication

**Consultations with / Grievances by the Public**

Queries and/or grievances on ESHS management from local communities, business community, local representatives, the press, and any other external parties shall be handled according to the Community Grievance Procedure included in the Project's Stakeholder Engagement Plan.

**Consultations with / Grievances by the Workforce**

As for worker grievances, they can be made and shall be addressed through the BOT Developer's Employee Grievance Procedure found in the Project's Stakeholder Engagement Plan.

## 2.7. Project ESMP Documentation, Monitoring and Auditing

### 2.7.1. Project E&S Records

Maintaining up-to-date documentation and records is critical for complying with specific regulatory requirements where required, but also for ensuring that the health and safety plan can be adequately understood, efficiently operated, effectively evaluated, and systematically improved.

Project related ESHS records, being part of the Project ESMP shall be maintained by the BOT Developer's ESHS Manager to facilitate internal and external auditing and review by key Project stakeholders. These ESHS records shall consist of:

1. This Project ESMP and any review records.
2. Minutes of Meetings related to ESHS meetings held between the BOT Developer and the Project Promoter.
3. Monthly/Semester ESHS site inspection reports.
4. Incidents and near miss investigation reports.
5. Incidents and near misses review and lessons learnt reports.
6. Emergency drill records undertaken.
7. Record of induction, training and toolbox talks.
8. Copies of any ESHS Project related correspondence including any nonconformities notification.
9. Internal and external ESHS audits records.
10. Consolidated annual ESHS report for all Project sites.

### 2.7.2. Accident and Incident Reporting and Investigation

All significant ESHS accidents or incidents and high potential near misses shall be recorded by the BOT Developer (through his EPC Contractor) and reported to the Project Promoter. ESHS accidents or incidents and high potential near misses shall be thoroughly investigated by the BOT Developer and action taken to prevent recurrence.

The Project Promoter shall be informed of any damage caused to people, or the property of individuals, other than the Contractor's personnel, within 8 hours of the event, regardless of the value of the damage.

The CESMP and OESMP shall comprise procedures to manage, rectify, and record any incidents related to community disturbances and utilities damages (refer to Section 2.10.3.1).

### 2.7.3. Internal and External Audits

The AAWDC Project related ESHS performance at site level shall be regularly monitored through the following means:

- Weekly site inspections undertaken by BOT Developer (through his EPC Contractor).
- Ad hoc site inspections by the Project Promoter.
- Internal reviews of the Project ESMP.
- External audit visits by local competent authorities or IFIs.

### 2.7.4. Nonconformity, Corrective and Preventive Actions

Non-conformities are defined as deviations from the requirements of the applicable regulations, the contract ESHS provisions, and the Construction/Operation ESMPs.

Non-conformities detected during ESHS inspections or during internal and external audits shall be addressed by the BOT Developer through appropriate measures adapted to the severity of the situation. To this effect, the BOT Developer shall ensure appropriate escalation procedures to his contract with the EPC Contractor.

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## 2.8. Project ESMP Review

Reviews shall take place on [*Annual basis*] along the AAWDC Project duration, or after any significant changes that might affect the ESHS performance, to ensure the ESMP's continued suitability and effectiveness in satisfying the Project's ESHS objectives and targets. The review shall consider the results of internal and external audits, lead and lag indicators, resources, changing circumstances along Project implementation and opportunities for continuous improvement.

Lead indicators, which shall be used to report against, are those that focus on positive efforts towards preventing injury and illness. Lead indicators under this ESMP shall include:

- Percentage of completed ESHS inductions and training executed.
- Number of inspections / audits performed in a given time frame.
- Number of "near miss" environmental incidents and hazards reported and addressed .
- Percentage of completed corrective actions.

Whereas lag indicators, which shall be used to report against, are those providing direct measures of harm. Lag indicators under this ESMP shall include:

- Environmental (and health and safety) incident reports.
- Community compensation claims as a result of an environmental incident reported and addressed.
- Lost time injuries reported and addressed.
- Worker compensation claims reported and addressed.

The review procedure shall involve the following steps:

1. At the end of each calendar year along the Project duration, the BOT Developer shall undertake an internal review of the Project ESMP to verify that its provisions are incorporated into the Construction/Operation ESMPs and are properly implemented and maintained.
2. When changes are made to legislation, standards, codes of practice, agreements, and guidelines, these shall be appended to the Project ESMP.

3. The review shall include all ESHS Management provisions and procedures to ensure they remain relevant and current and that are appropriate to Project's ESHS risks and the legislative requirements.
4. Corrective actions identified from all audits (internal and external) shall be included in the review.
5. All changes made to provisions and procedures as a result of the review shall be documented in a Review and Revision record.

## 2.9. Environmental and Social Management Plan – Structure and Requirements

### 2.9.1. General Considerations for the Structure of Construction/Operation ESMPs

The ESMPs to be developed by the BOT Developer during the construction and operation phases of the AAWDC Project shall integrate the environmental and social mitigation/management provisions as detailed in Sections 2.8.2 to 2.8.4 below, the provisions for Project monitoring plans as detailed in Sections 2.10.1 to 2.10.6 below, as well as the relevant provisions of the Stakeholder Engagement Plan appended to the ESIA Study. As for the Project LARPF, those are to be adopted by the AAWDC Project Promoter with input from the BOT Developer on land requirements for the Project.

The CESMP and OESMP for the Project shall be guided through the ISO 14001:2015 standard, developed under the Plan-Do-Check-Act approach and be structured as shown in Table 2-2.

***Table 2-2: Structure and Content of BOT Developer's CESMP and OESMP***

| No. | Thematic Area / Chapter | Content |
|---|---|---|
| **1.** | **Environmental policy** | ➢ Declaration of ESHS policy signed by the Managing director of the BOT Developer and defining the commitment of the Contractor/Operator in terms of (i) ESHS management for its construction/operation sites and (ii) compliance with the Project ESIA study, Project ESMP, and applicable national regulations and IFI's E&S standards. |
| **2.** | **CESMP/OESMP** | ➢ Target and content of the CESMP/OESMP (including H&S)<br>➢ Preparation and updating schedule<br>➢ Quality assurance and validation |
| **3.** | **ESHS resources** | ➢ Human resources:<br>– ESHS manager<br>– ESHS supervisors/officers<br>– Person in charge of relations with stakeholders<br>– Medical personnel<br>➢ Logistics & communications:<br>– ESHS vehicles<br>– IT stations<br>– In situ noise, air, and water measuring equipment<br>– Analysis laboratory used<br>➢ Reporting:<br>– Weekly inspections<br>– Monthly inspections<br>– Accident/Incident inspections (environment and H&S) |
| **4.** | **ESHS regulations** | ➢ Definition of standards for the applicable national ESHS regulations and the ESHS recommendations of EIB, USAID, International Labour Organization (ILO) and other IFIs, applicable to the execution of the Project works and the subsequent operation of the Project facilities:<br>– Environment<br>– Noise and Vibration<br>– Soil Erosion<br>– Air Quality<br>– Solid Waste<br>– Hazardous Materials |

| No. | Thematic Area / Chapter | Content |
|---|---|---|
| | | – Wastewater Discharges<br>– Contaminated Land<br>– Occupational Health and Safety<br>– Community Health and Safety<br>– General Site Hazards<br>– Disease Prevention<br>– Traffic Safety<br>– Discharge standards<br>– Minimum wage<br>– Day and/or night traffic restrictions<br>– Other<br>➢ Definition of ESHS standards for the industry applied (i.e., water supply, RO desalination) |
| **5.** | **ESHS operational inspection resources** | ➢ Site tracking procedure:<br>– Frequency<br>– Personnel<br>– Assessment criteria<br>➢ Nonconformity handling and detection procedure:<br>– Distribution of information<br>– Notification depending on the level of importance allocated to nonconformities<br>– Tracking of the closing of the nonconformity<br>➢ Management of data on tracking and nonconformities:<br>– Archiving<br>– Use as a performance indicator |
| **6.** | **Project Areas** | ➢ Description of Project Areas, where the term “Project Area” during construction means: (i) the land where Project works will be carried out; or (ii) the land necessary for the implantation of construction facilities (work camp, workshops, offices, storage areas, concrete production plants) and including special access roads; or (iii) quarries for aggregates, rock material and riprap; or (iv) borrow areas for sand and other selected material; or (v) stockpiling areas for dredging spoils, backfill material or other demolition rubble; or (vi) any other location, specifically designated in the Contract as a Project Area, and (vii) The term “Project Area” encompasses any individual Project Area or all Project Areas, while the term “Project Area” during operation means all the sites where the Project water abstraction, treatment, and conveyance facilities are sited:<br>– Number<br>– Location on a topographical map<br>– Activities<br>– Opening & closing schedule<br>– Access<br>➢ Reference to the Appendix: an ESMP for each Project Area |
| **7.** | **Health and safety plan** | ➢ Identification and characterisation of health and safety risks during either of Project construction/operation phases, including the exposure of personnel to chemicals, biological hazards, and radiation.<br>➢ Description of working methods to minimise hazards and control risks.<br>➢ List of the types of work for which a work permit is required<br>➢ Personal protection equipment<br>➢ Presentation of the medical facilities at Project Areas:<br>– Healthcare centre, medical equipment and allocation of medical staff<br>– Medical treatments that can be carried out onsite<br>– Ambulance, communications<br>– Referring hospital<br>➢ Evacuation procedure for medical emergencies<br>➢ Description of the internal organisation and action to be taken in the event of an accident or incident |

| No. | Thematic Area / Chapter | Content |
|---|---|---|
| 8. | **Training plan** | During both construction and operation phases:<br>➢ Basic training for nonqualified staff<br>➢ Health and Safety inductions<br>➢ Health & safety training |
| 9. | **Labour Conditions** | ➢ Description of Human Resource Policy for construction works/operation activities of direct and indirect workers |
| 10. | **Local Recruitment** | ➢ Local labour requirements (during both Project construction and operation phases):<br>– Job descriptions and the levels of qualifications required<br>– Recruitment procedure and deployment schedule<br>– Initial training to be provided by the Contractor/Operator for each job description<br>➢ Location and management of the local recruitment office(s) |
| 11. | **Project machinery and vehicle traffic** | ➢ Description of the fleet of vehicles/machinery used for the execution of the Project works and emission levels and safety requirements<br>➢ Deployment (Project Area & schedule) and maintenance sites for each vehicle and machine<br>➢ Mapping of itineraries, travel times, and areas with speed limits<br>➢ Dust suppression:<br>– Mapping or road sections where dust reduction initiatives apply<br>– Water points identified or to be created for refuelling tanker trucks<br>– Capacity of the tanker trucks used and calculation of the number of trucks required<br>– Width of the track to determine if one watering run or equivalent is adequate (narrow track) or if two runs are required (wide track)<br>– Number of watering or equivalent operations proposed per day depending on weather<br>➢ Similar arrangements as relevant and appropriate for the Project operation phase. |
| 12. | **Dangerous substances** | ➢ Inventory of dangerous substances per Project Area and per period (during both Project construction and operation phases)<br>➢ Transport and storage conditions and chemical incompatibility during both Project construction and operation phases |
| 13. | **Effluents** | ➢ Characterisation of effluents discharged to the receiving environment (during either of Project construction/operation phases)<br>➢ Facilities for the treatment or pre-treatment of effluents including sufficient run-off (during either of Project construction/operation phases)<br>➢ Measures for reducing the sediment content of rainwater runoff (during either of Project construction/operation phases)<br>➢ Measures for monitoring the efficiency and performance of facilities for reducing sediment content of rainwater runoff (during either of Project construction/operation phases)<br>➢ Resources and methods for monitoring effluent and rainwater runoff quality (during either of Project construction/operation phases) |
| 14. | **Noise and vibrations** | ➢ Estimation of the frequencies, duration, days of the week and noise levels per Project Area (during either of Project construction/operation phases) |
| 15. | **Waste** | ➢ Inventory of waste per Project Area and per period (during either of Project construction/operation phases)<br>➢ Collection, intermediate storage, handling, and treatment methods for ordinary or inert waste (during either of Project construction/operation phases)<br>➢ Storage and handling methods for dangerous waste (during either of Project construction/operation phases) |
| 16. | **Clearing and revegetation** | ➢ Methods & schedule for clearing vegetation and earthwork activities<br>➢ Methods, species and schedule for the revegetation of Project Areas disturbed by the works |
| 17. | **Biodiversity** | ➢ Schedule for adequate fauna and flora management (during both Project construction and operation phases)<br>➢ Measures for minimizing impact on fauna and flora species based on the Project ESIA study (during both Project construction and operation phases)<br>➢ Measures for monitoring the efficiency and performance of the plan in place<br>➢ Measures for limiting invasive alien species<br>➢ Measures for monitoring the efficiency and performance of the plan in place |
| 18. | **Prevention of erosion** | ➢ Location of zones suffering from erosion |

| No. | Thematic Area / Chapter | Content |
|---|---|---|
| | | ➢ Methods and schedule for the implementation of anti-erosive actions, including topsoil storage |
| **19.** | **Documentation of site condition** | ➢ List and cover of viewpoints<br>➢ Imaging method<br>➢ Archiving photographs |
| **20.** | **Rehabilitation** | ➢ Method and schedule for Project Area rehabilitation |
| **21.** | **Appendices** | ➢ Project Area-ESMP in number and location specified in Section 6 “Project Areas” above (during both Project construction and operation phases):<br>– Marking out of the Project Area perimeter on a map<br>– Definition of zones for vegetation clearing, zones for the storage of usable timber, zones for burning of green waste, etc.<br>– Definition of on-site activities: construction, storage areas, accommodation areas, offices, workshops, concrete making units<br>– Layout of activity areas on the Project Area: construction works, production/operation areas, rehabilitation and closure<br>– Zones for the storage of topsoil, spoil from earthworks, materials<br>– Access routes and checkpoints<br>– Project Area occupancy schedule<br>– Organisation of Project Area preparation<br>– Liquid discharge outlet points<br>– Proposed sampling points for monitoring water quality<br>– Atmospheric emission outlet points<br>– Location of the storage site for dangerous products<br>– Location and mapping of waste treatment facilities when handled by an external service provider<br>– Any other information relating to the environmental management of the Project Area<br>➢ Emergency Response Plan (during both Project construction and operation phases):<br>– Description of facilities<br>– Characterisation of hazards<br>– Emergency situations<br>– Organisation structure - roles and responsibilities<br>– Emergency procedures<br>– Human and material resources<br>– Triggering of the plan<br>– Reporting<br>➢ Pollution Prevention and Management Plan<br>➢ Traffic Management Plan<br>➢ Waste Management Plan<br>➢ Labour Management Plan<br>➢ Code of Conduct<br>➢ Environmental Monitoring Plans |

### 2.9.2. Environmental and Social Mitigation/Management Provisions during Detailed Design

The following sections present the overarching E&S mitigation/management requirements that the BOT Developer shall necessarily consider and integrate into his detailed design during the Project pre-construction phase, i.e., during procurement. The responsibility to this effect lies under the BOT Developer at no separate cost (i.e., included in detailed design costs as part of the tender preparation). It is noted that the following mitigation in design has taken into account environmental, construction, and operational constraints related to the AAWDC Project intake and outfall systems as detailed in the ‘*Pre-feasibility of Seawater Intake and Brine Discharge Components and Comparative Analysis of Intake Options Report*’ appended to the Project ESIA study and outlined in Section 2.8.2.1 below.

#### 2.9.2.1. ESIA Identified Constraints Related to the Intake and Outfall Systems

## 1. Gas Pipeline

A gas pipeline is located on the seabed to the immediate north of the IPS. This gas pipeline runs between Egypt and Jordan. The crossing of the gas pipeline even by tunnelling would normally be considered a major project technical risk. This gas pipeline shall not be disturbed during the construction and operation of the intake and outfall systems.

The gas pipeline path is shown in Figure 2-2 and a photograph of the pipe in Figure 2-3.


*Figure 2-2: Gas Pipeline Path*

*Figure 2-3: Gas Pipeline Observed by ESIA Team Divers*

A safety exclusion zone shall be set in the detailed design for the protection of the submerged gas pipeline located at the north of the IPS location and pursuant to the guidelines/provisions of the competent national authorities.

## 2. Seismic Activity

The area is seismically active, the last major earthquake was the Nuweiba earthquake on 22 November 1995 that had a magnitude of 7.2 Mw.

From a risk-based perspective, the AADWC Project shall be designed anticipating major earthquakes.

The intake abstraction and intake/outfall pipes material selection and construction shall consider the seismic vulnerability. HDPE has been proven to be robust during previous earthquakes for use with water utility pipelines (Figure 2-4 below refers). It is considered that marine GRP pipes and concrete pipes are more vulnerable to earthquake damage than HDPE pipes. If there is a break in a marine intake or outfall pipe due to an earthquake, it will be necessary to repair this as quickly as possible considering maintaining the plant availability with regards to intakes and minimising environmental degradation with regards to outfalls. When the pipes are buried, then the repair of pipes will be more difficult to achieve. It is considered that only low vulnerability pipes shall be selected for the submerged works of the AAWDC Project. The following figure shows a table adopted by US EPA for the vulnerability comparison of the different pipe materials to earthquakes.

| Pipe Material Type and Diameter | AWWA Standard | Joint Type* |
|---|---|---|
| **Low Vulnerability** | | |
| Ductile Iron | C1xx Series | B&S, RG, R |
| Polyethylene | C906 | Fused |
| Steel | C2xx Series | Arc Welded |
| Molecularly Oriented PVC | C909 | B&S, RG, R |
| Ductile Iron Seismic Joint | C1xx Series | B&S, RG, R |
| **Low to Medium Vulnerability** | | |
| Concrete Cylinder | C300, C303 | B&S, R |
| Ductile Iron | C1xx Series | B&S, RG, UR |
| PVC | C900, C905 | B&S, R |
| Steel | C2xx | B&S, RG, UR |
| **Moderate Vulnerability** | | |
| AC > 8" D | C4xx Series | Coupled |
| Cast Iron > 8" D | None | B&S, RG |
| PVC | C900, C905 | B&S, UR |
| Concrete Cylinder | C300, C303 | B&S, UR |
| **Moderate to High Vulnerability** | | |
| AC <= 8" D | C4xx Series | Coupled |
| Cast Iron <= 8" D | None | B&S, RG |
| Steel | None | Gas Welded |
| **High Vulnerability** | | |
| Cast Iron | None | B&S, Rigid |

*Figure 2-4: Vulnerability of Pipe Material to Earthquakes2*

[2] Earth Resilience Guide for Water and Wastewater Utilities, US EPA March 2018

**B&S – bell and spigot; RG – rubber gasket; R-restrained; UR – unrestrained*

*Vulnerability was based on consideration of ruggedness, bending, joint flexibility and joint restraint.*

### 3. Phosphate Ships

Immediately south of the intake pump station a jetty is located for loading phosphate to large ships (Figure 2-5). It is understood that the phosphate ships are not allowed to cast anchor in this area, which prevents the potential for anchor damage to intake pipelines, outfall diffusers and outfall pipeline manifolds.

The intake towers will require frequent maintenance to remove seaweeds and other fouling from the screens on the intake towers and maintenance of the intake pipelines will likely require pigging retrieval. The passing of ships overhead of an intake tower may potentially cause sediment to be raised interfering with feed water quality to the SWRO. It is necessary that the seawater intake towers and the intake abstraction locations are not in the direct path of the moving ships and are separated as much as possible to optimise seawater feed quality to the SWRO plant.

The phosphate ships will have ballast water, which is typically discharged when the ships are being loaded. It is understood that ballast waters (as well as oils, oils mixtures, sewage, litters, and waste) can be only discharged by ships frequenting the port upon ASEZA's approval, after ASEZA's direction towards specific disposal areas, or upon other disposal procedure set out by ASEZA (Art. 57 of Regulation 21/2001 refers). It is necessary that the intake towers are located where the seabed depth is higher than the docked ships because suspended solids/sediment from ballast water, if allowed to be discharged, will likely fall downslope. The seabed depth at the ship docking point is approx. -35m.

The outfall pipes and the diffuser manifolds could be located in the area of the shipping because they do not require frequent access for operator maintenance. A remotely operated vehicle/diver inspection of the outfall diffuser annually is typically the maintenance requirement for the outfall.

The flora of the seabed area in the ship docking area is visually observed to be already disturbed (Figure 2-6) because of the jetty construction activity, in addition to the turbidity disturbance and ballast discharge caused by the phosphate ships.


***Figure 2-5: Phosphate Ships Loading Jetty***

A safety exclusion zone should be considered in the detailed design for the phosphate loading/unloading jetty located at the south of the IPS location.

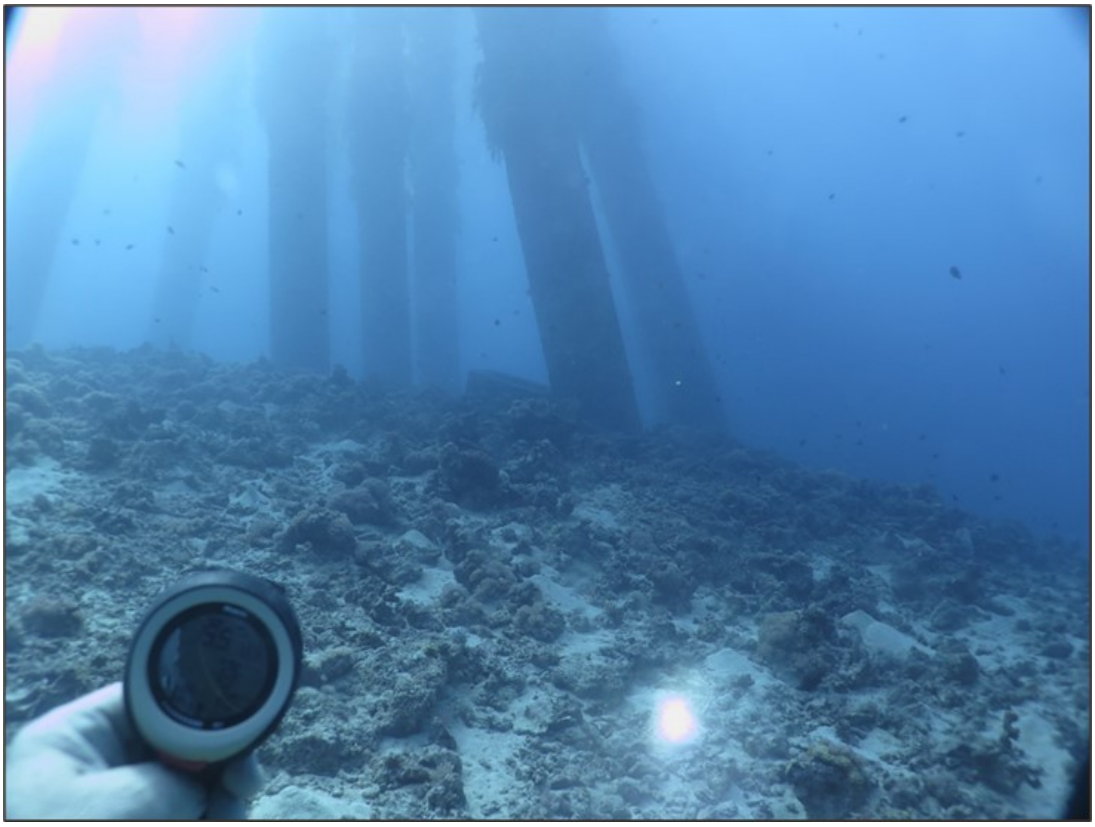

*Figure 2-6: View of Seabed Flora at the Phosphate Jetty (Video ref. 7 N-S 20 11 18 23m)*

## 4. Intake Towers Depth for Cleaning

The screens on the desalination plant intake towers are prone to fouling by seaweeds and barnacles and other macro organisms. An example of the fouling on the screens is shown in Figure 2-7.

This fouling gradually reduces the aperture size of the intake tower screen and must be cleaned manually by divers. Such cleaning of the screens takes several hours for large intake towers.


*Figure 2-7: Macrofouling on screen of Intake Tower at Perth 1 SWRO plant*

Divers using normal air are allowed limited duration in deeper water, without using decompression stops on the assent. For safety reasons, the dive times that are typically allowed without decompression are shown in Table 2-3. It can be observed from the table that it will be very hard to have sufficient dive time to clean intake tower screens where the water depth is greater than approx. 20 m. The time allowed at 20 m depth is only 45 min.

*Table 2-3: Time of Depth and Time Allowed with No Decompression Stop*

| Depth (m) | Time at Depth allowed Professional Association of Diving Instructors (PADi) (mins) |
|---|---|
| **10** | 219 |
| **15** | 72 |
| **18** | 56 |
| **20** | 45 |
| **22** | 27 |
| **24** | 29 |
| **30** | 20 |
| **33** | 14 |
| **40** | 9 |
| **42** | 8 |

**5. Brine Plume Height Minimum Depth**

The brine diffusers shall be located at a seabed depth that allows the brine plume to rise and fall without hitting the seawater surface and also that allows ambient seawater to pass to the diffusers above the brine plume height. The selected seabed depth shall ensure that a gap of equal to or more that 5 m is achieved between the maximum height of brine plume rise above the diffusers and the seawater surface. This is required in order to maximize rapid dispersion of the brine plume to protect the local marine flora and fauna.

**6. Brine Diffuser Uniform Flow**

Even flow through the diffusers shall be ensured at all times in order to maximize rapid dispersion of the brine plume to protect the local marine flora and fauna. This can be achieved by either placing the diffusers' manifold on the same isobath (i.e., with direction parallel to the shore and the diffusers discharging towards the deeper bathymetry) or through the incorporation of restriction orifice arrangements within the diffusers risers in order to balance the flow along the length of the manifold should a configuration perpendicular to the shore be selected.

**7. Minimise Brine Recirculation to Intake**

It is important to minimise the brine plume recirculation of brine from the outfall diffusers back to the seawater abstraction point in order to prevent higher salinity feed to the SWRO plant causing increased power requirements for desalination. This can be achieved by seabed bathymetric level separation and distance separation.

The near field modelling results have shown that the brine plume spread layer after hitting the seabed has a width of 4.5 m. If the seabed level of intake tower is above 5 m from the diffuser seabed level, the brine plume would not reach the intake towers.

**8. Intake Tower Minimum Seawater Depth – Operational Constraint**

The lower sill of the intake tower windows shall be raised above the seabed to reduce the entrainment of the fine sand/silt/small benthic fauna material from the seabed because this sand/silt material has then to be removed by the pretreatment process at the SWRO desalination plant. There is not a uniform approach to the selection of this separation height for large scale desalination facilities and associated intake works. Examples have been observed ranging between 1.5 m and 5 m. Considering the seabed morphology being coral rocks with patches of sand, a minimum height of 3 m between the seabed and the lower sill window shall be selected. A monitoring buoy shall be installed at the area of the intake towers and at around 12m water depth to continuously collect turbidity data from 3 m to 4 m above the seabed.

In addition, surface pollution resulting from phosphate ships, power plant oil supply ships and other ships is of concern, in particular small oil leaks from these vessels. RO membranes have no tolerance for hydrocarbons and the RO pre-treatment systems of dual media filtration and UF/MF membrane treatment are not designed for hydrocarbon removal. To reduce the potential for hydrocarbons and other surface floating pollutants entering the RO feed, the top of the intake tower windows shall be located at least 5 m below the seawater surface. It is considered that a 5 m submergence shall also eliminate any potential for air to enter the intake due the formation of surface vortices.

The intake area seabed survey videos undertaken for the Project ESIA study show high clarity water in the region of 10 m to 20 m seabed depths. It is considered that the intake towers shall be placed at seabed depth of at least 12 m. However, the BOT Developer shall be free to locate the intake towers in deeper water considering, however, keeping the length of the intake pipelines as minimum as possible to minimise seabed disturbance during construction works.

**9. Through Screen Velocity**

The intake velocity through the intake tower screen shall be less than or equal to 0.15 m/s at ultimate capacity, when the screens are clean (not fouled), and all intake towers are in operation. The velocity during maintenance and after fouling can be allowed to be higher. The 0.15 m/s velocity is typically required for velocity cap designs which is intended to reduce entrainment of swimming fauna.

**10. Minimise Plankton Entrainment**

Seawater in the Gulf of Aqaba shows major stratification in the summer months, which means there is gradual nutrient decline profile from the deep seabed region to the sea surface. The low nutrient availability in the region near the surface (seawater depths less than 25 m) results in lower production of the algae and plankton as compared to deeper waters. On the other hand, extreme depths of seawater reduce the primary production due to lack of light. However, these depths become mixed with the surface layers during February to April. Seawater depths ranging from 12 m to 15 m were assessed to both reducing the potential for plankton entrainment and seabed disturbance.

**11. Flat Ground for Intake Towers**

Due to their size, the intake towers, shall be located at relatively flat ground to minimise the excavation and ground levelling that must be achieved. Preliminary bathymetry information is presented for the seabed area near the intake pump station in Figure 2-8. It can be observed that most of the area has unfavourable steep seabed slopes of 1 m vertical: 5 m horizontal to even more extremes of 1:1. One seabed area identified of lower seabed slope appears to be between where the seabed depths are 10 m and 15 m.

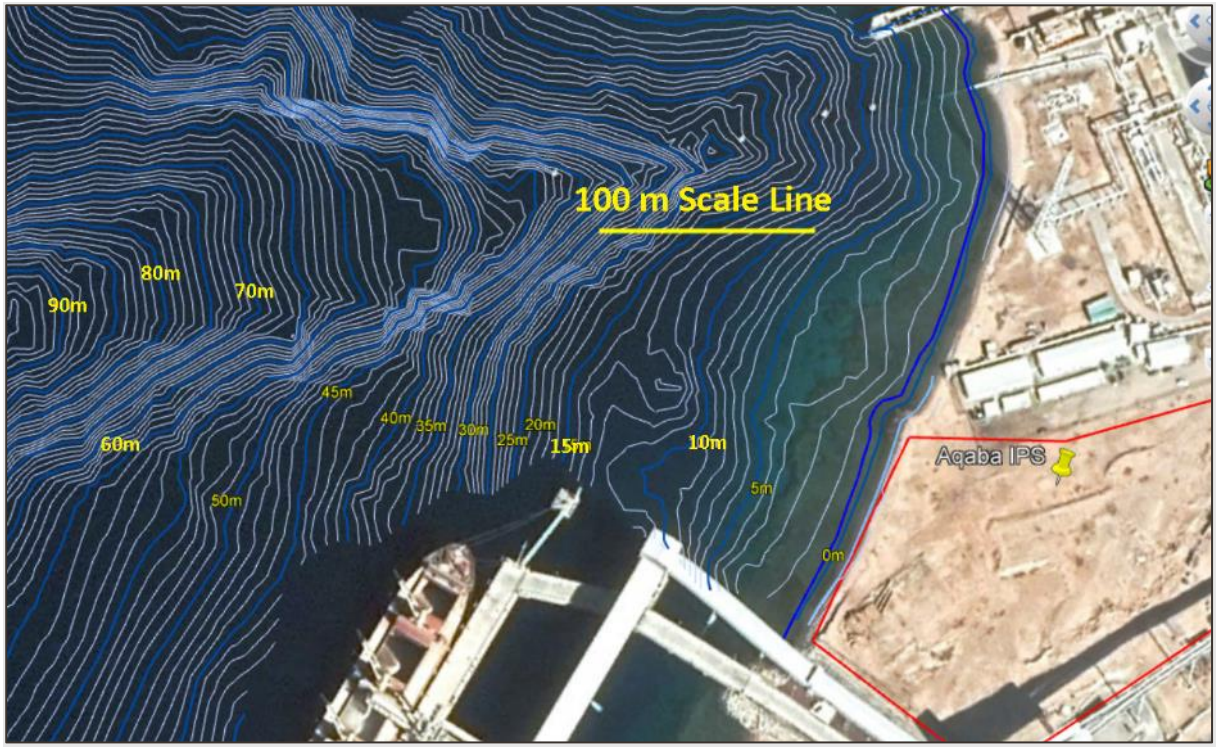


*Figure 2-8: Bathymetry Showing Very Steep Slope*

**12. Minimise Pipe Lengths**

The length of intake pipelines shall be kept as minimum as possible due to the following considerations:

- Environmental – Minimise the excavation disturbance to the benthic community and the destruction of any corals found in the path of the pipelines.
- Environmental and Construction - Delivery schedule and construction risk minimization; reduced duration of construction results in lesser intensity of impacts to the seabed and benthic communities.
- Operational and H&S - Short intakes are easier to clean by pigging or manually by divers; reduced duration of working in confined spaces.

**13. Intake Pipe Cleaning**

Macrofouling by barnacles and other molluscs can cause dramatic increase in the pipe roughness of intake pipes, resulting in serious loss of intake hydraulic capacity. The desalination plant therefore requires an effective and proven intake macrofouling control strategy.

The fouling control solutions to be adopted must allow safe access for divers to the whole length of the intake pipework in cases of:

- Planned periodic manual cleaning of pipes.
- Pig retrieval, in case the pig cleaning unit, if used, becomes stuck in pipe.

The need to have divers for prolonged intake pipe cleaning or pigging retrieval operations shall require that the intake pipes are located at a water depth less than 20 m (refer to Point 4).

**14. Intake Pipe Cleaning - Association with Brine Discharge**

The flora and fauna of the Gulf of Aqaba, including the AAWDC Project marine location in which corals were observed during the video recording surveys, requires the highest level of protection. In the absence of results from whole effluent toxicity testing on the local flora and fauna, a precautionary principle approach shall be used with regard to brine discharge detailed design proposal. This is interpreted to mean:

- Design of the diffusers shall ensure that dilution of the brine salinity shall be maximised to achieve and ensure the concentration of brine plume closer to ambient sea concentration in very short distance from the diffusers.
- There is considerable uncertainty with regards to the effect to flora and fauna by the long-term use of non-native chemical additives to the brine. The brine shall, as far as practically possible, only comprise the concentrated ions that originated from the local sea. The brine shall be free of disinfectants, disinfection by-products (if technically possible), and organic membrane cleaning substances. The discharge of the pre-treatment solids, coagulant precipitated solids, and post treatment waste solids shall be minimised using a solids treatment plant with high solids capture to minimise the overall brine turbidity and iron discharge.
- Chlorination for macrofouling control shall not be used unless there is no other feasible technical solution (i.e., manual cleaning or mechanical pigging) due to concerns for THM formation and their subsequent disposal into the marine environment considering that THMs cannot be dechlorinated with sodium bisulphate (SBS) as free residual chlorine can.

**15. Intake Availability**

The combination of intake tower, intake pipeline system, and RO production plant must have an overall availability of 97%.

**16. Proven at the Scale**

Any process solution for the intake and the outfall system for a project of this scale shall be proven technology at the scale of large desalination plants with sizes equal to or exceeding 100,000 $m^3$/d..

**17. Lack of Footprint for Shore Facilities**

The site footprint available for the intake pump station is relatively small. The construction and lay down facilities for the intake screening and pump station alone will not allow significant additional room for large intake/outfall pipe storage, for long string HDPE pipe section welding, or for tunnel shaft facilities.

**18. Existing Infrastructure Utilities**

The detailed design shall take due consideration of any crossings with existing utilities so that utilities are maintained in good operating condition by temporary/ permanent diversions or by supporting in position.

#### 2.9.2.2. Pollution Prevention, Marine Biodiversity Protection and Response

The following mitigation measures shall be embedded into the BOT Developer's detailed design to prevent and/or minimise adverse impacts related to degradation of seawater quality, seabed sediments, marine habitats, flora, and fauna.

**1. SWRO desalination plant and brine outfall system**

The detailed design of the brine outfall system and the SWRO desalination plant shall be guided by the 'precautionary approach' and more specifically:

- The brine outfall system shall be equipped with high velocity multiport diffusers.
- The design of the diffusers shall ensure that dilution of the brine salinity achieves a concentration of brine plume salinity that is closer to ambient seawater salinity concentration in a very short distance from the diffusers.
- Taking into account the considerable uncertainty with regards to the effects on marine flora and fauna from the long-term use of non-native chemical additives to the brine, the brine effluent shall, as far as practically possible, only comprise the concentrated ions that originated from the local sea.
- The discharge of chemicals and processing solids to the sea with the brine must be avoided where technically possible.

Thus, the detailed design of the brine outfall system shall meet the following requirements:

**a) Brine Effluent Discharge Standards**

- Mixing Zone and Ambient Salinity Standard
  - The size of mixing zone size shall be 100 m from the diffusers, throughout the water column.

- The ambient salinity standard to be achieved shall be less than or equal to 2% salinity increase above ambient salinity at the end of the mixing zone.

It is noted that near field dispersion modelling carried out as art of the ESIA study for the AAWDC Project showed that this mixing zone requirement can be achieved with effective diffuser design. The modelling indicated that an ambient standard for salinity of less than 1.65% above ambient at 100 m from the diffusers could also be achieved with diffusers designed with a requirement for a Froude number of equal to or more than 20, which is the value of the Froude number that enables the Roberts/Abessi equations for near field dilution to be valid.

- End of Pipe Standards
  - Dissolved Oxygen: ≥ 3.5 mg/l
  - Total Iron: ≤ 0.3 mg/l on average, ≤ 0.5 mg/l maximum
  - Turbidity: ≤ 5 NTU (90% ile) plus ambient intake seawater turbidity; < 10 NTU (100% ile) plus ambient intake seawater turbidity
  - Residual Chlorine: 0
  - THMs: Zero increase above the limit concentration; where the limit concentration for THMs will be the ambient measured THMs concentration multiplied by the plant concentration factor (at overall recovery).
  - pH: ≥7 and ≤9

**b) SWRO Process Effluents and Marine Discharge**

- A Solids Treatment System (STS) shall be provided on-site, which shall meet the following requirements:
  - The solids treatment system shall receive backwash effluents from media filtration and/or UF/MF backwash, post treatment limestone filters backwash effluents or lime saturator waste and spent neutralised RO membrane cleaning-in-place (CIP) effluents. Post treatment limestone filters backwash effluents can be also sent to a buffering tank; however the high solids stream from the bottom of the buffering tank shall be first sent to the STS and not to the brine chamber for direct outfall disposal.
  - The solids treatment system shall include sludge thickening and dewatering.
  - The solids treatment system shall remove equal to or more than 90% of incoming solids load.
  - Retained solids shall be thickened and dewatered to achieve a sludge cake of dry solids of equal to or more than 20%.
  - The supernatant liquors from the sludge thickener and/or dewatering centrifuges shall only be allowed to be discharged to the brine for outfall disposal should the supernatant turbidity be less than or equal to 30 NTU.
- RO membrane CIP effluents containing organic cleaning chemicals or biocides, or chelating agents must not be allowed to be discharged to the brine for outfall disposal. These CIP effluents shall be sent to on-site evaporation ponds provided for and designed to this effect.
- Spent phosphorus-based membrane cleaning agents must not be allowed to be discharged to the brine for outfall disposal.
- Other RO or MF/UF Membrane CIP effluents containing only inorganic chemicals can be allowed to be discharged to the brine for outfall disposal. These CIP effluents must be first neutralised to pH 7 - 8.5 and then sent to the solids treatment system and subsequent final entry to the brine for ultimate outfall disposal.
- Halogen disinfectants (e.g., disinfectants based on chlorine, iodine, bromine) must not be allowed to be discharged to the brine for outfall disposal.
- Organic disinfectants must not be allowed to be discharged to the brine for outfall disposal.
- Antiscalant shall only be used by the Project if it is demonstrated as essential for plant operation by the use of pilot testing and subsequent RO membrane autopsy or by presenting such testing from another recent project or recent published research. Said pilot testing can be undertaken during construction or at the start of operation.

- Antiscalant, if it must be used, shall be (a) nitrogen free, (b) readily biodegradable in the marine environment, and (c) dosed at a minimum effective quantity, determined by pilot testing. If antiscalant is used, this pollutant will unavoidably be discharged with the brine for outfall disposal.

**c) Macrofouling Control Strategy for the Intake System**

The BOT Developer will be free to select its strategy for keeping the intake system clean from macrofouling but shall consider the following requirements in order to effectively mitigate the adverse impacts related to chlorine residual and chlorine disinfection by-products (THMs) release to the marine environment at the area of discharge due their acute and chronic toxicity and mutagenic character (refers to THMs):

- Chlorine used for pre-treatment and the intake pipelines barnacle fouling protection shall be avoided by the Project if it is technically and long term operationally possible to maintain the intake pipeline hydraulic capacity by other methods such as manual cleaning by divers and mechanical pigging. This is to prevent chlorinated disinfection by products such as Trihalomethanes (THMs) entering the marine receptor with the brine. It shall be noted that although residual chlorine itself can be eliminated from the brine at the SWRO plant by using dechlorination chemicals such as Sodium Bisulphite (SBS), the use of chlorine generates carcinogenic by-products THMs which cannot be eliminated from the brine with dechlorination and would end up discharged into the marine environment with the RO brine.
- If chlorination is technically deemed essential for intake pipeline macrofouling control, full dechlorination of any shock chlorinated, or continuous chlorinated, or pulse chlorinated seawater shall be carried out before it is allowed to discharge to the bulk brine flow for outfall disposal. A zero-chlorine residual shall be achieved before discharge to the outfall. In addition, if chlorination is used, a zero-THMs increase above the limit concentration shall be achieved before discharge to the outfall, where the limit concentration for THMs will be the ambient measured THMs concentration multiplied by the plant concentration factor (at overall recovery).
- If the MF/UF process is used as pre-treatment, then full dechlorination of any chemical enhanced backwash shall be undertaken before this enters to the on-site solids treatment system for further treatment before discharge to the bulk brine outfall.
- Any chlorinated RO permeate water, product water, or off specs product water shall be fully dechlorinated before it is allowed to be discharged into the bulk brine flow for outfall disposal.
- The intake pipelines from the intake towers to the shore IPS and the SWRO production facility must have a macrofouling strategy to ensure sufficient seawater supply ensuring SWRO plant availability. The intake pipelines to the IPS are anticipated to be relative short, at less than 200 m, and it should be possible to maintain hydraulic intake capacity in these short pipelines by the use of divers' manual cleaning or by the use of mechanical pigging without the use of chlorine.
- There are anticipated to be two large diameter (2.3 m) HDPE pipelines from the IPS to the SWRO plant, at a distance of approx. 3 km. If these pipes can be mechanically pigged, then chlorine dosing should not be needed for intake fouling control. However, if mechanical pigging is not technical feasible, then, the pipe fouling control strategy will require the intake pipes to be manually cleaned, and then the use of shock or continuous chlorination will likely to be essential to reduce the frequency of manual pipe cleaning requirement and fulfilling the required plant availability.

**d) Brine Outfall Diffusers Design**

- The diffusers design must achieve dispersion of the brine salinity to ≤ 2% above the ambient seawater salinity concentration at 100 m from the diffusers, in stagnant seawater conditions.
- Multiport diffusers shall be used.
- The diffusers design shall have a Froude number, F, equal to or more than 20, where
  - F = Uo / (g1 - do)^0.5
  - Uo = Velocity of brine at the diffuser port
  - g1 = g*(ρo-ρa)/ρa
  - g = acceleration due to gravity
  - ρo = density of brine leaving the diffuser

- ρa = density of the ambient seawater
- do = diffuser port diameter

- The discharge angle of the diffuser port to the horizontal shall be 60 deg.
- The diffusers' direction shall be orientated so that the brine plumes do not return to the diffusers. The diffusers can be back-to-back provided this is restriction is respected.
- The design of the diffusers shall ensure that the variation in flowrate due to diffusers laid at different depths shall not exceed 10% between the diffusers at the design flow to maximise brine dispersion.
- To prevent interference between the brine plumes of each diffuser, the minimum separation distance between the diffusers (or back-to-back diffusers pair) centrelines shall be in minimum 2 x do x F, where do is the diffuser port diameter (m), F is the Froude Number.
- The diffusers shall be located at a seawater depth so that ensures a gap of equal to or more than 5 m between the maximum height of brine plume rise above the diffusers and the seawater surface is achieved. The maximum brine plume height above the diffusers being calculated as 2.25 x F x do, where do is the diffuser port diameter (m), F is the Froude Number.
- The diffusers must be located in seawater depth that is at least 5 m deeper than that at the closest intake tower location.

**e) Brine Dispersion Modelling**

The detailed design of the brine outfall system shall be supplemented with:

- Near field dispersion modelling to predict the behaviour of the brine in the near field region, i.e., the region where the brine plume is influenced by the discharge characteristics of the brine at the diffusers. The model shall validate that the set mixing zone salinity standard of ≤ 2% above ambient seawater salinity is achievable at 100 m from the diffusers.
- Far field dispersion modelling to predict the behaviour of the brine in the far field region, i.e., the region beyond the first 100 m from the diffusers where the brine plume behaviour is no longer influenced by the diffusers and further dilution occurs by very slow mixing caused by undersea currents and the plume motion under gravity and by concentration diffusion mixing. The model shall validate that (a) the brine plume salinity starting at 2% above ambient seawater salinity is further slowly diluted beyond the 100 m and over the next 3 to 5 km, (b) the brine plume behaves as density current following the deeper bathymetry, and (c) no significant brine plume recirculation occurs at the location of the seawater intake towers system.

**f) Overarching Design Mitigation in Construction**

The detailed design of the brine outfall system shall ensure the following overarching mitigation measures/principles in construction:

- The number of outfall pipelines to be kept as minimum as possible considering the ultimate plant capacity of 300 MCM/y at the set overall availability. It is expected that two (2) outfall pipelines can accommodate the ultimate Plant capacity.
- The outfall pipelines shall be constructed from HDPE or GRP.
- Provision of sufficient manholes to allow inspection of outfall pipe by a remotely operated vehicle .
- The outfall pipelines shall be fully buried in a trench in the surf zone, considered up to a seabed depth of 5 m. The depth of cover over the top of the pipe in the surf zone trench to be at least 1 m.
- The length of the outfall pipelines shall be kept as minimum as possible considering the physical constraints at the particular marine location (e.g., operation of phosphate loading/unloading jetty south of the IPS) and near field dispersion modelling results related to the seawater depth shall be required so that the rising brine plume from the diffusers do not hit the seawater surface since this will reduce brine dispersion. The required seawater depth shall allow for a gap of 5 m between the maximum height of brine plume rise and the seawater surface.
- The outfall pipelines shall be laid directly on the seabed as much as possible with minimum excavation and clearance of ground. Consideration shall be given for just laying a gravel bed (seabed conditioning), thus minimising the disturbance of the seabed. However, the requirements for pipe stability shall be first priority.

- If GRP is used for outfall pipelines, special conditioning of the seabed is required.
- Turbidity screens (silt curtains) shall be used to enclose the perimeter of construction works related to the brine outfall system in order to keep the impacted area footprint as minimal as possible and avoid the dispersion of suspended solids generated during the marine excavation works.
- Any corals identified in the construction path of the outfall pipelines and associated diffusers manifolds shall be carefully collected and relocated where it is safe to do this by divers. A dedicated Corals Transplantation Protocol and Plan shall be developed by the BOT Developer for approval by ASEZA and implemented by the BOT Developer under ASEZA's supervision. A specific and detailed quantification of corals to be transplanted will be part of this plan. Once the exact pipeline route and intake towers location are defined (and the same for the brine outfall pipeline), all coral heads or pieces to be translocated shall be identified, quantified and their translocation site shall be determined. This Transplantation Protocol and Plan will comprise the very details of corals identification and quantification as well as the proposed site for their translocation. In addition, the BOT Developer shall promote artificial reef development around the marine infrastructure, such as along the pipeline route, around the intake structures.
- Should tunnelling be adopted as construction method, then the drill cuttings, drilling muds and excavated materials generated by this operation shall be screened and contained in a barge for transportation and disposal on-shore on dedicated sites approved by competent national authorities. The direct marine disposal of such materials must not be allowed.
- Seawater, soil, and groundwater pollution during construction works shall be prevented through the placement of appropriate secondary containments to all fuel/oil and other hazardous chemicals containing tanks.
- Stainless steel used for nuts and bolts of the pipelines flanges and concrete ballast locking mechanisms shall have pitting resistance equivalent number (PREN) of at least 40.
- The BOT Developer shall design and implement a marine monitoring program to assess the environmental conditions before, during, and after the completion of the construction works so that the 'new' baseline conditions before operation commences are determined (refer to Section 2.10.1.1 below for specifics).
- The BOT Developer shall design and implement a Whole Effluent Toxicity (WET) testing program (refer to Section 2.10.1.1 below for specifics).

**g) Overarching Design Mitigation in Operation**

The detailed design of the brine outfall system shall ensure the following overarching mitigation measures/principles in operation:

- Annual condition assessment of outfall integrity by divers/ROVs with video cameras. After 5 years of subsequent records indicating no damages or malfunction of the outfalls, the frequency of condition assessment can be once every 2 years.
- Operational marine monitoring (refer to Section 2.10.1.2. below for specifics).
- Brine dispersion and discharge compliance monitoring (refer to Section 2.10.1.2 below for specifics).
- Annual reporting to national regulatory authorities (MoEnv, ASEZA) (refer to the next thematic area for specifics).
- WET testing program (refer to Section 2.11.1 below for specifics).

**2. Intake System**

The detailed design of the seawater intake system shall take into account the following requirements:

- To prevent potential brine recirculation, the intake towers shall be located at seabed depths at least 5 m higher that the nearest outfall diffuser seabed depth and at an appropriate straight-line distance validated by far field modelling.
- The lower sill of the intake tower windows shall be at minimum 3 m above seabed to prevent ingress of sediments and sessile organisms from the seabed.

- The upper sill of the intake tower windows shall be at minimum 5 m below seawater surface to prevent any floating oil pollution from entering the intake system and subsequently the SWRO desalination plant.
- The ESIA study assessed a seabed depth of equal to or more than 12 m to be technically and environmentally feasible for the construction of the intake towers. The proposed area corresponding to that depth has been investigated through underwater video recording which indicated a relatively flat seabed, surrounding areas are almost empty of corals, shore distance to that depth is reduced hence would result in less excavation and subsequently less seabed degradation/destruction, and is good enough in terms of water quality (i.e., leaves an adequate submergence window for the towers). However, deeper seawater depths might be used but taking into consideration that intake towers or passive screens need to be cleaned regularly by divers, which restricts the location of the intake towers/passive screens to seabed depths of less than 30 m and preferably less than 20 m to allow safe diver prolonged cleaning time (i.e., without decompression stops).
- The through screen velocity shall be less than or equal to 0.15 m/s with clean screens and all intake towers operating to minimise entrainment of marine life.
- The towers' screen mesh shall be provided with aperture of nominal size less than or equal to 75mm. The material of the mesh shall be non-metallic. The mesh panels shall be easily removable and with non-metallic fixings.
- Intake towers shall have access hatches of non-metallic material for divers' entry as required for cleaning and inspection purposes.
- The intake pipe inside each intake tower shall have non-metallic access hatch/es that can be closed during pigging events to prevent pig pressure losses and debris generated during cleaning of macrofouling from barnacles filling the tower.
- Should a pigging system be used for the cleaning of the intake pipes from macrofouling, the pigging system shall not discharge the pig and resulting debris into the intake tower. Instead, pigs shall discharge using a tower bypass spur and the discharge of the pig shall be located where the seabed depth is at least 5 m deeper than the location of the intake tower to avoid accumulation of shell material inside the tower.
- The intake towers shall be designed for high intensity seismic events.
- Marker buoy shall be installed above each intake tower.
- A separate wireless monitoring buoy shall be located above the intake towers measuring the actual seawater salinity (in practical salinity scale PSS-78 from conductivity), temperature, turbidity, and chlorophyll A). The data shall be monitored online.
- Should passive screens be used for seawater abstraction instead of intake towers, they shall meet the following requirements:
  - Aperture size shall be ≤ 5mm.
  - Through screen velocity shall be less than or equal to 0.15 m/s.
  - There should be at least 20% redundancy for the screens.
  - Copper nickel alloys shall be used for mesh material, which inhibits marine biofouling.
  - Ability to air blast each passive screen automatically and individually shall be provided.
  - Means to isolate passive screens from intake pipes when an intake pipe is being pigged shall be provided.
  - Passive screens shall be located where the seabed depth is at least 15m so that the screenings can disperse away downslope.
  - The bottom of the screen must be at least 3 m above the seabed.
- The intake pipes shall be preferably constructed from solid wall HDPE, to provide greater resilience for earthquakes to be suitable for potential future mechanical pigging.
- The intake pipes shall be suitable for pigging using a steel mandrel type pig with polypropylene rings and not just foam pigs.

- Provision shall be made for manholes for diver access with breathing apparatus (BA) sets to be located at intervals of no more than 50 m (min 2 per intake pipe).
- The intake pipes shall be fully buried in a trench in the surf zone, considered up to a seabed depth of 5 m. The depth of the cover over the top of the pipe in the surf zone trench shall be at least 1 m.
- Outside of surf zone, the intake HDPE pipes shall be installed in trench, and backfilled to at least half way up pipe, or higher if that is needed to ensure pipes stability.
- Stainless steel used for nuts and bolts of the pipe flanges and concrete ballast locking mechanisms should have PREN of at least 40.
- The ESIA study concluded that the use of chlorination for intake system macrofouling control shall be avoided unless it is proven that there is no other technical solution to this effect (i.e., manual diver cleaning or mechanical pigging). However, should chlorination be used, the chlorination dosing pipelines shall be double contained and equipped with a leak detection system. Furthermore, a means to prevent scaling of the chlorination dosing lines shall be provided if hypochlorite is used.
- An exclusion zone for vessels and fishing boats shall be defined over the whole routing of the intake pipelines and intake towers in coordination with the Project Promoter and the competent national authorities.
- Turbidity screens (silt curtains) shall be used to enclose the perimeter of construction works related to the intake system in order to keep the impacted area footprint as minimal as possible and avoid the dispersion of suspended solids generated during the marine excavation works.
- Any corals identified in the construction path of the intake towers and pipelines shall be carefully collected and relocated where it is safe to do this by divers. A dedicated Transplantation Protocol and Plan shall be developed by the BOT Developer for approval by ASEZA and implemented by the BOT Developer under ASEZA's supervision.
- Seawater, soil, and groundwater pollution during construction works shall be prevented through the placement of appropriate secondary containments to all fuel/oil and other hazardous chemicals containing tanks.
- Notwithstanding the above, the BOT Developer's detailed design shall be allowed to select (a) specific locations for the intake and outfall pipes; (b) intake tower sizes, (c) pipe sizes, (d) diffuser number and sizes and respective works provided the Project constraints in Section 2.8.2.1 above are accounted for and all abovementioned requirements in Section 2.8.2.2 are achieved.

#### 2.9.2.3. Risk Reduction in Design: Seawater & Brine Pipeline Structural Failures and Associated Seawater and Brine Leakages

The following mitigation measures shall be embedded into the Project's detailed design to prevent and/or minimise adverse impacts to environmental resources, degradation of marine and terrestrial habitats, flora, and fauna, damage to cultural resources, risks to H&S workforce and community, disturbance of social welfare and amenities, public health issues, and impact on water delivery reliability as a result of structural failures of the intake and brine pipelines and associated leakage due to seismic events or sabotage:

- The detailed design shall allow for deflection and elongation of the marine structures and pipes, as well as reliable accessibility to intake towers and intake and outfall pipelines especially where the facilities and pipes cross seismic fault areas. Adherence to Jordan Building Code based on UBC 1997, EN Eurocodes or similar international accepted building/design codes for earthquakes shall be ensured.
- Site response studies shall be conducted at all planned construction sites (i.e., marine works location, IPS, SWRO plant) to determine the local potential ground acceleration and potential liquefaction.
- Leakage and intruder detection shall be provided and interfaced appropriately with SCADA system.
- In case the geotechnical surveys reveal unconfined aquifer underlying the area between the IPS and the SWRO desalination plant, then groundwater monitoring wells every 1 km of the brine pipelines from the IPS to the SWRO Desalination Plant shall be provided. .

#### 2.9.2.4. Risk Reduction in Design: Flood

The following mitigation measures shall be embedded into the BOT Developer detailed design to prevent and/or minimise adverse impacts related to degradation of groundwater, and soils, disruption of livelihood conditions, public health issues, destruction of infrastructure, and reliability of water delivery as a result of a flood event.

The detailed design of the Project IPS and SWRO Plant (as well as PSs and RGTs along the water conveyor up to Amman) shall comprise the following mitigation measures:

- Plan the new infrastructure at a suitable elevation above the current high tide level by utilizing an accurate topographic survey.
- Preserve flood management conditions of existing wadis drainage channels (e.g., at SWRO Desalination Plant and elsewhere in the water conveyor routing).
- Provide for additional site drainage measures or even flood retention walls around key Project facilities with high vulnerability to flooding.
- Provide for planting soils adjacent to key Project facilities to prevent erosion and sediments flows during flood events.
- Prevent any leakages of fuel or lubricant or other chemicals during flood events through appropriate protection against flooding of storage areas for all fuel or chemical storage facilities and provision of secondary containment of appropriate volume.

#### 2.9.2.5. Risk Reduction in Design: Oil Pollution

The following mitigation measures shall be embedded into the BOT Developer detailed design to prevent and/or minimise adverse impacts resulting from failures at the SWRO process, disruption of livelihoods, and public health issues as a result of an oil spill at sea.

The detailed design of the Project seawater intake system shall comprise the following mitigation measures:

- The upper sill of the intake towers' windows shall be at minimum 5 m below seawater surface to reduce the potential entrainment of any floating pollution, particularly hydrocarbons and subsequent failures of the SWRO process and degradation of produced drinking water.
- The BOT Developer shall provide for installation of floating barriers around the intake towers and installation of an oil detection and alarm system at the intake towers' wireless monitoring buoy as means for protection against hydrocarbons spillages.
- Although the shore intake option as intake channels was not favoured in the Pre-feasibility Assessment of Intake Options appended to the Project ESIA study, should such a concept be adopted in detailed design, the BOT Developer shall provide for protection against hydrocarbons pollution through the use of permanently installed floating oil exclusion barriers.
- It is noted that dissolved air flotation, if included in the SWRO pre-treatment stage, targets algae removal. This process may provide limited hydrocarbon pollution load removal but it is not normally guaranteed by suppliers to this effect.

#### 2.9.2.6. Climate Change Adaptation in Design

The following mitigation measures shall be embedded into the BOT Developer detailed design to ensure adaptation to climate change.

- The assessments and related mitigation measures provided in the Climate Risk Vulnerability Assessment appended to the Project ESIA study shall be taken into consideration.
- The detailed design of key Project components shall ensure resilience to climate change through:
  - Identifying and implementing appropriate measures to reduce the impact of the Project on the wider environment that is expected to be further compounded by climate change (i.e., effective brine dilution, minimisation of entrainment effects in seawater abstraction, energy recovery from brine, use of energy efficient equipment, continuous monitoring of drinking water quality, etc.).
  - Factoring in climate change projections into detailed design where appropriate (e.g., temperature extremes, flooding).
  - Reviewing design standards and selecting materials to be robust to climate risks and particularly to extremes.

- Assessing the implementation of wider sustainability measures e.g., the use of renewable energy resources.

#### 2.8.2.7 GHG Emission Reduction and Energy Efficiency in Design

The following mitigation measures shall be embedded into the BOT Developer's detailed design to ensure GHG emissions reduction and energy efficiency:

- Optimum energy monitoring and power control through:
  - Use of high-efficiency motors and pumps;
  - Automatic control of outdoor lighting, HVAC systems and power losses (light, heat, and cold);
  - Use of solar system to power the auxiliary systems;
  - Use of LED technology for illumination; and
  - Power factor management
- Desalination process elements in service shall be operated within their optimum efficiency ranges at the set desalination plant capacity and availability.
- Where applicable, desalination plant facilities shall be configured as series of structures sharing common walls, roofs, and equipment, which allows significant reduction of their physical footprint.
- The principles of the Leadership in Energy and Environmental Design (LEED) program in structural design shall be followed for all Project facilities in terms of:
  - Material selection;
  - Sustainable site development;
  - Energy efficiency in provided lighting, ventilation, and air conditioning systems;
  - Indoor environmental quality through maximisation of natural lighting and exterior views, automatic controls for switching off non-emergency interior lighting, controls and monitoring of interior ventilation; and
  - Water savings through water conserving devices for all service facilities (e.g., lavatory faucets, showers, water closets, toilets, etc.) and for landscape irrigation.

#### 2.9.2.7. Social Engagement in Design

In addition to implementing the Stakeholder Engagement Plan appended to the Project ESIA, the following mitigation measures shall be embedded into the BOT Developer's detailed design to ensure effective and meaningful social engagement.

- The LARPF appended in the Project ESIA shall be taken into account in detailed design.
- The Project Promoter shall elaborate and implement Land Acquisition and/or Resettlement Action Plans pursuant to EIB/USAID E&S standards should the detailed design trigger such the need for such plans as defined in the LARPF.
- Any land acquisition and lease issues shall be resolved, and agreements reached ahead of construction commencement. To facilitate work progress, the components can be divided into portions whereby works can commence once land acquisition within each portion has been resolved. Portions of the Project Site shall not be handed over to the BOT Developer by the Project Promoter until the land acquisition is reached for the affected parcels within that portion.
- The BOT Developer shall provide for land access and compensation mechanisms related to Project Affected Persons (PAPs) livelihood and damages to property and existing infrastructure.

#### 2.9.2.8. Environmental and Social Compliance in Design and Procurement

The following considerations ensure environmental and social compliance in design and procurement and shall be taken on-board by the Project Promoter and the BOT Developer to ensure compliance of Project related environmental and social impacts related to degradation of environmental resources, degradation of marine & terrestrial habitats, flora, and fauna, degradation of cultural resources, H&S workforce and community risks, disturbance of social welfare and amenities, and reliability of water delivery.

- Environmental and social performance requirements shall be embedded into BOT tender and contract documents by the Project Promoter similar to operational, finance, institutional, and legal contractual requirements.

- The standards and mitigation provisions of the Project ESIA study and ESMP shall be considered and reflected in detailed design by the BOT Developer.
- The BOT tenders shall be evaluated for compliance to the Project ESIA study and ESMP.
- As part of the detailed design for the Project, the BOT Developer shall update the ESIA study and the ESMP to reflect changes to Project components as well as institutional set up and arrangements.
- During the detailed design, an Ecologist shall be recruited to develop a Permitted Species List for each Project Area. This list shall include only species native to the area and relevant bio-climactic zone. Only species on this list may be used for revegetation and landscaping.
- The BOT Developer shall assess the feasibility of installing renewable energy facilities to compensate for power needed to operate the Project and, if found feasible, proceed with installation in coordination with relevant authorities.
- All land needed for the Project will be prepared by the BOT Developer and shared with the Project Promoter for preparation of the Land Acquisition Plans or Resettlement Action Plans (where needed) in line with the Project LARPF.

### 2.9.3. Environmental and Social Mitigation/Management Provisions during Planning and Pre-construction

Prior to commencement of Project related works, the alignments, boundaries, and limits of Project sites shall be staked out based on the detailed design plans. A working strip shall be established to restrict the area impacts to within the working corridor and limit personnel and vehicle movements to only within working areas. All Project related construction works activities will stay within the staked out alignments and boundaries, and outside any designated ecologically and archaeologically/culturally sensitive areas.

With the exception of access roads, or unless instructed otherwise by the Project Promoter, the entire perimeter of Project sites with a surface area of less than 2 hectares shall be physically demarcated with a fence or tape. For Project sites with a surface area of more than 2 hectares, the perimeter shall be physically demarcated by a perimeter track, road, signs, or any other means leaving no possible ambiguity as to the location of the Project Areas perimeter.

The definition of the Project Perimeter shall take into account the provisions of national regulations related to distances from watercourses, floodable areas, urban services, and buildings (e.g., health centre, school, public water supply, etc.), housing. Said distances should also consider the specific case of works requiring the use of explosives.

A topographic survey of all additional areas and facilities shall be undertaken including ground elevations in order to reinstate the land after termination of the works. This shall include recording all perimeter GPS coordinates and ensuring that the entire area proposed for land take or temporary usage is included in the survey and recorded via photographs. Access roads shall be identified as new, upgraded, or existing. All relevant data, including GPS coordinates, shall be provided electronically to the Project Promoter.

A detailed Construction Methods Plan shall be developed for approval by the Project Promoter comprising, but not limited to the location of proposed borrow areas or areas to be excavated, the proposed backfill material stockpile locations or zones designated for the rubble from any demolition works, Project related maintenance facilities, storage areas, batch plants, and any side casting during the construction of linear infrastructure (roads, pipelines, transport routes).

The Construction Methods Plan will include a technical section that will detail the manner of execution of the works at sea, on the coast and on inner land, and the location of organization/mobilization areas, materials borrow pits, spoils temporary storage areas, which for the marine and coastal works will be as far as possible from the water line.

The trenching/backfilling plant/equipment shall be carefully selected to increase the retention of suspended sediments during the dredging activities, e.g., a suction dredger would be preferable to a backhoe dredger. The selection of equipment shall be based on the geotechnical properties of the seabed on the target marine locations for the installation of the intake and outfall systems.

Geotechnical surveys shall be undertaken to confirm the suitability of dredged materials for backfilling purposes.

Continuous turbidity monitoring shall be undertaken during the construction of marine works near any sensitive marine life e.g., seagrasses or corals found in the vicinity of the routing of the intake and outfall systems as defined in the detailed design. Selected locations shall comprise a representative number of monitoring stations up and down

current the marine works and a remote location not affected by the marine works to ensure representativeness and comparability of monitoring results. Historic seawater quality data shall be also used for comparison.

The opening or rehabilitation of access routes between Project Areas shall be also shown on a map and approved by the Project Promoter prior to the start of the corresponding works.

A Code of Conduct shall be established and implemented throughout the duration of construction works so that construction personnel not to disturb or interfere with the inhabitants of local communities close to or in the Project Area, and respect their houses, cultures, animals, properties, customs, and practices (refer to Section 2.10.3.2.8).

Construction personnel shall be trained to understand and acknowledge the requirements about use of unapproved land and the need to stay strictly within the set Project site boundaries and within the set working areas and to use only approved access and service roads.

Access to all Project Areas will be prohibited to unauthorized persons/third parties.

Should Project construction activities require blasting, the integrity of existing housing or public service buildings situated within a radius of 500 meters around the Project Areas where blasting will occur shall be examined by a bailiff and his statement report shall be included in the CESMP.

Any blasting activities will be executed pursuant to the provisions of the national regulations. In case of any problems detected due to the intensity of blasting, seismic measurements of the intensity of the vibrations induced by the blasting, at variable distances from the blasting points, may be required to be executed.

Protection zones will be set pursuant to national regulations and/or the specifications of existing utilities based on the detailed design such that the CESMP shall comprise procedures to manage, rectify, and record any incidents related to utility damages.

Visual aesthetics shall be protected through proper planning of the siting of the construction areas and associated facilities and by putting visual barriers or screens around the key construction related sites and facilities, especially within the urban settings (e.g., Amman).

### 2.9.4. Environmental and Social Mitigation/Management Provisions during Construction

Table 2-4 presents the overarching environmental and social mitigation and management provisions for the AAWDC Project technical components which should be integrated into the CESMP (and Project-Area CESMPs) that will be implemented during the construction/commissioning phase of the Project to ensure environmental and social welfare protection and legal compliance.

*Table 2-4: Environmental and Social Mitigation during Construction*

| E&S Component / Project Component | Potential Impact | Significance | Proposed Mitigation | Residual Significance |
|---|---|---|---|---|
| **Physical Environment** | | | | |
| Soil & Geology<br><br>Water Desalination Component (Onshore Facilities) and Conveyance Pipeline | ▪ Soil compaction and natural drainage blockage due to the movement of vehicles and workers on the site, and soil erosion as a result of topsoil layer removal, land preparation and vegetation stripping | Low | ▪ Develop and implement Erosion and Sediment Management Procedures as per provisions in Section 2.10.1.3 | Negligible |
| | ▪ Disruption of soil quality and morphology from improper disposal of excess excavated material or unsuitable excavated material for fill | Low | ▪ Develop and implement Waste Management Plan (WMP) as per provisions on Spoils and Excavation Material in Section 2.10.1.2.1 | Negligible |
| | ▪ Soil pollution from accidental oil or chemical spills or from improper disposal of generated solid waste and wastewater | Low | ▪ Develop and implement a Pollution Prevention Management Plan (PPMP) as per provisions in Section 2.10.1.1 and Emergency Preparedness and Response Plan (EPRP) in line with provisions of Section 2.10.3.1<br>▪ Implement WMP as per provisions in Section 2.10.1.2 | Negligible |
| Soil & Geology<br><br>Water Desalination Component (Onshore and Offshore Facilities) | ▪ Disruption of sediment layering and structure<br>▪ Surface sealing (if structures placed on the seabed) | Low | ▪ Optimise water abstraction depth considering suitable distances from seabed and sea surface and keeping the length of submerged intake pipelines as minimum as possible.<br>▪ Laying of outfall pipeline directly on the seabed as much as possible with minimum excavation and clearance of seabed floor and, if possible, just laying a gravel bed (conditioning).<br>▪ Minimise footprint of excavation/dredging activities by considering placing intake and outfall pipelines into the same trench up to a certain depth.<br>▪ Appropriately plan and keep duration of construction activities according to schedule. | Negligible |
| Water Resources (Surface Water and Groundwater)<br><br>Water Desalination Component (Onshore | ▪ Contamination of seawater, surface and groundwater from seepage of domestic or construction wastewater, accidental oil and chemical spillages, and diversion of contaminated rainwater runoff from the construction site | Low | ▪ Implement Effluent Management measures in Section 2.10.1.1.1 and Spill Prevention and Management in Section 2.10.1.1.2 of the PPMP<br>▪ Implement WMP | Negligible |

| E&S Component / Project Component | Potential Impact | Significance | Proposed Mitigation | Residual Significance |
|---|---|---|---|---|
| Facilities/SWRO) and Water Conveyance Component | ▪ Sea water, surface and groundwater pollution with suspended particles, hydrocarbon or chemical substances and organic loads from improper management of the generated wastewater, improper handling and storage of chemicals along with improper management of the generated solid waste | | | |
| Water Resources (Surface Water and Groundwater)<br><br>Water Desalination Component (Onshore and Offshore Facilities) | ▪ Resuspension of sediments that may increase turbidity, pollutant or nutrient levels or decrease oxygen levels from excavations/dredging, trenching, cut and fill, compaction and levelling activities, installation of the intake towers, laying of intake and outfall pipelines | Moderate | ▪ Optimise water abstraction depth.<br>▪ Use turbidity screens (silt curtains) to enclose the perimeter of construction works.<br>▪ If marine works tunnelling of the outfalls (or intakes) is adopted, ensure drill cuttings, drilling muds and excavated materials generated by this operation are screened and contained in a barge for transportation and disposal on-shore in line with WMP provisions on Spoils and Excavation Material in Section 2.10.1.2.1. | Low |
| Water Resources<br><br>Water Desalination Component (Onshore Facilities/SWRO) and Water Conveyance Component | ▪ Overconsumption and depletion of water resources due to overuse | Moderate | ▪ All construction associated wells to have prior approval by the competent national regulatory authorities.<br>▪ Adopt water conservation measures for all activities. | Low |
| Energy Resources<br><br>Water Desalination Component (Onshore Facilities/SWRO) and Water Conveyance Component | ▪ Overconsumption and depletion of fuel due to generators and engines left running idle | Moderate | ▪ Regularly maintain the generators, vehicles, and construction machinery<br>▪ Shut down lighting at site offices during the night<br>▪ Switch off machinery and equipment when not in use<br>▪ Raise awareness among site staff on energy conservation | Low |
| Air Quality<br><br>Water Desalination Component (Onshore | ▪ Exhaust gas emissions, including GHG emissions | Low | ▪ Size equipment used for construction activities appropriately.<br>▪ Use of reusable concrete formwork.<br>▪ Implement Air Emission Control measures (Section 2.10.1.1.3) in the PPMP | Negligible |

| E&S Component / Project Component | Potential Impact | Significance | Proposed Mitigation | Residual Significance |
|---|---|---|---|---|
| Facilities/SWRO) and Water Conveyance Component | ▪ Dust generation from construction machinery and construction activities | Low | ▪ Implement by Air Emission Control measures (Section 2.10.1.1.3) in the PPMP | Negligible |
| **Biological Environment** | | | | |
| Biological Environment<br><br>Water Desalination Component (Offshore Facilities) | ▪ Habitat destruction by excavation works<br>▪ Disruption of haul-out sites of marine mammals or nesting sites of turtles in the landing area | Moderate | ▪ Develop and implement Biodiversity Management Plan (BPM) in line with provisions in Section 2.10.1.4<br>▪ Carefully collect and transplant any corals that might be encountered during the construction works before any construction works commence.<br>▪ Lay the outfall pipeline directly on the seabed as much as possible with minimum excavation and clearance of seabed floor and, if possible, just laying a gravel bed (conditioning).<br>▪ Minimise footprint of excavation/dredging activities by considering placing the intake and outfall pipelines into the same trench up to a certain depth. | Low |
| | ▪ Damage to habitats from contamination by spills or leakages<br>▪ Exposure to residual chemicals that may be present in the discarded wastewater during commissioning | Moderate | ▪ Implement PPMP and WMP. | Low |
| | ▪ Increased turbidity leading to reduced light penetration and increased sedimentation rates (blanketing)<br>▪ Remobilization of nutrients or pollutants from sediments<br>▪ Behavioural responses and temporary habitat loss due to sediment plumes, noise, and vibrations, etc. | Moderate | ▪ Use turbidity screens (silt curtains) to enclose the perimeter of construction works<br>▪ If marine works tunnelling of the outfalls (or intakes) is adopted by the BOT Developer, then the drill cuttings, drilling muds and excavated materials generated by this operation should be screened and contained in a barge for transportation and disposal on-shore on dedicated sites in line with WMP provisions on Spoils and Excavation Material in Section 2.10.1.2.1.. | Low |
| Biological Environment | ▪ Habitat loss and clearance of vegetation cover<br>▪ Introduction of invasive alien species during revegetation | High | ▪ Implement measures for Clearing of Vegetation and Revegetation set out in BMP (refer to 2.10.1.4.4Section 2.9.1.4.4)<br>▪ Implement PPMP, NVMP and WMP | Low |

| E&S Component / Project Component | Potential Impact | Significance | Proposed Mitigation | Residual Significance |
|---|---|---|---|---|
| Water Desalination Component (Onshore Facilities) | ▪ Behavioural disturbance to avifauna during migratory and breeding seasons<br>▪ Constructed prominent features could preclude linkages and movement corridors | | | |
| | ▪ Habitat loss within the routes for vehicles and machineries movement and parking | High | ▪ Develop and implement Traffic and Transport Management Plan (TTMP) in line with Section 2.10.1.7 | Low |
| | ▪ Generation of elevated noise disturbing nearby natural habitats | High | ▪ Develop and implement Noise and Vibration Management Plan (NVMP) in line with Section 2.10.1.6 | Low |
| | ▪ Emissions to air from the vehicles and machineries disturbing nearby species | High | ▪ **2.10.1.1.3)** set out in the PPMP | Low |
| | ▪ Oil spills from machineries on, site lubrication and petrol supply, contamination due to leaks/spills of construction chemicals disturbing marine habitats | High | ▪ Implement Spill Prevention and Management measures (Section 2.10.1.1.2) set out in the PPMP | Low |
| Biological Environment / Water Conveyance Components | ▪ Habitat loss and fragmentation and impact to natural water flow in the intermittent wadis and streams | High | ▪ Avoid the removal of the Acacia, Tamarix and other native tree community and translocation of those unavoidable ones (if applicable) | Low |
| Biological Environment / Water Conveyance Components | ▪ Pollution impact on terrestrial biodiversity | Moderate | ▪ Implement PPMP and WSP | Low |
| Biological Environment / Water Conveyance Components | ▪ Disturbance of natural fauna from noise, vibration and lighting | Moderate | ▪ Implement BMP and NVMP | Low |
| Biological Environment / Water Conveyance Components | ▪ Hunting and active taking of wildlife | Moderate | Implement General Provisions (Section 2.10.1.4.1) set out in the BMP including:<br>▪ Avoid and strictly prohibit wildlife persecution killing, hunting, and all forms of animal and plant collection and active taking.<br>▪ Strictly prohibit tree cutting by the project staff and workers, and apply fines and charges on none-compliance by the staff. | Low |

| E&S Component / Project Component | Potential Impact | Significance | Proposed Mitigation | Residual Significance |
|---|---|---|---|---|
| | | | ▪ Avoid introduction of pets | |
| **Socioeconomic Environment** | | | | |
| Economic Activities / Water Desalination Component (Onshore Facilities/SWRO) and Water Conveyance Component | ▪ Disruption of access to local businesses | Low | ▪ Install temporary structures from excavation sites (mainly roads) to local businesses<br>▪ Inform the residents and shops' owners about construction activities and the planned schedule of works<br>▪ Proper communication and coordination with affected owners | Negligible |
| Land Use and Development Plans / Water Conveyance Component | ▪ Land acquisition economically affecting landowners (no physical displacement is foreseen) | High | ▪ The use of publicly owned land over privately owned land shall be encouraged<br>▪ Ensure fair compensation to affected persons (in case of private owned lands) in line with the LARPF.<br>▪ Develop and Implement Land Acquisition and/or Resettlement Action Plan where needed in line with the LARPF<br>▪ Develop and implement community GRM (Section 2.10.3.3) | Low |
| Noise / Water Conveyance Component | ▪ Nuisance to local residents from sources of noise pollution such as excavators, generators, concrete mixers and other construction machinery and vehicles and from traffic related noise | Low | ▪ Implement NVMP supplemented with a Noise/Vibration Monitoring Program.<br>▪ Inform occupiers of nearby properties prior to commencement of works where relevant, including the duration and likely noise and vibration impacts.<br>▪ Investigate and record noise complaints<br>▪ Implement TTMP. | Negligible |
| Infrastructure / Water Desalination Component (Offshore Facilities) | ▪ Potential destruction of existing offshore utilities such as the gas pipeline and the gas storage ship and/or the phosphate export jetty facilities | Moderate | ▪ Plan and coordinate with relevant authorities and abide by safety exclusion zone set in the detailed design for the protection of the submerged gas pipeline and the phosphate loading/unloading jetty | Negligible |
| Infrastructure / Water Desalination Component (Onshore Facilities) and Water Conveyance Component | ▪ Generation of different types of solid waste and domestic wastewater<br>▪ Potential disruption and/or destruction in utilities (electricity network, water supply network and telecommunication services) | Low | ▪ Repair any damage to people and property caused by the execution of the works or the procedures used for execution<br>▪ Develop and implement procedures to manage, rectify, and record any incidents related to utilities damages or community disturbances in line with Section 2.7.2 | Negligible |

| E&S Component / Project Component | Potential Impact | Significance | Proposed Mitigation | Residual Significance |
|---|---|---|---|---|
| | | | ▪ Plan and coordinate with other contractors and the municipality to avoid disruption to utilities and underground infrastructure.<br>▪ Integrate response to damage to infrastructure within the EPRP.<br>▪ Implement PPMP provisions on effluent management (Section 2.10.1.1.1) and WSP | |
| Traffic and Transport / Water Desalination Component (Offshore Facilities) | ▪ Potential alteration in ship mobility patterns due to construction activities | Low | ▪ Coordinate with the relevant authorities in Aqaba especially for traffic movement in restricted cases.<br>▪ Set up flags and light signals as agreed with navigational authorities to alert maritime traffic.<br>▪ Limit construction activities and marine traffic restrictions.<br>▪ Implement TTMP (integrating marine traffic management and restricted zones, if any)<br>▪ Strictly adhere to international standard best practice measures related to navigation and safety. | Negligible |
| Traffic and Transport / Water Desalination Component (Onshore Facilities) and Water Conveyance Component | ▪ Traffic congestion due to construction activities<br>▪ Traffic delays due to the closure of certain streets | Moderate | ▪ Implement TTMP | Low |
| Public Health and Safety / Water Desalination Component (Onshore Facilities/SWRO) and Water Conveyance Component | ▪ Accident and injuries to public because of rehabilitation activities<br>▪ Health risks to the public from the generated dust and noise<br>▪ Traffic accidents and injuries | Low | ▪ Develop and implement a Health and Safety Management Plan (HSMP) (Section 2.10.1.5)<br>▪ Implement EPRP and TTMP<br>▪ Implement community GRM<br>▪ Ensure close coordination with relevant authorities in Aqaba and implement an exclusion zone in place surrounding the footprint of construction activities at sea.<br>▪ Mark routing of pipelines with buoys so that any obstruction to marine navigation and traffic is avoided.<br>▪ Strictly adhere to international standard best practice measures related to navigation and safety, including management of vessel movement via AIS | Negligible |

| E&S Component / Project Component | Potential Impact | Significance | Proposed Mitigation | Residual Significance |
|---|---|---|---|---|
| Occupational Health and Safety<br><br>Water Desalination Component (Onshore and Offshore Facilities/SWRO) and Water Conveyance Component | ▪ Health risks from exposure to dust and noise and construction related accidents<br>▪ Injuries to workers working at confined spaces<br>▪ Health problems from natural environmental challenges such as extreme cold conditions, heat stroke or snake bites<br>▪ Traffic accidents and injuries<br>▪ Risk of spreading of communicable and infectious diseases (such as sexually transmitted diseases (STDs), Influenza and Covid-19) | Moderate | ▪ Implement a HSMP<br>▪ Keep record of health and safety incidents on site | Negligible |
| Occupational Health and Safety<br><br>Water Desalination Component (Offshore Facilities) | ▪ Risk of drowning while working on construction of the offshore facilities. | Moderate | ▪ Implement HSMP provisions on buoyancy equipment and PPEs (Section 2.10.1.5.13) | Negligible |
| Labour Influx and General Labour Conditions<br><br>Water Desalination Component (Onshore Facilities/SWRO) and Water Conveyance Component | ▪ Social tension between local and foreign workers<br>▪ Culturally insensitive behaviour by workers | Low | ▪ Implement and abide by Labour Conditions (Section 2.10.3.2)<br>▪ Develop and train staff on Code of Conduct to be signed by all staff and enact a monitoring system to ensure compliance such that noncompliance leads to sanctions and possibly termination<br>▪ Implement community GRM and worker GRM (Section 2.10.3.2.7) and respond to culturally insensitive behaviour and incidents as a matter of priority<br>▪ Coordinate and implement worker influx plan inclusive of community liaison to deal with the local population and minimize friction caused by contacts between the construction workforce and communities | Negligible |
| | ▪ Gender discrimination and gender-based violence and harassment (GBVH) | Low | ▪ Implement and abide by Labour Conditions<br>▪ Training of staff on Code of Conduct and raising awareness on GBVH<br>▪ Implement community and worker GRMs and respond to culturally insensitive behaviour and incidents as a matter of priority | Negligible |

| E&S Component / Project Component | Potential Impact | Significance | Proposed Mitigation | Residual Significance |
|---|---|---|---|---|
| | ▪ Recruitment of minors | Low | ▪ Prohibit the recruitment of minors in any hazardous activity and abide by Labour Conditions on Child Work (Section 2.10.3.2.6)<br>▪ Abide by national legislation and ILO convention on employment of minors | Negligible |
| | ▪ Increase demand/pressure on health services | Low | ▪ Coordinate with local health facilities to ensure availability of health services within area of work | Negligible |
| Cultural Resources<br><br>Water Conveyance Component | ▪ Unknown artifacts may be uncovered during the excavation activities. | Low | ▪ Develop and implement Chance Find Management Plan (Section 2.10.1.8) | Negligible |
| | ▪ Disruption of nearby sites from construction activities that are source of vibration and dust<br>▪ Effects of Al Hijaz Railway cultural site | Low | ▪ Implement PPMP and NVMP.<br>▪ Leave a15-m buffer zone around each site | Negligible |

### 2.9.5. Environmental and Social Mitigation/Management Provisions during Operation

Table 2-5comprises the overarching environmental and social mitigation/management provisions for the AAWDC Project technical components which shall be integrated into the BOT Developer's OESMP related to the operation phase of the Project to ensure environmental and social welfare protection and legal compliance.

*Table 2-5: Environmental and Social Mitigation during Operation*

| E&S Component / Project Component | Potential Impact | Significance | Proposed Mitigation | Residual Significance |
|---|---|---|---|---|
| **Physical Environment** | | | | |
| Soil and Geology / Water Desalination Component (Onshore Facilities) and Water Conveyance Component | ▪ Deterioration of soil quality from accidental spills from fuel, oil and other chemicals used for the maintenance and operation of the conveyance pipe or the PSs<br>▪ Soil pollution due to improper disposal of domestic and office waste as well as improper discharge of domestic wastewater at the various facilities | Low | ▪ Develop and implement PPMP (Section 2.10.2.1) including provisions for Effluent Management (Section 2.10.2.1.1) and Spill Prevention and Management (Section 2.10.2.1.2)<br>▪ Develop and implement by WSP (Section 2.10.2.2) | Negligible |
| Coastal and Marine Environment / Water Desalination Component | ▪ Brine plume may sink to the seafloor and may cause an increase in pore water salinity due to diffusion<br>▪ Increase in ambient seawater salinity at the mixing zone<br>▪ Large volumes may affect circulation and mixing processes in the discharge area<br>▪ Sinking of the brine plume and seafloor spreading<br>▪ Potential enrichment of nutrients, organic matter, pollutants, or trace metals<br>▪ Residual chemicals and heavy metals (if present in the concentrate due to corrosion) may accumulate in sediments at the discharge site<br>▪ Discharge of antiscalants may bind nutrients and ions dissolved in seawater<br>▪ Sedimentation and accumulation of coagulants in sediments<br>▪ Potential change in water circulation by open intakes when large volumes of water are extracted<br>▪ Direct discharge of acidic/alkaline solutions may affect ambient pH in the mixing zone | Low | ▪ Abide by design practices and criteria as presented in Section 2.9.2.2 for seawater abstraction and brine discharge | Negligible |

| E&S Component / Project Component | Potential Impact | Significance | Proposed Mitigation | Residual Significance |
|---|---|---|---|---|
| | ▪ Detergents or complexing agents if used and discharged with the brine may interfere with natural processes of dissolved constituents of seawater (e.g., metals | | | |
| Water Resources / Water Conveyance Component | ▪ Wadis and groundwater pollution from accidental spills during maintenance activities or from the improper disposal of domestic wastewater and solid waste generated from the offices | Low | ▪ Implement Spill Prevention and Management measures in the PPMP | Negligible |
| Energy Resources / Water Desalination Component and Water Conveyance Component | ▪ Depletion of non-renewable energy resources such as fuels used for power generation<br>▪ Increase in the fiscal burden on the country as fuel is imported | High | ▪ Regular maintenance of stand-by generators and pumps<br>▪ Ensure energy efficiency in all Project related operations | Moderate |
| Air Quality / Water Desalination Component and Water Conveyance Component | ▪ GHG and other air emissions from transport methods related to Project operations | High | ▪ Proper coordination of transportation of workers, materials, and waste.<br>▪ Considering options for construction crew transport to Project sites<br>▪ Maintain Project vehicles such that generated atmospheric emissions do not exceed threshold emission values set out in national regulations or international recognised standards including those of the EIB/USAID | Moderate |
| | ▪ GHG emissions and other air emissions due to the significant power demand for the operation of the SWRO and PSs | High | ▪ Regular maintenance of stand-by generators and pumps<br>▪ Ensure energy efficiency in all Project related operations and at all Project sites | Moderate |
| **Biological Environment** | | | | |
| Marine Biodiversity / Water Desalination Component | ▪ Entrainment of macro flora spores, invertebrate larvae, fish eggs and early stages through open intakes<br>▪ Impingement of nektonic species through seawater intake | Moderate | ▪ Abide by Seawater Intake Recommendations in Section 2.9.2.2 | Low |

| E&S Component / Project Component | Potential Impact | Significance | Proposed Mitigation | Residual Significance |
|---|---|---|---|---|
| Marine Biodiversity / Water Desalination Component | ▪ Potential change in moving fish species abundance and diversity in the discharge site<br>▪ Decline of algae stands and seagrass meadows due to increased salinity<br>▪ Potential toxicity to benthic species and change in abundance and diversity due to Increased salinity<br>▪ Loss of nutrients availability needed for plant growth due to binding with discharged antiscalants | Moderate | ▪ Abide by the Brine Discharge Recommendations in Section 2.9.2.2 | Low |
| Terrestrial Biodiversity / Water Desalination Component and Water Conveyance Component | ▪ Loss of habitat or loss of feeding and nesting grounds due to increased noise levels | High | ▪ Design and implement NVMP (Section 2.10.2.5) and BMP (Section 2.10.2.3) | Low |
| Terrestrial Biodiversity / Water Desalination Component | ▪ Wildlife killed or affected due to exposure to hazardous substances from accidental spillage or leakage | High | ▪ Abide by provisions related to hazardous substances and waste in the PPMP, WMP and BMP.<br>▪ Upon occurrence of leaks/spillage, rehabilitate impacted site its original condition and monitor post leakage impacts on wildlife. | Low |
| Terrestrial Biodiversity / Water Conveyance Component | ▪ Contamination of the biological habitat by spills or leaks of chemicals and lubricants causing deleterious impact on wildlife | High | ▪ Abide by Spill Prevention and Management provisions in PPMP.<br>▪ Upon occurrence of leaks/spillage, rehabilitate impacted site to its original condition and monitor post leakage impacts on wildlife. | Low |
| **Socioeconomic Environment** | | | | |
| General Labour Conditions / Water Desalination Component and Water Conveyance Component | ▪ Social tension between local and foreign workers<br>▪ Culturally insensitive behaviour by workers | Low | ▪ Abide by national labour legislation and Labour Conditions specified in Section 2.10.3.2<br>▪ Implement Code of Conduct for workers and ensure that workers sign and understand the Code of Conduct<br>▪ Develop and implement a GRM and respond to culturally insensitive behaviour and incidents as a matter of priority | Negligible |

| E&S Component / Project Component | Potential Impact | Significance | Proposed Mitigation | Residual Significance |
|---|---|---|---|---|
| | | | ▪ Purchase materials and supplies required for O&M from local suppliers and businesses when possible | |
| | ▪ Gender discrimination and GBVH | Low | ▪ Implement and abide by Labour Conditions<br>▪ Training of staff on Code of Conduct and raising awareness on GBVH<br>▪ Implement community and worker GRMs and respond to culturally insensitive behaviour and incidents as a matter of priority | Negligible |
| | ▪ Recruitment of minors | Low | ▪ Prohibit the recruitment of minors in any hazardous activity and abide by Labour Conditions on Child Work (Section 2.10.3.2.6)<br>▪ Abide by national legislation and ILO convention on employment of minors | Negligible |
| Noise / Water Desalination Component and Water Conveyance Component | ▪ Disturbance to the local community from the noise generated from operation of PSs at the SWRO and along the conveyance pipeline | Moderate | ▪ Implement NVMP<br>▪ Develop and implement TTMP (Section 2.10.2.6)<br>▪ Use and maintain plant and equipment pursuant to the manufacturer's specifications<br>▪ Investigate and record noise complaints. | Low |
| Traffic and Transportation / Water Desalination Component and Water Conveyance Component | ▪ Traffic congestion during maintenance activities | Low | ▪ Implement TTMP | Negligible |
| Occupational Health and Safety / Water Desalination Component and Water Conveyance Component | ▪ Worker exposure to risks of accidents, injuries and health impacts associated with working in confined spaces or exposure to chemicals and drowning (for the offshore facilities).<br>▪ Risk of spreading of communicable and infectious diseases (such as Influenza and Covid-19) between workers in offices. | Moderate | ▪ Develop and implement HSMP (Section 2.10.2.4) | Negligible |

## 2.10. Supplementary Plans and Conditions for the ESMP

Supplementary to Sections 2.8.3 to 2.8.5 above related to the Project ESMP E&S mitigation provisions, which the BOT Developer shall incorporate in the CESMP and OESMP on the basis of the AAWDC Project's detailed design, the following sections aim at providing overarching principles for the supplementary plans that shall be developed and form integral part of these ESMPs.

### 2.10.1. Construction Plans, Mechanisms and Procedures

#### 2.10.1.1. Pollution Prevention Management Plan

The BOT Developer shall develop a PPMP as part of the CESMP and will be applicable to all Project construction sites. The following sections describe the various topics and conditions that shall be included in the PPMP.

##### 2.10.1.1.1. Effluent Management

The PPMP shall include measures for the management of effluents, defined as liquid discharges transporting a pollutant (dissolved, colloidal or particles), including infiltration, that are generated at Project Areas. A pollutant is a given chemical compound at a concentration greater than the limit value established for that compound according to national regulations and/or international recognised standards including those of EIB and USAID.

If no recognized threshold exists for a chemical compound, the BOT Developer shall provide proof that the concentrations of the chemical in effluents released (discharged) to the environment are harmless to it and to humans.

No effluent generated during construction shall be discharged into water courses or bodies including the marine environment nor to ground surface or infiltrated into subsoils, without prior treatment and without monitoring quality of the treatment's performance to guarantee the absence of pollution in the effluent. Effluent discharge and flow rates into natural water bodies will be managed to control erosion and sediment load (refer to Section 2.10.1.3).

All sources of effluents and outlets to the natural environment shall be listed, located, characterised (flow, expected quality, discharge frequency) and reported.

An Effluent Quality Monitoring Report shall be submitted on a monthly basis during construction, including documentation for each effluent discharge point comprising the following: (a) average flow rates of discharged effluents, (b) discharge frequencies and durations over the month, and (c) the physical and chemical quality of the effluent discharged, for the conformity with set parameters and limit values.

**Wastewater**

Appropriate measures shall be taken to ensure that discharges of any process wastewater, sanitary wastewater, wastewater from utility operations or stormwater to surface water or seawater does not result in contaminant concentrations in excess of local ambient water quality criteria or, in the absence of local criteria, other sources of ambient water quality.

Adequate sanitation facilities shall be set up for the workforce. Domestic wastewater shall either be discharged to the sewage network (if any), to the on-site Domestic Wastewater Treatment Plant at the Desalination Plant site, or to septic tanks. The condition of the septic tanks shall be checked regularly and accumulated sludge pumped out and disposed to an appropriate regulated facility off-site as per the national regulations. The operation of the on-site Domestic Wastewater Treatment Plant at the Desalination Plant site shall be closely monitored for treated effluent legal compliance pursuant to national legal provisions. Discharge of untreated wastewater or sludge to the sea, streams or wadi beds shall not be permitted.

All excess construction water shall be discharged downstream of construction works. Domestic wastewater and other effluent discharges shall only be permitted where the discharge quality and location conform to the national regulations.

**Rainwater and Run-off**

Run-off consists of rainwater flow on the surface or the soil and other technical surfaces at Project Areas. Provisions for drainage through all Project worksites and accommodation camps shall be included in the PPMP. These will include measures to ensure that surface water run-off is contained and managed appropriately. Such provisions shall prevent flooding of the sites and the resulting contamination of the surrounding environment.

The natural flow of unpolluted rain and spring water along all rivers, streams, wadis, wadi openings and alluvial fans shall be maintained throughout the construction period.

In case of pollution suspicion (e.g., through to contact with chemicals or waste storage areas), all runoff shall be treated before discharge.

Suspended solids in rainwater shall be removed using sediment traps or settling ponds. Whereas rainwater from vehicle parking areas, machinery areas, workshops shall be subject to treatment with oil interceptors.

Any rainwater pre-treatment units shall be sized, cleaned, maintained and accessible to ensure compliance with the effluent quality criteria set out in national regulations and to allow for monitoring of performance.

#### 2.10.1.1.2. Spill Prevention and Management

The BOT Developer shall identify all potential spill source areas, such as loading and unloading, storage, and processing areas, places where dust or particulate matter is generated, and areas designated for waste disposal. The BOT Developer shall also evaluate the spill potential for any Project stationary facilities, including manufacturing areas, warehouses, service stations, parking lots, and access roads. The PPMP shall define material and waste handling procedures and storage requirements and outline actions necessary to reduce spill potential and impacts on seawater, surface water or groundwater quality.

All platforms where generators, hydrocarbon storage tanks and refuelling stations are installed shall have impervious and chemical resistant surfaces, are drained separately and are equipped with an oil removal treatment (oil-water separator) to prevent pollution. For concrete batching plants, run-off shall be drained to a settling basin, where the pH is buffered.

Vehicle/machinery and equipment operations, maintenance and refuelling shall be carried out to avoid spillage of fuels and lubricants and ground contamination. An “oil interceptor” shall be provided for wash-down and refuelling areas. Fuel storage shall be located in proper bunded areas.

Fuel and hazardous chemicals/materials shall be stored in designated areas, except for quantities generated or required for the daily construction activities. Fuel, oil, or hazardous materials required to be temporarily stored onsite will be stored within secondary containments located at least beyond 100m from any watercourse or the sea.

Fuel and hazardous chemical storage areas shall not be allowed within 50 m of a minor watercourse, within 100 m of a major watercourse, within a floodplain or where there is the potential for spilled fuel and chemicals to enter groundwater through soil percolation.

All fuel and hazardous chemical storage facilities shall be located on flat or gently sloping ground and should be contained within a bund designed to contain at least 110% of the total capacity of the storage containers plus 10% of the aggregate tank volume within the containment area or 20% by volume of the chemical waste stored or as otherwise specified by national regulatory requirements. The bund walls and floor shall be constructed of concrete with appropriate coating protection for corrosion or other suitably impermeable material. The filling connection must be within the bund. No drain valves or other connections through the bund walls should be permitted. Tanks shall be fitted with a gauge to allow the fill level to be monitored during refilling and preferably with a high-level alarm.

Oily water discharges shall not be permitted. Provisions shall be made so that that oil, chemicals, and other contaminants stored on Project worksites and accommodation camps are properly stored, isolated and bunded, with secondary containment of adequate volume where appropriate, to prevent leakage or spillage to the sea, soil, wadis, and groundwater.

All hydraulic equipment shall be laid on percolation preventive surfaces.

For the marine works, there shall be equipment on site to contain and absorb fuel at sea:

- Containment-absorbing boom: long enough to circle the largest vessel at least one and a half times.
- At least a set of absorbent pillows.
- At least a set of absorbent cloths.

Any event of a failure or oil spillage at sea and on the coast shall be reported to the competent authorities (ASEZA, MoEnv, Maritime Authorities) and the oil shall be contained and absorbed immediately. Any other measures shall be avoided (such as the use of chemicals) without the prior approval of the competent regulatory authorities.

Turbidity screens (silt curtains) shall be used to enclose the perimeter of construction works in order to keep the impacted area footprint as minimal as possible and avoid the dispersion of suspended solids generated during the excavation/dredging works.

A regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors shall be implemented at all Project worksites.

#### 2.10.1.1.3. Air Emission Control

Air emissions refer to any discharge into the air of solid substances, aerosols, gases, radiation, or energy, whether point sources (e.g., stacks) or diffuse (e.g., fugitive dust emissions from road use by trucks).

Equipment and vehicles shall be used and maintained so that generated atmospheric emissions are not in excess of the threshold emission values set out in national regulations or international recognised standards including those of the EIB and USAID.

The fleet of vehicles or equipment emitting combustion gases shall be maintained at the intervals and according to the methods specified by the manufacturer.

The maintenance records for the fleet of vehicles, machinery, and equipment shall be recorded.

The PPMP shall describe the road sections designated for the application of dust suppression agents and the methods and frequencies programmed. Where it is deemed that dust is impacting or may have an impact on human, plant, or animal receptors or where dust may cause sedimentation of watercourses/water bodies or unacceptable levels of soil loss, water shall be applied to the area creating the dust and consideration shall be given in implementing other dust control measures such as using windbreaks, netting screens or semi-permeable fences; controlling vehicle speeds to reduce traffic-induced dust dispersion and resuspension by setting and enforcing speed limits. This shall include posting speed limit signs in sensitive areas; ensuring trucks hauling sand, dirt or other loose materials are covered (sheeting trucks); suspending topsoil stripping and replacement during strong winds; using a dust collection system for bulk materials unloading; wet suppression (as needed, depending on the soil type) in the dry season, where unpaved roads and/or the working strip is located < 200 m from settlements taking appropriate abatement measures.

When storage, transport and handling of bulk materials is made in the open air and exposed to the wind, the necessary dust abatement measures shall be implemented.

#### 2.10.1.1.4. Documentation, Procedures and Training

Detailed description of practices and procedures that will be used to prevent spills and other emergencies from occurring shall be included in the PPMP. These procedures shall provide for employee training, inventory monitoring, inspection, secondary containment, etc. and shall include:

- Worksite site characterization comprising the following information:
  - Site data description inclusive of location, and nearby businesses or residences, site plan showing location of storage areas for hazardous materials/waste, location of storm drains, yard drainage, wadis, etc.
  - Products/Materials Lists comprising the types and amounts of hazardous materials stored at the particular worksite/facility site (wastes and products).
  - Emergency Contacts List of individuals who should be contacted in the event of a spill or other emergency. This list should include all relevant management and site personnel, police, fire, health department personnel, clean-up contractors, chemical treatment/disposal companies, and other local agencies and authorities, as necessary.
- Response actions comprising the following information:
  - Denomination of person(s) who will be responsible for responding to spills and notification of emergency response teams.
  - Description of equipment and material located on-site to be used in spills' response as well as marking of the location of said response equipment and material.
  - Description of plans for evacuation of employees and third parties.
  - Detailed description of procedures that will be followed in responding to emergency situations.
- Audit and Review Procedures
- Communications and Reporting Procedures

- Personnel Training Requirements/Procedures

Moreover, the PPMP shall clearly document the locations of spill response equipment and procedures to be used and ensure that procedures are clear and concise. The plan shall include step-by-step instructions for the response to spills and also identify individuals responsible for implementing the plan, define safety measures to be taken with each kind of hazardous material/waste, specify how to notify appropriate authorities, such as police and fire departments, hospitals, or municipal sewage treatment facilities for assistance, set out procedures for containing, diverting, isolating, and cleaning up the spill, and describe the spill response equipment to be used, including safety and clean-up equipment.

An outline but concise PPMP shall be posted at appropriate points at all Project worksites. In addition, the PPMP shall be evaluated and updated on semester basis by the BOT Developer along the duration of construction.

Training is necessary to ensure that all worksite personnel/operations personnel are knowledgeable enough to follow the procedures outlined in the PPMP. The BOT Developer will be responsible for making equipment and materials for clean-up readily accessible, and for marking them clearly so that site personnel/operations personnel can follow procedures quickly and effectively.

#### 2.10.1.2. Waste Management Plan

The BOT Developer shall develop a Waste Management Plan (WMP) as part of CESMP, detailing the amount and type of waste that will be produced at Project sites and how this waste will be reduced, reused, recycled, or disposed of. The WMP shall be updated during the construction phase at semester basis to record how waste is being managed and to demonstrate that any materials which cannot be reused or recycled are disposed of at a legitimate site and in a manner pursuant to the Jordanian regulations and international best practice, as well as EIB and USAID E&S standards.

The WMP shall take into consideration the following measures:

- Avoid unnecessary and/or prolonged solid waste accumulation especially at the tidal zone, the beach front, and other sensitive areas.
- Whenever waste accumulation, prolonged storage or use of area close to the water (tidal zone) is unavoidable, reduce disposal of waste, leakage of leachate and blocking of water courses.
- Restore areas used as temporary storage grounds immediately after the completion of the construction activities.

Waste shall be categorised according to the following definitions:

- Non-hazardous solid waste generated at construction and/or decommissioning sites including excess fill materials from grading and excavation activities, scrap wood and metals, and small concrete spills. Other non-hazardous solid waste include office, and household waste when these types of operations are part of construction project activities.
- Hazardous solid waste including contaminated soils, which could potentially be encountered on-site due to previous land use activities, or small amounts of machinery maintenance materials, such as oily rags, used oil filters, and used oil, as well as spill clean-up materials from oil and fuel spills.

##### 2.10.1.2.1. Spoils and Excavation Materials

Spoils and excavation materials shall be managed in line with the Construction Methods Plan (refer to Section 2.9.3). Whenever cut materials are not suitable to be used for filling, the BOT Developer shall identify a final destination site that is neither ecologically sensitive nor important. Conducting an ecological assessment of this site is a prerequisite and shall be approved by the relevant authorities.

If marine works tunnelling of the outfalls (or intakes) is adopted, then the drill cuttings, drilling muds and excavated materials generated by this operation shall be screened and contained in a barge for transportation and disposal onshore on dedicated sites approved by the relevant authorities. Marine disposal of such material shall be prohibited.

All measures shall be taken on board the vessels that will perform/assist the marine/coastal works to prevent marine pollution as set out in national laws and regulations and EIB/USAID E&S standards.

The workspace in the coastal environment shall be reduced to the minimal operational area and time required.

On the coastal part, the workspace and the access thereto shall not use concrete, asphalt, or any other permanent sealing material.

Spoils excavated for the establishment of trenches for the pipelines shall be backfilled into the trench and the excess spoil shall be spread out and re-profiled along the length of the pipeline route.

No dumping of spoil or any other type of waste in the surrounding environment or at any location other than to sites approved by the competent national authorities will be allowed and after actions have been taken to assess and minimize the effect on the environment and public health.

Large quantities of concrete or bentonite slurries shall be mixed in enclosed/shielded areas.

Bentonite slurry or similar debris generated from pile driving or other construction activities shall be disposed of to avoid overflow into surface water bodies or at sea or form mud puddles in the works area.

On completion of the laying of marine pipelines, any temporary launching plant shall be dismantled and the scaffolding removed so that no waste will be left on the seabed and on the coast. Furthermore, all necessary actions shall be taken to rehabilitate the coastline, by the transfer of sand from where it is accumulated (if it is accumulated) to the place where it is recessed (if it is recessed). The necessary actions shall also be taken to rehabilitate the coast by blurring of signs of excavation, cleaning and levelling the sand and any additional actions required by national laws and regulations.

On completion of construction works, efforts shall be made to restore the situation to its original state including the dismantling of all temporary roads and installations.

All dust generating materials transported to and from the construction worksites shall be covered by sheeting.

The wheels of vehicles leaving the worksites shall be cleaned so that dirt and mud is not spread on surrounding roads.

The following shall be implemented to the extent possible/practicable:

- Minimize storage time of spoils stockpiles.
- Align stockpiles to prevailing wind to minimise surface area exposed to wind erosion.
- Minimize stockpiles height and use gentle slopes and compact stockpile surfaces.
- Store materials away from the site boundary and downwind of sensitive receptors.
- Minimize height and fall of excavation materials during handling.
- Minimize cutting and grinding on site.
- Equipment and techniques shall be used such as dust extraction to minimise dust. A wet cutting saw or the use of vacuum extraction shall be considered.

In the event that excavation spoil materials are encountered with detectable levels (above natural background) of radiation from concentrations of naturally occurring radioactive ores (such as Uranium Oxide, deposits of which have been found in other parts of Jordan), the Radiation Protection Directorate within the Jordan Nuclear Regulatory Commission shall be notified, and suitable spoil handling, storage and disposal measures shall be developed and applied accordingly.

#### 2.10.1.2.2. Non-hazardous and Domestic Waste

Specific measures that have to be implemented to achieve waste reduction and to maximise reuse and recycling of waste materials shall include segregation and storage of different types of waste in different containers or stockpiles and provision of separate labelled bins for collection of aluminium cans, plastics and waste paper. Wood, steel and other metals shall be separated from construction and demolition waste, to enable its re-use and/or recycling.

Proper storage and site practices shall be employed to reduce the potential for damage or contamination of construction materials; and ordering and stocking of construction material shall be carefully planned to avoid unnecessary generation of waste.

General waste shall be transported directly to the nearest local and approved landfill for final disposal. If no landfill area exists nearby and providing a suitable location can be found to avoid transporting the waste over long distances, consideration may be given in coordination with the Project Promoter to establish a Project associated landfill site. In this event, the landfill design and operation shall meet international standards (e.g., EU Landfill Directive) and be undertaken pursuant to the national planning and permitting requirements, and in close liaison with the competent regulatory/permitting agencies.

Local recycling companies shall be contacted to arrange for the recycling of as many waste types as possible.

The following materials may be collected separately for recycling from each Project worksite and accommodation camps: ferrous metal (construction sites only), non-ferrous metals (construction sites only), wood (construction sites only), plastic bottles (all sites), waste oils (all sites where vehicles are based), and paper/cardboard (all sites).

#### 2.10.1.2.3. Hazardous Waste

The WMP shall ensure prevention of the generation of significant amounts of hazardous waste through good management and control actions. Waste reduction shall be achieved by careful planning and design, as well as by ensuring the implementation of good site practices.

The WMP shall comprise detailed procedures for working with chemical products and hazardous materials and handling hazardous waste.

Hazardous materials are those that pose a potential risk to human health or the environment and include cleaning chemicals, solvents, and fuels.

Any hazardous waste generated at any of the Project worksites and camps shall be temporarily stored safely and securely for later disposal. Hazardous wastes shall be handled to avoid potentially dangerous incidents due to escape of the waste or mixing of incompatible waste. No hazardous waste shall enter the non-hazardous waste stream.

Storage areas for hazardous waste shall be clearly labelled and used solely for the storage of hazardous wastes; have adequate ventilation; be covered to prevent rainfall entering (water collected within the bund), and be arranged so that incompatible materials are appropriately separated.

Should the hazardous waste management be conducted by third parties, they must be reputable and accredited in Jordan for this activity, such that the waste shall be disposed at the MoEnv operated Hazardous Waste Facility at Swaqa, should the type of hazardous waste indeed be accepted at this facility. The capability and track record of waste collectors shall be assessed and confirmed in coordination with the competent regulatory authorities prior to the appointment of any such sub-contractors.

Containers used for the storage of hazardous wastes shall be suitable for the substance they are holding, resistant to corrosion; maintained in a good condition, and securely closed; display a label in Arabic and English to state clearly the nature of the waste, any hazards which it may pose, contact numbers of persons that can provide additional information in the case of an emergency, and display any international hazard warning sign as appropriate.

Hydrocarbons, lubricants, paints, solvents, and batteries shall be transported in drums to suitable waste management facilities.

Any contaminated land encountered during construction works shall be dealt with in compliance with the relevant regulations and in agreement with the competent regulatory authorities. All contaminated land, whether existing, or as a result of spills or leakage during construction, must be treated/disposed in a manner approved by the competent national regulatory authorities.

Vehicles carrying hazardous waste to be labelled appropriately. If hazardous waste is mixed with non-hazardous waste, the entire mix will be considered and handled as hazardous.

All transportation vehicles shall be equipped with suitable materials or equipment to contain, handle, and remove accidental spillages.

#### 2.10.1.2.4. Other Provisions

No organic waste shall be used for backfilling. Original material shall be used as far as possible, supplemented by approved inert material where necessary.

The open burning of any waste, hazardous and non-hazardous, at construction sites, permanent Project sites or workers' accommodation camps shall be prohibited.

Hazardous and non-hazardous waste shall be securely transported from the point of arising to storage facilities and from there to treatment or disposal facilities to avoid spillages, windblown litter, and other potential environmental issues. The following precautions should be observed:

The type, material, and integrity of transport packaging and containers shall be appropriate to the type and class of waste being transported.

Transportation vehicles shall be appropriate for the type, class and quantity of waste being transported in terms of its composition, load capacity, need for covering, etc.

Strict loading and unloading procedures shall be followed to avoid any waste loss.

Each worksite shall have one or more staff with responsibility for implementing the waste management procedures detailed in the WMP.

The WMP shall be disseminated to all Project worksites and camps and to all subcontractors working on the Project Areas.

All personnel shall be trained in proper waste management procedures as appropriate to their level of responsibility and duties. This includes training in concepts of site cleanliness and good housekeeping, and on appropriate waste management procedures, including waste reduction, reuse, and recycling under the waste management hierarchy.

A waste register shall be established since the mobilisation of the construction works and maintained throughout construction duration. This register shall record all waste management operations from production through to collection, transport, treatment, and final disposal. The following aspects should be documented in this register: Type of waste; Waste quantities; Name and address of the third-party waste management facilities receiving waste or parties taking possession of the substances no longer considered as waste; Name and address of waste transport Contractors; Planned waste treatment; Final disposal locations.

The WMP shall be structured to include at minimum the following contents:

1. Introduction
   - *Project Description*
   - *Purpose of the WMP*
   - *Scope of Application of the WMP*
   - *Terms and Definitions*
2. Involved Parties, Roles and Responsibilities
   - *Client*
   - *Principal Contractor*
   - *Principal Designer*
   - *Sub-contractors*
   - *Materials Suppliers*
   - *Waste management contractors*
3. Regulatory Framework
   - *Waste Management Principles*
   - *Jordanian Legislation*
   - *International Standards (EIB, USAID)*
4. Implementation Schedule of the WMP
5. Determination of Types of Waste
   - *Construction and demolition waste*
   - *Excavated materials*
   - *Hazardous waste*
   - *Non-hazardous waste*
6. Estimation of Waste Generation
7. Waste Management Procedures
   - *Waste Prevention and Minimisation*
   - *Preparation for Reuse*
   - *Recycling*
   - *Other recovery*
   - *Disposal*
   - *On-site waste management*
   - *Off-site waste management*
8. Monitoring, Reporting, and Control Procedures
   - *Waste Register*
   - *Documentation for Waste Transportation*
   - *Reporting*
   - *Audit and Control*
   - *Quality Monitoring*
9. Review and Updating Procedures
10. Personnel Training Requirements/Procedures

#### 2.10.1.3. Erosion and Sediment Management Procedures

Erosion and sediment control shall be taken into consideration from the beginning of the construction phase through development and implementation of the Erosion and Sediment Management Procedures.

Earthworks shall be planned and the management of space should be optimised to ensure that all cleared surfaces and areas exposed to soil erosion are minimised on all Project Areas.

The appropriate locations and the type of erosion control measures required shall be determined.

Covers shall be used to prevent erosion from exposed heaps of chemicals.

As far as practicable, erosion matting shall be installed to provide an immediate protection for slopes against erosion, prevent the washing-out of seeds and enhance the micro-climatic conditions in the soil for plant growth. Erosion matting is used to provide temporary protection of the soil surface until sufficient natural vegetation cover has been established.

#### 2.10.1.3.1. Borrow Pits and Quarries

Operation of a new borrow area on land, in a river, or in an existing borrow pit area, shall be subject to prior approval by the competent national regulatory authorities, and the operation shall cease if so instructed. Borrow pits shall be prohibited where they might interfere with the natural or designed drainage patterns. River locations shall be prohibited if they might undermine or damage the river banks, or carry too much fine material downstream.

It shall be ensured that all borrow pits used are left in a tidy condition with stable side slopes and are drained ensuring that no stagnant water bodies are created, which could breed mosquitoes.

Rock or gravel taken from a river shall be far enough removed to limit the depth of material removed to one-tenth of the width of the river at any one location, and not to disrupt the river flow, or damage or undermine the river banks.

The location of potentially required crushing plants shall be subject to the approval of the competent national regulatory authorities, and not be close to any environmentally sensitive areas or to existing residential settlements and shall be operated with approved fitted dust control devices.

#### 2.10.1.3.2. Earthworks

Earthworks shall be properly controlled, especially during any heavy rainfall periods.

Cut and fill slopes shall be maintained stable at all times and the least possible disturbance should be caused to areas outside the prescribed limits of the works.

Cut and fill operations shall be completed to final cross-sections at any location as soon as possible and preferably in one continuous operation to avoid partially completed earthworks, especially during rainfall.

To protect any cut or fill slopes from erosion, in accordance with the drawings, cut off drains and toe-drains shall be provided at the top and bottom of slopes. Cut off drains shall be provided above high cuts to minimize water runoff and slope erosion.

Any excavated cut or unsuitable material shall be disposed of in designated tipping areas pursuant to the approval of the competent national regulatory authorities.

Tips shall not be located where they can cause future slides, interfere with agricultural land or any other properties, or cause soil from the dump to be washed into any watercourse or at sea.

Drains may need to be dug within and around the tips, as directed by the competent national regulatory authorities.

Topsoil is the uppermost and most fertile portion of the soil (unless indicated otherwise, the top 25 centimetres), containing organic matter, seeds and nutrients that promote vegetation growth. Its presence is a key factor in promoting revegetation success. Consequently, preserving topsoil is a key component of revegetating worksites and restoring the soil's ability to protect itself against erosion. The following basic principles of good topsoil management shall be observed:

- Topsoil shall be removed from working areas only when absolutely necessary. Areas subject to topsoil stripping will be identified prior to any grading activities.
- Any plant, turf layer or root mass shall be stripped together with the topsoil, except in case of wetlands where the turf will be stripped separately from the topsoil layer where practical. Topsoil shall be removed using backhoes.
- Topsoil shall be stored in a manner enabling its reuse during the rehabilitation of any Project Areas.

#### 2.10.1.3.3. Sediment Control

**Marine Works**

In case cutter suction dredging will be applied, then the material shall be cut and sucked onto the dredger into a hopper, and the material from the hopper shall be further deposited next to the trench or at a designated site onshore or offshore (pursuant to permits to be issued by ASEZA and MoEnv). When the intake/outfall pipelines are laid, then the dredger shall collect the deposited materials and shall distribute them over the pipelines / trenches as backfill. The overall area where dredging is performed shall be cordoned off with silt curtains around it and close to the trenches to contain any plumes of suspended solids generated from the dredging and backfilling activities.

In case backhoe dredging will be applied, then the trenching shall be done by a long reach excavator and the material shall be deposited to the side of the trench or to a floating hopper barge alongside the trench (pursuant to permits to be issued by ASEZA and MoEnv). When the intake/outfall pipelines are laid, then the stored materials on the side of the trenches shall be deposited by the excavator back over the pipelines and trenches. Similarly, silt curtains shall be deployed around the perimeter of dredging to avoid sediment migration and control the spread of suspended solids plumes within the confined area of the marine works. The amount of dredged materials shall be planned and then managed in a manner so that what is to be dredged and then ultimately reused for the backfilling of installed intake/outfall pipelines.

During backfilling, provisions shall be taken so that the same sediments are put back onto the seabed from the bottom back on the top surface (i.e., with potential marine fauna and flora).

It shall be ensured that the amount of seabed dredging is kept to the required footprint and volume.

It shall be ensured that the footprint of temporary sediment storage is kept as minimum as practicably possible and to near-by locations considered as less sensitive or low quality in terms of dwelling species (e.g., any corals or seagrasses).

It shall be ensured that dredging activities take place outside the spawning period of corals (noted that corals in the Gulf of Aqaba spawn repeatedly every year on the full moon during June and July). The most appropriate season for dredging activities shall be assessed and selected, e.g., early spring / late autumn so that winter storms and summer upwelling is avoided and subsequently sediment plume extent is reduced.

Dredging activities for the routing of the intake/outfall systems shall avoid as practicably as possible any spots of healthy corals. If this is not technically feasible considering the physical constraints of the target marine location (e.g., space left in between the phosphate loading jetty and the submerged gas pipeline), then any corals found in the path of the pipelines shall be carefully removed and transplanted on the basis of the approved Corals Transplantation Protocol under the supervision of ASEZA. In addition, the BOT Developer shall promote artificial reef development around the marine infrastructure, such as along the pipeline route, around the intake structures.

**Inland Works**

Sediment control barriers shall be installed to slow the flow of water and control sediment transport at Project Areas with (a) a gradient of more than 20%, and (b) where land is disturbed by the works or where stockpiled mineral material is exposed to sheet or rill erosion.

Sediment control barriers shall be installed on the slope or at the base of the slope to protect the natural drainage system from sediment accumulation at levels higher than the natural situation. These barriers shall comply with the following principles:

- Made with geotextiles or straw bales or any other means pursuant to the Project specifications.
- Deployed before the start of works and removal of topsoil. Barriers can be used for the physical demarcation of working areas.
- Installed, cleaned, maintained, and replaced according to manufacturer recommendations.
- If applicable, the drainage surface area not to exceed 1,000 m² per 30 m of barrier. The length of the slope behind the barrier shall be less than 30 m, and not to be used for flows in excess of 30 l/s.

#### 2.10.1.3.4. Backfilling and Stockpiling of Backfill Materials

In case mineral material stockpiles exceed a height of 6 m, with a maximum slope of 3:2 (height: volume), the slope shall be crossed at a height of 3 m by a berm with a minimum width of 2 m and with a peripheral drainage trench, to ensure stability and resistance to rainwater runoff erosion.

For permanent backfill material stockpiles, the stockpile shall be shaped and compacted every 30 cm to ensure long-term stability.

Temporary stockpiles in place for more than 60 days shall be protected against runoff erosion by (a) revegetation using fast growing grass species, either by direct seeding or by hydro-seeding, or (b) using other natural anti-erosion cover according to the Project specifications.

Side casting during the construction of linear structures (roads, pipelines, transport lines) shall be permitted under the following conditions:

- For natural gradients with a slope < 40%, the side cast materials are piled to create a slope of less than 2H:1V.
- For natural gradients with a slope > 40%, to ensure stability, 3m wide berms will be installed perpendicular to the slope and onto which the side cast material is deposited. Regular earthworks to maintain the form of the side case and long-term stability of the side cast is carried out. The slope of the side cast in general does not exceed 3H:2V.

#### 2.10.1.3.5. Site Rehabilitation

All Project Areas and landscapes disturbed by the works shall be rehabilitated to their original condition where possible upon completion of construction and prior to commissioning. Close collaboration with all statutory stakeholders will be conducted in cooperation with the Project Promoter during the reinstatement.

The planned rehabilitation and/or revegetation works shall be described in the CESMP. These shall comprise methods, plant species to be used and their origins, activity schedule based on a progressive commissioning of Project Areas.

As a minimum, the following reinstatement activities shall be undertaken:

- All construction areas/yards shall be checked for spills of substances such as oil, paint, chemicals, other types of waste, and these shall be cleaned up.
- Any temporary services, e.g., chemical toilets shall be removed.
- Surfaces shall be checked for waste products from activities such as concreting/asphalting and cleared accordingly. All surfaces hardened due to construction activities shall be ripped and concrete/asphalt material removed.
- Fences, barriers, and demarcations associated with the construction areas footprint shall be removed from the sites.
- All residual stockpiles must be removed from the sites.
- Any quarries used for sourcing construction materials shall be rehabilitated accordingly.
- Any damages that the construction works has caused to neighbouring properties must be repaired.
- All temporary buildings, campsites, and free standing and underground structures (e.g., piping, underground tanks, sumps, and basins) shall be removed.
- All waste and rubble shall be removed and disposed of in accordance with the provisions set out in the WMP (refer to Section 2.10.1.2).

After removal of buildings structures and rubble, Project Areas shall be returned to their original condition, according to the following provisions: (a) land is levelled to ensure that run-off water drains without eroding soil or stagnating in pools; (b) rehabilitated Project Areas do not represent hazards for people. Areas near steep drops at quarries are fenced off and indicated with permanent concrete warning signs. Holes are refilled. Sharp or unstable items are rendered inoffensive. The use of a geotextile cover is particularly important where there is a slope, or where the soils are likely to remain exposed for any period of time while the new vegetation establishes itself; (c) All Project Areas disturbed by the works shall be revegetated if vegetation was cleared at the commencement of works. Topsoil must be replaced back to disturbed surfaces and used to revegetate disturbed areas (refer to Section 2.10.1.4), and (d) Exceptions related to restoration to the original state may be accepted where, after consultation with the competent national authorities and stakeholders, a decision is made to hand over a certain facility (for example a road, a well, or a building) to be maintained for the use of the local population.

#### 2.10.1.3.6. Site Conditions Documentation

The changes in condition of all Project Areas from the start of works until the completion of works and commissioning shall be documented. Documentation shall comprise dated and geo-referenced colour photographs taken from a constant angle and viewpoint.

Site conditions shall be documented at the following stages at minimum:

- Before any Project Area disturbance at the start of works.
- On completion of works, but prior to starting rehabilitation.
- On completion of rehabilitation and revegetation, if necessary.

The CESMP shall specify (a) the list of viewpoints to be used, (b) the areas to be photographed, and (c) the methods used for taking and archiving photographs, according to industry photographing and archiving standards.

Adjacent areas (100 m from the perimeter of the Project Areas) shall be also included in photographic documentation.

### 2.10.1.4. Biodiversity Management Plan

As part of the CESMP, a BMP shall be prepared and implemented taking into consideration the measures described in this section.

Based on the detailed design and final project routing, a constraints map shall be developed, showing the areas where sensitive, endangered, or breeding species are known to occur, including protected areas, sites of importance for nature conservation, wildlife refuges, nature and national parks, important bird areas. Seasons for the protection of birds and wildlife shall be identified.

#### 2.10.1.4.1. General Provisions

Where clearing is required for permanent works, for approved construction activities and for excavation operations, local geomorphology, natural drainage systems and natural vegetation shall be conserved and protected from the resulting damage to the extent possible.

Changing the morphology, the local drainage systems and clearing of flora shall be prohibited outside the proposed project construction zones and corridor.

Throughout all Project areas, the following shall be implemented:

- Avoid changing topography within large wadis and runoff areas.
- Avoid and strictly prohibit wildlife persecution, hunting, and all forms of animal and plant collection and active taking.
- Strict prohibition off-road driving, strict prohibition of shooting and active taking of animals and birds, active enforcement of relevant hunting regulations
- Strict prohibition of tree cutting by the project staff and workers, and applying fines and charges on none-compliance by the staff.
- Avoid unnecessary removal of native vegetation and wood collection by workers within the designated corridor are avoided and prohibit beyond the corridor.
- Avoid introduction of pets
- Avoid unnecessary excavation and off-road driving and utilize existing roads instead of making new ones whenever possible.
- Surround open trenches with a fence that prevents small animals falling in.
- Avoid blasting as much as possible
- Minimize land levelling and destruction of existing habitat by identifying early machinery movement routes and excavated material accumulation areas.

After work completion, all work areas shall be rehabilitated, smoothed and graded in a manner to confirm the natural appearance of the surrounding landscape (refer to Section 2.10.1.3.5).

All construction personnel shall adhere to the following:

- Not approach, injure, hunt, capture, possess, feed, transport, rear, or trade wild animals and/or collect birds' eggs within the Project Areas.
- Not collect flora or fauna species on the Project Areas.

- Be informed and aware of the importance to protect species, habitats, fauna, and flora and about wildlife encounter procedures. Provided information and awareness training shall be documented.

Excavations shall be protected with temporary fencing to prevent injury to animals and any trapped uninjured animals shall be released immediately. Whereas any injured endangered and/or larger animals shall be reported to the Construction Supervision Consultant if appointed who will inform the Project Promoter and the competent national authorities.

Regarding habitat loss/degradation and habitat fragmentation the following measures shall be taken:

- Permanent infrastructure shall be sited on unused land of no particular ecological value.
- No construction materials shall be taken from the surrounding environment unless otherwise specified in the respective management plan.

Best construction site practices shall be adopted to minimize the risks of adverse effects on neighbouring habitats/species from the Project construction activities (dust, noise, waste disposal, etc.). This shall include appropriate sanitation, drainage, and litter collection facilities at workers camps pursuant to the CESMP and national regulations.

Invasive Alien Species (IAS) shall not be introduced in Project Areas. All construction machinery imported from overseas shall be inspected to detect IAS and washed before dispatching to the Project Areas. Where necessary, IAS control procedures (e.g., physical removal, slashing, mulching, herbicides, etc.) shall be developed. The methods to be used to control or prevent such species shall not cause adverse impacts on the environment or communities.

#### 2.10.1.4.2. Protected Areas

Sensitive areas, including Important Bird Areas and existing and proposed protected areas, and other areas identified as particularly sensitive in the ESIA study shall be protected as follows:

- Apply nature conservation legislation, including restrictions related to protected areas.
- Confine vehicles as well as vessels to identified access corridors. No off-path trips shall be permitted and speed limits shall be observed.
- Restrict night work and use of lights both onshore and offshore.
- Minimize or avoid contact with birds
- Provide construction staff and workers with orientation as to the sensitivity of the area and specific ecosystems and training to minimize disturbance or damage.
- Restricting the number and size of worksites and campsites required to the minimums necessary.
- Ensure selection for the project offices and camp locations that avoid biodiversity sensitive areas or sites that might require substantial modification of the natural landscape and morphology.
- Implement forest fire prevention methods.
- Preserve the trees and shrubs in the side wadis, wadi mouths and alluvial fans around the worksites.
- Avoid breeding, feeding, and nesting sites of endangered species.
- Avoid disturbance of unique vegetation assemblages mainly sand dunes and granite scups and alluvial fans that harbor Acacia woods in the southern segments where they occur.
- Avoid the removal of the Acacia, Tamarix and other native tree community and translocation of those unavoidable ones (if applicable) in coordination with related authorities including the Ministry of Agriculture, the Royal Society for the Conservation of Nature, the Ministry of Environment and Aqaba Special Economic Zone Authority.

#### 2.10.1.4.3. Marine Environment

Any corals found in the routing of intake/outfall pipelines shall be carefully collected and transplanted based on the Corals Transplantation Protocol and Plan as approved by ASEZA. In addition, the BOT Developer shall promote artificial reef development around the marine infrastructure, such as along the pipeline route, around the intake structures

Any sensitive species such as corals and seagrasses shall be protected against sediments plumes and potential blanketing through sediment control measures (refer to Section 2.10.1.3.3).

To limit the risk of introducing marine invasive species, ballast water and anti-fouling systems of vessels arriving from other bioregions shall be controlled in accordance with International Maritime Organization (IMO) conventions and guidelines.

#### 2.10.1.4.4. Clearing of Vegetation and Revegetation

Areas cleared prior to undertaking earthworks shall be shown on a plan with a minimum scale of 1:10,000. Physical demarcation of zones shall be undertaken ahead of any clearing activities commencement. Trees and areas to be cleared shall be marked precisely so that clearing is undertaken without damage to adjacent non-cleared areas. Topsoil shall be stored within the cleared areas at the edge of the cleared zone. Clearing should be undertaken through working from the edge of the zone inwards.

The works, including the opening up of the right of way and other worksites (e.g., camps, access roads, storage yards, etc.) may require vegetation clearance in work areas. Vegetation includes crops, trees, shrubs, bushes, grasses, and other minor vegetation. The construction staff shall be trained in the controlled felling of trees to prevent impacts beyond worksites. They shall be also trained on the importance of identification and preservation of wild fauna encountered and disturbed during the stripping operation.

The BMP shall describe the planned methods and schedule for vegetation clearing and considering that clearing of vegetation should be only limited to that which is strictly necessary to the construction activities.

Vegetation clearing using chemicals shall not be permitted.

Vegetation clearing using bulldozer shall not be permitted in zones less than 30 m from areas designated as sensitive, or as set out in national pertinent regulations, where only manual clearing shall be authorised.

Where possible, any cutting of vegetation on steep hillsides shall be minimal.

Where it is not possible to restrict the timing of construction practices, vegetation shall be cleared outside breeding periods of relevant species so that works can carry on into this period unhindered.

The felling of trees shall be avoided to the extent possible. Fallen trees may be used for building gabions, if required for land stabilization. Vegetative material shall not be used for construction purposes and shall be stockpiled at the edge of worksites.

During clearing, tree trunks shall be stockpiled differently as per their diameter to large ones and smaller ones including also branches, leaves, stumps, and roots.

Burning of cleared vegetation shall not be permitted. Areas of gathered plant material shall be separated to prevent flames spreading in the event of a fire.

The removed vegetation shall be placed far from surface water bodies. Large woody debris shall be stored along the outside edge of worksites in clear areas. Small twigs, branches and pieces of vegetation may be used for composting along with biodegradable waste generated in the camps and worksites areas pursuant to national regulations.

Final disposal of excess materials from vegetation clearing activities shall be undertaken pursuant to the WSP and national regulations.

Revegetation, where and when required, shall be undertaken gradually throughout the duration of construction works, as required, and not to be limited to the rehabilitation of Project Areas at completion of the works.

The species to be used for revegetation must be suitable for the local environmental conditions, and selected according to the rehabilitation program purposes i.e., stabilisation of backfill, landscaping, drainage, prevention of erosion, etc. and in line with the Permitted Species List for each Project Area as defined during the detailed design. Non-native species shall not be introduced to the area during revegetation and landscaping.

Fertiliser application shall be limited to areas where it is necessary to establish a rapid vegetative cover for erosion control purposes in areas of high risk. Any fertiliser applications must be formulated and performed so that natural nutrient balances in adjacent ecosystems are not altered, particularly where there are nearby water bodies.

Routine maintenance of revegetated areas shall be undertaken.

Noxious weeds and invasive species within revegetated areas, if found, shall be controlled.

### 2.10.1.5. Health and Safety Management Plan

Based on a risk assessment to be conducted, the BOT Developer shall develop a HSMP as part the CESMP, which shall identify and specify the following:

- All health and safety risks relating to the execution of the Project works, including gender-specific risks;
- Prevention and protection measures to control risks related to the execution of the works/operations, by differentiating, where necessary, measures concerning the protection of women and men;
- Human and material resources required;
- Works requiring a permit (e.g., blasting, working at height, working in confined spaces, etc.); and
- Emergency plans to be implemented in the case of an incident or accident.
- Training of staff.

The BOT Developer shall ensure efficient and effective H&S communication and consultation with all personnel involved in the Project Areas construction activities. This includes but is not limited to toolbox meetings prior to the start of the works, worksite H&S meetings on a regular basis with all parties involved (including subcontractors, the Construction Supervision Consultant if appointed and third parties).

The BOT Developer shall ensure that supervision, directly in charge of construction activities, fully brief and discuss with personnel at H&S Toolbox Talks at the start of each work day and prior to commencing new activities. These talks should be conducted in Arabic. A checklist shall be utilised for this purpose. At a minimum it shall include the following: Nature of the job; Associated hazards; Safe working methods to be adopted; Requirements of the Permit to Work.

Adequate training shall be provided to all employees working on Project worksites who may be exposed to harmful substances and situations. Employees shall be trained to prepare for the work to be done, including knowing what the hazards are at the site, learning how to use the PPE needed to perform tasks safely, understanding the work practices that will reduce risks, using safe engineering controls and equipment, and recognizing the signs that may indicate overexposure to a hazard.

#### 2.10.1.5.1. Safety and Security

The BOT Developer shall evaluate the security strategy and arrangements required for all worksites including transport. This evaluation shall be performed by qualified security experts and should form the basis for the Worksite Security Strategy and Plan which shall be submitted as part of the HSMP. The Security Strategy and Plan shall describe:

- Security risks and the identified mitigation / management measures
- Roles and responsibilities including details of the EPC Contractor and Subcontractors
- Detection, monitoring and management procedures
- Escalation plans including resources

The facilities and equipment used by the BOT Developer shall be installed, maintained, revised, inspected, and tested pursuant to the manufacturer's recommendations. The recommendations shall be available in an appropriate language.

To safeguard local community members and the public, A Community Health and Safety Plan shall be developed as part of the HSMP and include the following:

- Fence the construction area from all sides to prevent access to the site
- Prohibit unattended/unauthorized public access
- Install proper fence marked by red warning lights at night around excavations, material dumps or other obstructions at the construction sites (especially along the proposed roads where the conveyance pipeline will be installed)
- Install warning signs for drilling and construction at the external part of the site and at a distance of 100 meters
- Equip Project drivers with telephones for contacting the emergency services to enact the EPRP if necessary in case of emergency.
- Keep Project stakeholders informed of the Project (in particular its schedule) and monitor stakeholder engagement
- Manage the grievance mechanism through which community members can make complaints about Project activities

- Address potential increase demands on local health facilities from in-Project migration arising from the construction workforce and support to health facilities located in the Project area (e.g. in terms of infrastructure, equipment, staff or financial/running costs)
- Conduct influx management forums throughout the construction phase with the local communities to identify their experiences and concerns of impacts
- Information dissemination and education programmes regarding safety awareness around construction sites and traffic as well as sanitation and hygiene, particularly in schools in the area of the Project

The Community Health and Safety Plan shall cross reference with other relevant management plans such as the TMP and EPRP. Local health care and emergency services should be consulted in the development of the plan.

#### 2.10.1.5.2. Excavations / Trenching

Construction sites workers and associated inspection staff are frequently required to work in or around excavations and trenches. Hazards related to excavation and trenching operations include entrapment, suffocation, gas explosion, electrocution, and striking by heavy equipment.

A H&S Officer shall be assigned and trained to identify all existing and predictable hazards associated with the excavation or trench, including identification of soil types, and be authorized to take corrective action to eliminate hazards.

A written instruction on excavation safety shall be developed to ensure compliance with existing safety standards. Components of said instruction shall include the following:

- Notification of the Project Promoter and competent authorities when locating underground utilities according to the national legislation.
- Determination of location of any underground utilities.
- Consideration of confined-space atmosphere potential.
- Selection of proper soil protective systems and personal protective equipment and clothing.
- Determination of soil composition and classification.
- Assessment of surface and subsurface water problems.
- Determination of depth of excavation and duration of work.
- Training and supervision of all relevant workers.

The H&S Officer shall be onsite and ensure the safety instruction is followed by the dedicated worker(s) and in close cooperation with the supervisor of the excavation related tasks. Daily and periodic inspections of the excavation and trench site(s) shall be conducted and documented. Such inspections should be conducted before every shift, after a rain event, or any other event that increases hazards.

Soil testing shall be undertaken on freshly excavated samples from the worksite. This testing determines the soil type and points to the type of soil protective system that should be used. The three basic protective systems involve sloping and benching, shoring, and shield (trench boxes). It is noted that most fatal cave-ins occur on small jobs of short duration, such as service connections and excavations for drains and wells. Often the public perception is that these jobs are not hazardous enough to require safeguards against collapse. However, unless the walls are solid rock, entrance to trenches deeper than 1.2 meters, if not properly sloped, shored, or protected by a trench box shall not be undertaken.

Procedures and basic operating principles for safely carrying out excavation works shall be as described in the following paragraphs.

All excavation activities on Project worksites shall be controlled by a work permit. Key safety issues relating to the inherent risk involved in excavation shall be identified in the work permit and appropriate controls and protection measures put in place before excavation works are carried out.

Excavations shall be supported or battered back where necessary to prevent collapse. Ongoing review and inspection of supports shall be undertaken to ensure that any unauthorized removal and alterations of supports and braces are identified and rectified. Careful excavator operation shall be done in and around supports to prevent striking damage.

All overhead hazards (e.g., utility lines) shall be supported or removed as appropriate.

Excavated spoil/stockpile heaps shall be located well back from the edge of the excavation works. A general rule is to keep the spoil as back from the edge of the excavation at least the distance that the excavation is deep. The storage of materials close to the edge of excavated areas shall not be permitted.

Excavated areas require edge protection to prevent falls. Secured ladders shall be used for excavation access and climbing on excavation supports shall not be permitted.

When vehicles are operating in the vicinity of an excavation, e.g., trucks tipping for backfilling, the use of stop blocks or the establishment of berms/curbing to prevent vehicles driving into excavations shall be sought. Signs and barricades shall also be erected to protect workers from vehicular traffic.

Excavations shall be checked daily before entering for any change in condition which may make the excavation unsafe, e.g., after a heavy rainfall, changes in support and shoring, etc.

When working in and around excavations, workers shall always wear the appropriate personal protective equipment (PPE), never jump across excavations, and never throw tools or materials down to someone into an excavated area. A means of egress from the excavation or trench with a ladder, ramp, or stairs should be provided and appropriate lateral travel distance and anchorage at the top shall be ensured.

Testing for a hazardous atmosphere shall be carried out daily if potential for such a hazard exists.

Excavation machinery shall be checked regularly before use. Items to be considered include:

- Coupler assembly, free of debris and material; check for any damaged or cracked components.
- General check for any missing parts or components, oil leaks, distressed welds, etc.
- Check of safety, lynch and mounting pins, locks and nuts; ensure they are in good condition, not bent or worn, and functioning correctly.
- Check of blocking arm and bar components and operation.
- Check of all the hydraulic hoses, couplings, fittings.
- Check of all grease points; ensure maintenance scheduling is carried out
- Check of lights, flasher beacons, mirrors, etc.

In operating excavation machinery, the following precautions shall be considered:

- Never carry passengers.
- Keep watch for potential hazards, overhead cables, people and machines.
- If outriggers and supports are available, they should be used.
- Ensure safety pins are always fitted with quick hitch buckets.
- Always ground bucket before leaving the machine.
- Do not leave the machine unattended unless switched off, parked, and fully locked.

Storing of spoil piles shall be practiced in appropriate distance from the side of an excavation (at least 1.5 to 2 meters from the edge).

Rescue teams shall be alerted to the location of the excavation or trench.

#### 2.10.1.5.3. Confined Spaces

Construction sites workers are exposed to possible injury or fatality when entering in works areas considered to be confined spaces. A confined space is defined as a place that (a) is partially or fully enclosed, (b) is not both designed and constructed for continuous human occupancy, and (c) where atmospheric hazards may occur because of its construction, location, or contents, or because of work that is done in it. All three criteria have to be met before a space is defined as a confined space. general construction confined spaces involve excavations, vaults, and caissons. These spaces are large enough for a worker to enter, have restricted means of entry or exit, and may present hazards related to atmospheric conditions, engulfment, configuration, or any other recognized serious safety hazard.

Atmospheric testing with direct-reading instruments shall be conducted before a confined space is entered. In addition, before an entry is allowed to any staff, a written entry permit must be completed and posted at the confined space location. In many situations, power ventilation equipment may be used to ensure adequate oxygen levels are maintained and toxic contaminants are not above permissible exposure levels.

Any work carried out in a confined space shall be controlled by work permit. All personnel working in a confined space are required to be specifically trained to work in this environment.

The H&S Officer shall verify that the permit issued complies with the works plan before every shift. The duration of an entry permit shall not exceed the time required to complete the task. Entry permits shall be understood by everyone involved in the job and must be readily available to every person entering the confined space. At a minimum, the entry permit shall include:

- The location and description of the confined space
- A description of the work
- A description of the hazards and the corresponding controls
- The time period for which the entry permit applies
- The name of the attendant
- A record of each worker who enters and leaves
- A list of the equipment required for entry and rescue and verification that the equipment is in good working order
- The results of the atmospheric testing when required
- Additional control measures if, e.g., hot work is to be executed.

The safety of workers working in confined spaces shall be protected through identification and proper marking.

Considering that confined spaces are usually below ground and require stair / ladder entry, the necessary fall protection devices shall be provided to be commensurate to job tasks being performed. Full-body harnesses, ladder safety systems, tripods and hoists are among the more important fall protection equipment frequently used.

Although the use of fall protection devices can prevent serious injury, good housekeeping is also necessary for removing slipping or tripping hazards.

Rescue procedures shall be in place prior to the entry and a minimum of one trained attendant shall always remain outside the confined space to monitor the worker who has entered the confined space. Workers shall be adequately trained and equipped with the required safety equipment before the work is conducted.

Physical hazards from mechanical equipment shall also be locked out to ensure worker safety. Valve pits or manholes that may be flooded by water or other fluids shall be rendered safe prior to entry.

If work is performed on elevated tanks, additional fall-protection procedures shall be followed pursuant to the national H&S regulations.

When workers are exposed to air contaminants, such as sandblasting materials, welding fumes, or paint solvents, additional air monitoring and explosive hazards controls shall be taken pursuant to the national H&S regulations.

#### 2.10.1.5.4. Working at Height

Construction work often exposes people to hazards from working at height. Such works involve for instance:

- Steel workers erecting the steel framework of a building.
- Scaffolders erecting or striking (taking down) a scaffold.
- Roofers cladding the roof of a steel-framed building.
- Demolition workers dismantling machinery on the roof of a building.
- Welders working at the side of a deep excavation.
- Pipe fitters fixing pipework to the ceiling in a factory workshop.
- Painters painting a lamp-post or a steel-span footbridge.

Many of these tasks will involve the use of some form of access equipment (e.g., scaffolding or ladders) and those using this equipment are usually familiar with and used to such work, which can lead to complacency. Other workers may not be so used to these tasks at height, and lack competence.

The main risks associated with work at height are (a) the worker falling from height and (b) an object falling from height onto someone below.

All work at height shall be assessed.

Any work carried out at height shall be controlled by work permit. All personnel working at height are required to be specifically trained in such working positions.

Good design shall be adopted, not only of the existing structures or materials to be worked on, but design and strength/stability of the access equipment used, and the design of the task itself.

Work at height shall be planned in advance, with careful consideration given to the selection and use of work equipment. A pre-work permit is required.

If adverse weather such as icy, rainy, or windy conditions greatly increases the risk of working at height (e.g., carrying a wide roof sheet in high wind), the work shall be postponed until conditions are satisfactory.

Emergency procedures shall be in place to cover reasonably foreseeable circumstances, e.g., deployed fall arrest, in order that people can be rescued. The selected rescue method shall be proportionate to the risks in place.

Workers shall receive adequate training and instruction to appreciate the inherent dangers of working at height as well as the service and correct use of preventive and protective equipment. The following information shall be provided to the workers and implemented during work at heights:

- Where possible, avoid work at height and carry out work from an existing spot of work.
- Ensure safe access and egress to work face.
- Provide a safe working platform with guardrails, fences, toe boards, etc., that are strong enough to prevent a fall. Where this is not possible, provide properly installed personnel equipment such as rope access or boatswain's chairs. If this is not possible and a worker can approach an unprotected edge, provide equipment which will restrain or arrest falls, e.g. safety harnesses or safety nets.
- Provide isolation and barricading in areas where required.
- Ensure safe ladders use by:
- Prohibit extended use of ladders in lieu of working platforms.
- Check equipment before use (no splits or cracks in stiles and rungs, none be missing or be loose).
- Remove defective ladders from site.
- Do not position ladders in the place where it can be struck by passing vehicle or where it can be knocked by a door or window.
- Only use ladders when other platforms have been explored but not able to be used.
- Only work on ladders in short durations.
- Set ladders on a firm base and leaning at the correct angle. One (out) to Four (up) ratio is acceptable.
- Tie ladders at the top and extend a safe distance (1 m or 3 rungs) above the landing height.
- Stake the base of the ladder to prevent slipping.
- Clean footwear from excessive mud/soil before climbing the ladder.
- Always face the ladder when climbing; always have three points of contact on the ladder at all times.
- Do not overreach from the ladder; always move the ladder to the new work face.
- Ensure safe use of harnesses by:
- Harnesses shall only be considered as a last option after platforms, mobile towers, scaffolding, and where no other fall restraint is available.
- Harness equipment must be fully inspected before use. Include wedding, leather, checking for cuts, cracks, tears, tears, abrasions, and damage. Check hooks and karabiners and all stitching.
- Wet equipment and harnesses shall be hung to dry naturally.
- Confirm a firm and secure anchorage points and lines (best above head height). All anchorages shall be installed by a competent person and checked by the Health and Safety Officer.
- Do not tie, loop, or place the harness lanyard near small or sharp items during use, this could mean the lanyard fails in the event of a fall situation.

Users shall be trained in harness use by the Health and Safety Officer.

Established rescue/emergency procedures shall be in place.

Ensure proper use of mechanical elevated work platforms (scissor hoists, cherry pickers, crane baskets) by:

- Checking the machine is the correct type for the task intended.
- Ensuring trained operators are in place for the machinery in use.
- Not using the machine as a crane or have it overloaded.
- Providing regular inspection and testing, check before use of the machine.
- Ensuring the machine is set up on firm ground with all support legs fully extended where applicable.
- Operating well away from overhead services.
- Ensuring that workers on platforms are wearing harnesses.
- Ensuring the lanyard is just long enough to provide free movement within the confines of the platform.
- Not allowing material waste and rubbish to build up on platform.
- Ensuring tools are secured to the working platform.
- To prevent falling materials/objects:
- Not stacking materials near edges, and particularly unprotected edges.
- Close boarding of working platforms to minimise the gaps between scaffold boards or placing sheeting over the boards so that material cannot fall through.
- Avoiding carrying materials up or down ladders, etc., by using hoists and chutes to move materials.
- Preventing materials from falling by using physical safeguards such as toe boards and brick guards.
- Where a risk remains, use physical safeguards to prevent falling objects hitting people below, e.g., debris netting, fans (wooden shielding angled to catch debris) and covered walkways (tunnels).

**Scaffolds**

Falls from scaffolding may result in severe injuries and/or fatalities. Therefore, personnel involved in the design, installation, and inspection of the scaffolding systems for the Project shall be competent in the type and complexity of the scaffold system to be used.

Any scaffold system shall be formally inspected at least once a week to ensure it remains in safe condition. Each scaffolding and ladder shall be marked with the appropriate scaff tag, indicating inspection dates and whether scaffolding/ladder is safe for use. Scaffolds that are not completed or not safe to be used shall have a red tag with a clear ‘No Entry’ sign.

Procedures and basic operating principles for safe design, installation and ongoing use of scaffolds shall be, but not limited to, as follows:

***General***

- Scaffolders shall install guard rails, decking and ties as soon as possible when erecting.
- Appropriate PPE must be worn by scaffolders.
- Screening may be required to protect the surrounding areas.
- Screening material shall be suitable for the conditions and fixed correctly to withstand windy conditions.
- Scaffold shall be adequately protected against vehicle collision.
- Scaffolding shall not be overloaded. Material loads shall be distributed around the support standard bearing members.
- Walking space shall be allowed on platform where materials are also stacked.

***Foundations/Base***

- Scaffolding shall be on suitable foundations and stable against subsidence (level, compacted, cable of all loads).
- Each supporting standard shall be supported by a base plate and then a sole board (indicative guide on sizing, base plate 15 x 15 x 0.6 cm, sole boards 50 x 200 x 3.8 cm).
- Each supporting standard shall be centered on the base plate and sole board.

***Geometry***

- All standards shall be vertical.
- All ledgers and guardrails shall be horizontal.

- All transoms shall be horizontal.
- All standards, ledgers and guardrails shall be staggered.

***Bracing***

- Braces shall start from ground and extend to top platform at 45 degrees.
- All platforms shall have an appropriate width (70 cm minimal).
- All platforms shall be secured against uplift or horizontal movement.
- Platforms shall have toe/kick boards, at a minimum height of 15 cm, fixed to the scaffold
- All lap planks shall be tied/cleated.
- Gaps in the platforms shall not be more than 5 cm.
- The platforms shall be no more than 30cm away from the work face. If so an internal guardrail is required.
- Access to Platforms
- Appropriate access shall be provided to every working platform.
- Ladders shall be secured top and bottom.
- Ladders shall be positioned at a 4 to 1 ratio.
- Ladders above the second lift shall be located within the scaffold frame.

***Ties***

- Ties shall be placed every 4 to 5 m horizontal and vertically.
- Ties shall be staggered every second floor lift.

***Guardrails***

- Guardrails shall be installed on all platforms.
- Height of guard rails shall be between 90 – 110 cm.
- Platforms shall have a mid-rail.
- Internal guard rail shall be installed if platform is further than 30 cm away from work face.

***Raking Members***

- Raking members shall be connected to the standards.
- Raking members shall have a horizontal tube connected back to the scaffolding.

#### 2.10.1.5.5. Hot Works

Hot works is one the main causes of site and/or facility fires. Hot work is a temporary operation involving open flames or producing heat and/or sparks. The sparks, welding slag, open flames, and hot surfaces can ignite nearby combustibles, starting what could become an uncontrollable fire. A fire in a hidden area can often go unnoticed until it is well established, spreading and causing needless destruction to nearby equipment and materials as well as neighbouring private properties.

A formal permit to authorize hot work shall be in place related to all operations such as cutting, welding, brazing, grinding, soldering, or any other activity that produces an ignition source.

The permit shall require that trained fire watchers maintain constant fire watch of the work area during the hot work and for at least one hour after work is completed.

The permit shall be only valid for the single job and should expire at the end of the shift or on completion of the fire watch.

To the extent possible, all potential fire hazards from hot work areas shall be removed.

Guards shall be used to confine the heat, sparks, and slag, and to protect the immovable fire hazards.

Welders and other hot work personnel shall wear PPE, including eye protection, helmets and/or hand shields, and other protective clothing.

Appropriately rated fire extinguishing equipment shall be kept in the area, in a state of readiness for instant use.

All hollow spaces, cavities, or containers shall be vented to allow air or gases to escape before preheating, cutting, or welding.

Welding cable and other equipment shall be placed so that it is clear of passageways, ladders, and stairways.

Hot work shall be never conducted in the presence of explosive atmospheres (mixtures of flammable gases, vapours, liquids, or dusts with air), or on a metal partition, wall, ceiling, or roof with a combustible cover.

Cutters or welders and their supervisors shall be suitably trained in the safe operation of their equipment, the safe use of the process, and the use of appropriate PPE.

#### 2.10.1.5.6. Materials Handling

Construction sites workers have to undertake tasks including various materials-handling activities. These activities include manual lifting and the operation of cranes, hoists and powered industrial trucks. Workers can be at risk of collisions with moving parts and equipment, strain or injury from exertion or improper techniques, and other injuries.

Any work carried out that requires manual or mechanical lifting shall be controlled by work permit.

Workers shall be properly trained to operate various types of materials-handling equipment. When cranes or hoists are used, a trained operator shall be at the controls and all aspects of equipment inspection, maintenance, and operation procedures shall be followed to ensure safety. Proper rigging for lifting shall be ensured to prevent the load from shifting during the lift. When planning the lift, the operator shall be trained to understand the characteristics of the load, including weight, dimensions, center of gravity, and the hazardous/toxic nature of material in the load.

Operators shall also review the rigging to ensure slings and other devices are sufficient to support the load and attach it to the hook. During the lift, safe clearances shall be maintained and workers shall stay clear of the loads.

Periodic inspections of all operating mechanisms, hydraulic lines, hooks, ropes, chains, and related electrical apparatus shall be documented. Any damaged or defective equipment shall be immediately tagged and removed from service. All repairs and adjustments to this equipment shall be performed by well-trained and certified workers.

Procedures and basic operating principles related to lifting shall be, but not limited to, as follows:

**Tower Crane**

All tower crane erection, commissioning and maintenance shall be carried out by registered/licensed (in accordance with national authorities and laws) and experienced professional industry practitioners. Documented evidence shall be obtained confirming the suitability, experience, and expertise of the proposed company.

All erection, commissioning and dismantle operations shall be thoroughly pre-planned with written submissions detailing all personnel involved with relevant experience and role descriptions, design and loading calculations regarding crane base and fixing supports, erection/dismantle process including lifting methods, transport, unloading etc. The submission shall also outline all testing and certification processes for the crane commissioning including a comprehensive list of operating tolerances and items/equipment and operations for testing.

Key personnel including crane supervisor, driver, banksmen and slingers shall be nominated and trained, competent, experienced and, where required, certified to carry out the required tasks.

An operational and equipment testing program shall be established and executed as part of the tower crane maintenance program. Daily, weekly and six monthly inspection schedules are typical and records of such inspections and checklists shall be kept.

A suitable radio communication system shall be provided to allow for safe communication between the crane drive and banksman.

An evacuation/rescue procedure shall be developed to access personnel working in the crane cab or on the crane jib in the case of an emergency.

**Mobile Cranes**

Mobile crane operation shall be undertaken under the following conditions:

- Operate only by trained and or certified operators.
- Ensure the planned regular inspections have been carried out.
- Ensure outriggers are used and are on suitable load bearing ground.
- Confirm signals between driver and slinger/dogman.
- Check minimum of 600mm slewing clearance.
- Check for overhead cables, services, and structures.

- Ensure load is correctly fixed, balanced, and secure.
- Never exceed the safe working load.
- Slew the load gently to minimise load swing.
- Ensure the vehicle driver is out of the cab before lifting.
- Ensure fully planned tandem lifting with a full briefing prior to any operation.
- Never leave a load suspended.
- Confirm operation design and ability of machine prior to any operation to carry (Very few cranes can lift and travel with loads).

**Excavator, Forklifts and Hiabs**

A machine operator shall be responsible for controlling each lift. If something cannot be lifted safely, then it shall not be lifted at all.

Only machines that are designed for lifting and have the proper lifting attachment fitted for securing and lifting the load shall be used.

Safe Working Load capacity of the equipment shall be never exceeded. It shall be marked in the cab or on the boom. It shall also be found in the instruction handbook that is supplied with the machine in the form of lifting or load charts or tables. The lifting chart gives information about the lifting capacity of the machine at different distances from the cab (the lifting radius), different height or depths and whether the lift is parallel to the tracks or across the tracks.

Machines that are permitted to lift shall be clearly marked.

Load shall be correctly fixed, balanced, and secure.

Lifts shall only be undertaken following communication with the slinger/signaller and on his signal.

The weight of the load shall be established/estimated prior to lifting.

Lifting shall be only carried out in area clear of people.

Only properly checked lifting equipment (such as chains, strops and shackles) shall be used for lifting.

Good lifting practice is to position the machine to carry out the lift most effectively. Where possible, the load shall be kept between the tracks; or reasonably close to the machine (not at full stretch); or low to the ground.

Lifting shall be kept to level ground avoiding side slopes. If lifting takes place on a slope, the tracks shall be positioned up (or down) the slope (and not sideways).

If lifting includes travel with a load, the load shall be positioned between the tracks, reasonably close to the cab and not too high off the ground. Travel shall be slowly and carefully, ensuring the route is clear of obstructions and personnel at all times.

The lifting operation shall be stopped at any time if events dictate (such as if someone is walking towards or into the lifting area).

**Manual Lifting**

Personnel engaged in manual lifting shall adhere to the following:

- Wear back braces if required to lift and carry heavy loads.
- Avoid twisting and turning movements.
- Use legs to position and move the torso.
- Avoid leaning or bending over for extended periods.
- Stretch and exercise the back before starting work each day.
- Inspect the work area for slip, trip, and fall hazards.
- Inspect steps and stairs before climbing; use a handrail whenever possible.
- Lift with the legs; position the body so the load is centered and supported by the body before lifting and carrying.
- Avoid sudden jerks and pulls on a load, which could cause muscle sprain or injure discs.

#### 2.10.1.5.7. Traffic and Driving Hazards

Transportation incidents/accidents and workers and or public struck by vehicles or mobile equipment account for the highest number of permanent and/or fatal work injuries. In a worksite zone, workers, and the public in the vicinity of a worksite, are susceptible to the careless driving of in/out-coming traffic as well as to the activities of worksite vehicles and equipment. To avoid/minimize traffic and driving hazards, a TTMP shall be developed and implemented (refer to Section 2.10.1.7).

#### 2.10.1.5.8. Noise Hazards

Construction sites workers are frequently exposed to noise levels that can be harmful to hearing. Noise sources include heavy construction equipment and vehicles, alarms, generators, compressors, and ventilation equipment. Excessive noise exposure can cause temporary or permanent hearing loss, stress, and other physical problems. In general, noise levels above the 85-decibel level (dBA), expressed as an 8-hour time-weighted average, trigger the requirement for noise abatement and hearing protection measures.

In addition to implementing the NVMP (refer to Section 2.10.1.6), noise assessments of workplace shall be carried out by a professional. Workers exposed to noise shall be provided with appropriate PPE such as earplugs and earmuffs that reduce noise exposure levels by 15–20 decibels and inspect their usage.

#### 2.10.1.5.9. Respiratory Hazards

Construction sites workers are frequently exposed to various respiratory hazards, including dusts, chemical vapours, and gases. When engineering controls, such as general and local exhaust ventilation systems, are not adequate to control the hazard, workers must be provided and be obliged to use respiratory protection. Emergency procedures may also require the use of emergency escape or self-contained respiratory protective equipment.

Careful selection of materials and work practices shall be implemented to eliminate respiratory hazards. Where that is not possible, the next best choice is to undertake engineering controls, e.g. fume exhaust systems, or to use respirators.

Dust emissions are key concern to any construction site. Dust control measures shall be applied where there is the potential for air and water pollution from dust traveling across the landscape or through the air (refer to 2.10.1.1.3).

Appropriate ventilation systems shall be provided to all enclosed storage areas for chemicals as well as confined spaces.

Training shall be provided to workers on the use, cleaning, storage, and inspection of respiratory protection equipment for working tasks in confined spaces with high potential of exposure to chemicals and other respiratory hazards.

Medical evaluation of workers shall be provided before the use of respirators to ensure fitness to wear the respirator.

#### 2.10.1.5.10. Electrical Hazards

Construction workers are frequently exposed to many electrical hazards that can cause burns, arc blasts, fires, explosions, shocks, and electrocution (fatality). Overhead wires at various voltages are frequently present on worksites. The presence of water in the workplace compounds the hazard from electricity because water is a good electrical conductor.

Measures to eliminate/minimize electrical hazards shall include, but are not limited to:

- Maintaining all electrical equipment according to prescribed practices and manufacturers' instructions.
- Inspecting all electrical equipment on regular basis and making repairs only if authorized to do so. Reporting all electrical failures and repair needs to appropriate power suppliers.
- Ensuring all safety features are used as designed.
- Protecting electrical cables and cords from damage.
- Using extension cords only when necessary, but never as a substitute for permanent fixed wiring.
- Avoiding wearing metal objects (rings, watches, etc.) when working with electrical systems.
- Using mats, gloves, shields, flame resistant clothing, and any other protective equipment required to protect workers from electric shock and burn (e.g., electric-shock-resistant footwear, hard hat, safety glasses with side shields, under and outer clothing that has flame resistance properties, earmuffs as applicable).

- Tools, devices, and equipment, including PP, to be used for live work must be designed, tested, maintained, and used so as to provide adequate protection for workers.
- Placing enough warning devices in the area of the hazard so that at least one is always visible to worker.
- Maintaining minimum clearance, according to H&S national regulations, from overhead wires that contain 50 kilovolts or higher voltages.
- Informing operators of large equipment where overhead and buried powerlines are and where overhead powerlines may be lower than expected.
- Informing workers not to let a ladder, scaffold, or elevated work platform lean or drift toward overhead powerlines. Always maintain minimum allowable clearances.
- When working in damp locations, inspecting electrical cords and equipment carefully to avoid shocks, and always making use of the ground-fault circuit interrupter.
- Avoiding use of electrical tools and lighting in wet and/or explosive environments, and using explosion-proof equipment and wiring instead in such conditions.
- Ensuring that all electrical power tools are properly grounded or double insulated for protection from shock hazards.
- Keeping doors on electrical panels in place and closed, correctly labelling circuits breakers and switches and plugging empty breaker slots.
- Using voltage-rated rubber gloves or jumpers when repairing or removing electrical equipment within an excavation.
- Properly installing and maintaining electrical protective devices, including fuses, circuit breakers, and ground-fault circuit interrupters.

#### 2.10.1.5.11. Hazardous Chemicals

Construction workers are often required to work with highly hazardous chemicals and compressed gases. Numerous potential physical and health hazards are associated with compressed gases such as propane, oxygen, nitrogen, argon, chlorine, ammonia, and compressed air. Compressed gases are hazardous because they are contained in high-pressure containers and can be released accidentally from a broken or leaking valve or safety device. When unsecured, uncapped cylinders can be knocked over, breaking the valve and releasing the high-pressure gas, turning the damaged cylinders into uncontrolled rockets or pinwheels and potentially causing severe injury and damage. Compressed gas in chemical reaction systems can cause vessels to burst if they are improperly released, create leaks in hoses, or produce runaway reactions.

Proper in-house storage and handling shall be provided to reduce or eliminate risks associated with hazardous chemicals.

Chemicals shall be properly labelled and stored according to information specified on the Material Safety Data Sheet.

Emergency equipment shall be provided when storing or handling chemicals. This equipment shall include, but is not limited to, first aid supplies, emergency phone numbers, eyewash and shower facilities, fire extinguishers, spill clean-up supplies and PPE, all of which should be readily available on-site any Project worksite.

Basic training and written materials for applied hazardous chemicals in construction activities shall be available to workers.

All workers handling or using cylinders of compressed gases shall have basic training in the use of gas cylinders, emergency shutoffs, proper equipment design, leak-testing procedures, and the use of appropriate respiratory protection in the event of a release of a compressed gas.

When in storage, compressed gas cylinders shall be restrained using straps, chains, or other suitable stand to prevent them from falling.

Full cylinders shall be segregated from empty cylinders and be legibly marked with the chemical or trade name of the gas.

Storage areas shall be well ventilated to prevent accumulation of explosive concentrations of gas. No ignition sources shall be permitted in these areas.

Hand trucks shall be used for the transfer of cylinders from storage area to shop or working area.

Valve protection covers shall be in place during the transport of cylinders.

Cylinders that cannot be identified positively shall not be used.

Compressed gases or air to blow away dust or dirt shall not be used.

When cylinders are not in use, the cylinder valves shall be closed.

On valves without hand wheels, the wrench recommended by the gas supplier shall be used. The wrench shall remain on the valve while the container is in use.

On valves with hand wheels, wrenches or hammer a hand wheel to open or close a valve shall never be used.

#### 2.10.1.5.12. Hazardous Waste

Sudden injuries or illnesses, which may also be life threatening, can occur when workers are exposed to safety or health hazards related to hazardous waste management operations. Activities where hazardous conditions may exist in construction include clean-up operations, treatment, storage, disposal operations, corrective actions, and emergency response. For instance, as a result of an uncontrolled spill of e.g., spent solvents, workers may be exposed, through skin contact or inhalation to harmful constituents and hence, can suffer significant damage to their health, some of it may even be permanent or life threatening.

Proper waste and hazardous waste management shall be provided in line with the Project WSP.

A written health and safety program shall be developed to identify, evaluate, and control the health and safety hazards for workers assigned tasks related to hazardous waste operations and emergency response.

#### 2.10.1.5.13. Personal Protective Equipment

PPE, such as hard hats, ear protection, safety glasses, and work boots must be provided and used to prevent injuries on all Project worksites.

All PPE clothing and equipment shall be of safe design and construction, and should be maintained in a clean and reliable fashion. The EPC Contractor shall take the fit and comfort of PPE into con-sideration when selecting appropriate items for his personnel.

All PPE must meet the Jordanian safety standards or international standards (e.g., ANSI standards).

- Personnel who must use PPE shall be trained to know at least the following:
- When PPE is necessary
- What PPE is necessary
- How to properly put on, take off, adjust and wear the PPE.
- The limitations of the PPE.
- Proper care, maintenance, useful life and disposal of PPE.

Training of each employee required to wear or use PPE shall be documented by preparing a certification containing the name of each employee trained, the date of training and a clear identification of the subject of the certification.

Appropriate PPE shall be selected for specific on-site hazards such as approved buoyancy equipment (e.g. life jackets, vests, floating lines, ring buoys) when workers are over, or adjacent to, water where there is a drowning hazard.

The provision of mandatory PPE signs in various areas at the Project worksites are an important visual reminder of the H&S policies and procedures. Though appropriate signage, personnel, guests, and subcontractors shall become more aware of certain workplace risks, taking protective measures as required.

#### 2.10.1.5.14. Incident Reporting

All accidents, dangerous occurrences and investigations shall be documented in a structured system (e.g., a Site Accident record sheet), which shall be available at all times for inspection by the Project Promoter or competent national authorities.

Any incident shall be investigated, recorded, and systematic follow-up of relevant findings and recommendations should be reported.

A monthly H&S progress report shall be developed. This report shall contain the following data, as related to the works:

- Progress against implementation of the HSMP

- A list, including a brief description, of all incidents and dangerous occurrences
- Number of fatalities
- Number of serious incident frequency
- Total recordable injury frequency
- Number and type of accidents with and without lost-time
- Serious illness
- Total number of 'near miss events
- Number of theft incidents
- Number of security and number and type of other incidents

The Project Promoter shall be informed within one hour day/night of any accident involving serious bodily injury to a member of personnel, a visitor or any other third party, caused by the execution of the works or the behaviour of the personnel of the Contractor.

The Project Promoter shall be informed as soon as possible of any near-accident (near misses) relating to the execution of the works which, in slightly different conditions, could have led to bodily injury to people, or damage to private property or the environment.

The BOT Developer shall prepare a report on each accident or dangerous occurrence and a copy of the report, together with witness statements and any other relevant information, shall be submitted to the Project Promoter as soon as possible.

A reportable accident shall include any accident to any person on site requiring medical attention or resulting in the loss of working hours or any incident that resulted, or could have resulted in injury, damage or a danger to the works, persons, property, or the environment. The Contractor will also notify and report of incidents of subcontractors and suppliers (in particular those for major supply items).

Any H&S accident, related to Project activities or personnel, shall be reported to national or local authorities as required by relevant legislation. A copy of all such reports shall be provided to the Project Promoter.

The BOT Developer shall not notify or give any information to the media or other units or people without the Project Promoter's consent.

The BOT Developer shall immediately rectify any situation or condition that could result in injury or a danger to the works, person, property, or the environment. If the situation or condition cannot be corrected immediately, temporary barriers and appropriate warning signs and devices shall be set up and/or other appropriate action necessary for the protection of persons, property, and the environment taken.

Given the above considerations, the HSMP shall be structured to include at minimum the following contents:

1. Stated H&S policy, leadership, and commitment that meets MWI E&S policy
2. H&S Management System definitions
3. Scope, objectives, and targets of the H&S Management System
4. Organizational roles, responsibilities, and authorities
5. Planning procedures
    - *Hazard identification, risk assessment and determination of controls*
    - *Identification of legal and other requirements and their incorporation into the development, implementation and maintenance of the system*
    - *Setting and maintaining objectives, targets and plans*
6. Implementation and operation procedures
    - *Resources, roles, responsibility, accountability and authority*
    - *Competence, training and awareness*
    - *Communication, participation and consultation*
    - *Operational controls (PPE, first aid, fire safety, electricity safety, work in heights and confined areas, manual handling, labelling of hazardous materials, etc.)*
    - *Documentation procedures*
    - *Development and updating of documentation*
    - *Control of documentation and records*
7. Emergency preparedness and response procedures
    - *Performance evaluation procedures*

- *Monitoring and measurement*
- *Evaluation of compliance*
- *Incident investigation*
- *Nonconformity, corrective, and preventive actions*
- *Internal (and external) audits*

8. Management review and improvement procedures

#### 2.10.1.6. Noise and Vibration Management Plan

The BOT Developer shall develop a NVMP as part of CESMP, which shall:

- Confirm an understanding of the legal requirements and management of all noise generating sources and associated risks relating to the execution of the Project works;
- Provide prevention, abatement, and protection measures to control noise and vibration emissions and related risks for both employees and the public; and
- Define human and material resources as required for the development and implementation of said NVMP.

The NVMP shall be developed pursuant to the national legal provisions and international standards related to noise/vibration effective abatement and workforce/community protection.

The plan shall comprise all feasible and reasonable methods to limit noise emissions and minimise the noise impact on workforce and people/properties neighbouring the Project areas/sites. These shall include at minimum: selecting quiet(er) equipment, incorporating periods of respite, maintaining community consultation relations, managing noise complaints, and conducting noise and vibration monitoring in response to complaints.

Equipment shall be used and construction and transport methods adopted in order not to generate noise levels in excess of values set out in national regulations or international recognised standards.

High noise generating works (e.g., pile driving, blasting, rock clearing, drilling, percussion drilling) shall be planned in line with national regulations and respect maximum ambient noise levels and night time rest hours at the nearest receptor areas. A receptor is defined as an area used for nocturnal socioeconomic activities (e.g., accommodation camps, residential areas, hotels, health centres).

Stationary equipment (such as power generators and compressors) shall be located as far as possible from nearby receptors (e.g., workers resting areas, populated areas, and environmentally sensitive areas). Equipment known to emit noise strongly in one direction, whenever possible, shall be orientated so that the noise is directed away from any sensitive receptors.

Construction shall be programmed carefully so that activities that may generate significant noise are planned with regard to local occupants and sensitive receptors.

Occupiers of nearby properties shall be informed in advance of the works taking place where relevant, including the duration and likely noise and vibration impacts. In the case of work required in response to an emergency, the local occupiers shall be advised as soon as reasonably practicable that emergency work is taking place.

Noise complaints (a dedicated point of contact will be made available to members of the public) shall be investigated and recorded.

A Noise Monitoring Program shall be developed ahead of the commencement of works comprising the following elements:

- Identification of noise/vibration sources and nearby sensitive receptors.
- Description of legal requirements related to noise/vibration measuring parameters, measuring locations, frequency of monitoring (intermittent or continuous).
- Description of arrangements for noise/vibration mitigation during construction in relation to identified noise sources and sensitive receptors.
- Reporting lines related to noise/vibration monitoring results.
- Communication/disclosure lines related to noise/vibration monitoring results.

To the extent possible, heavy vehicles (i.e., with a GVWR of more than 3.5 tons) shall not be used at night between 22:00 and 06:00.

Standard noise abatement equipment shall be fitted to equipment used and maintained in accordance with manufacturers' instructions, e.g., all vehicles and mechanical plant will be fitted with effective exhaust silencers and be maintained in good efficient order.

All machines in intermittent use shall be shut down in the intervening periods between work or throttled down to a minimum. Lorry engines will be switched off when vehicles are stationary.

Temporary noise barriers shall be used to reduce noise levels where appropriate and practicable. Such measures can be particularly appropriate for stationary or near-stationary plant such as pneumatic breakers, piling rigs, and compressors. Barriers shall be located as close to the plant as possible and, in order to provide adequate attenuation, shall have a mass per unit area of at least 7 kg/m$^2$. The screens may include soil mounds, site offices, site huts, acoustic sheds, or partitions.

Where reasonably practicable, fixed items of construction plant shall be electrically powered in preference to diesel or petrol driven.

Inherently quiet plants shall be selected where appropriate; installing silencers for fans, and placing hoarding around site perimeters to screen noise.

Where practicable, pre-fabrication shall be undertaken at sites not situated in close vicinity to sensitive areas.

All compressors and generators shall be "sound reduced" models and fitted with properly lined and sealed acoustic covers which shall be kept closed whenever the machines are in use, and all pneumatic percussive tools shall be fitted with mufflers or silencers of the type recommended by the manufacturers.

All ancillary plant such as generators and pumps shall be positioned so as to cause minimum noise disturbance, and, if necessary, acoustic enclosures should be provided.

Any Tunnel Boring Machine support sites, especially if operating on a 24 hour basis, shall be located at a sufficient distances from residential areas.

Normal working hours in or close to residential areas shall be respected, and in general, night-time working shall be kept to a minimum near those areas. Materials for night-time working shall be delivered during normal hours of working and be placed as close as possible to the work area for which they are required.

As far as practicable, any demolition activities shall be carried out using equipment that breaks concrete in bending in preference to percussive methods.

All pile driving shall be carried out by plant equipped with a noise reducing system or by silent driving systems. Percussive piling shall only be used where no other suitable system is available.

Vessels shall not be permitted to travel over 10 knots.

Vessels shall keep a continuous watch, and shall be provided with equipment for detecting, reporting, and responding to marine mammal sightings.

Vessels shall ensure a minimum distance of 500 m from any marine mammals and turtles, where possible.

Restrictions shall be applied to the navigation of large vessels when marine mammals (e.g., whales, shark whales, sharks) are detected within an exclusion zone of 5 km from the detection points for at least one hour.

Dredging activities shall be suspended in case any marine mammals are detected in the marine works areas until these areas are clear from said marine species.

Given the above considerations, the NVMP shall be structured to include at minimum the following contents:

- Project Description
- Existing Noise/Vibration Environment
  - *Background Noise Levels*
  - *Community Receiver Locations*
- Noise and Vibration Criteria
  - *National Regulations*
  - *International Standards*
- Construction Noise and Vibration Assessment
  - *Construction Methods*
  - *Construction Activities*
  - *Construction Traffic*

- *Construction Vibration Impacts*

- Construction Noise and Vibration Mitigation
  - *Noise Measurement Equipment*
  - *Noise Monitoring Procedure(s)*
  - *Noise Monitoring of Plant and Equipment and Reporting*
  - *Construction Hours*
  - *Construction Practices*
  - *Heavy Vehicles and Staff Vehicles*
  - *Community Relations*
  - *Managing Procedure of Noise Complaints*
  - *Protocol for out-of-hours Work*
- Construction Noise and Vibration Monitoring
- Review and Revision of the Construction Noise and Vibration Management Plan(s)

#### 2.10.1.7. Traffic and Transport Management Plan

Based on a Traffic Impact Assessment to be conducted at the identified hotspot areas of the IPS Zone, around QAIA and at Abu Alanda (as shown in Section 6.4.8 of the ESIA), the BOT Developer shall develop a TTMP as part of the CESMP, which shall:

- Define the characteristics of the fleet of vehicles and site machinery with the aim to prevent construction site vehicle incidents by the effective management of transport operations throughout the Project construction phase.
- Define the itineraries used on a map for each route between the different Project worksites (onshore and offshore) and for each stage of the construction works.
- Describe the expected traffic created by the construction fleet of vehicles (frequency of trips between Project worksites, working hours, convoys, etc.).
- Describe the number and positioning of flagmen.
- Include actions to limit and check the speed of all vehicles and machinery used to execute the works at an appropriate level.

The TTMP shall define itineraries to be used on a map for each route between the different Project Areas and for each phase of the construction works. In coordination with the Project Promoter, the required authorisations shall be obtained from the competent administrative authorities if public roads are to be used, specifically from ASEZA in Aqaba Region.

The TTMP shall be continuously updated, taking into account the exact location of the worksites, campsites, access roads, materials, and waste disposal sites, etc for both off-shore and on-shore works. The TTMP shall take account of the relevant noise standards and the receptors in the area (residential settlements, habitats, etc.). The key means of mitigation of impacts from traffic is to ensure that any unmade transportation/access roads for heavy goods vehicles be constructed so that they are as far away as feasible from residences, cultivated areas or natural habitats. In addition, any new roads shall be routed away from sensitive communities and other receptors and to be surfaced and maintained so as to minimise dust generation.

The characteristics of the fleet of vehicles and site machinery shall be defined in the TMP, which shall aim to prevent construction site vehicle incidents and accidents through effective management of transport operations throughout the construction duration.

The TTMP shall also describe the expected traffic created by the construction fleet of vehicles (frequency of trips between Project Areas, working hours, convoys, etc.). The number and positions of flagmen shall also be described in the Plan.

The CESMP shall comprise a consultation and notification process to give any local residents and businesses advance warning of potential delays on the road network as a result of increased traffic and any abnormal loads associated with construction activities in any Project Areas (refer to 2.10.3.2.7).

Within one month of the physical start of works, the administrative authorities shall be informed for the areas crossed by the construction vehicles, and for the itinerary and characteristics (frequency of passing, size and weight of trucks, materials carried) of the construction fleet of vehicles.

In the case of public roads and/or bridges are used, a bailiff shall be mandated to develop a sworn report regarding the state of the road/bridge prior to its use by the construction vehicles.

Only selected routes to the Project worksites shall be used during construction activities. Appropriately sized vehicles suitable to the class of road shall be selected and used, and transported loads shall be restricted to prevent damage to roads and bridges to be used for transportation purposes. The BOT Developer will be held responsible for any damage caused to the roads and bridges due to the transportation of excessive loads, and will be required to repair such damage to the approval of the competent national authorities.

Construction area warning signs shall always be visible when work is being performed, and removed or covered promptly when the work is completed.

An exclusion zone shall be put in place surrounding the footprint of dredging activities at sea.

The routing of the pipelines shall be marked with buoys so that any obstruction to marine navigation and traffic is avoided.

Traffic movement shall be coordinated with the relevant authorities in Aqaba especially in restricted areas.

Flags and light signals shall be set up as agreed with the navigational authorities to alert maritime traffic.

Construction activities and marine traffic restrictions shall be limited as possible to avoid any adverse impacts on ship mobility and import/export operations.

Strict adherence to international standard best practice measures related to navigation and safety shall be ensured. This is meant to include management of vessels movement via automatic identification system.

Competent maritime authorities and other users shall be notified ahead of any marine works commencement.

The trailers and skips used to carry materials, which could be dispersed (sand, crushed material, aggregates, selected materials), shall be covered with a tarpaulin for the entire itinerary between two Project Areas.

All abnormal loads shall be suitably marked to warn other road users.

The use of any vehicles, either on or off road generating excessive, exhaust or noise emissions shall be avoided. In any built up areas, noise mufflers shall be installed and maintained in good condition on all motorized equipment.

Paving roads is considered expensive, but may need to be considered in some Project locations in close proximity to or within residential areas (e.g. within Amman) to reduce dust emissions. The alternative use of binding agents shall be adequately assessed and justified in terms of effectiveness and potential contamination of soils and groundwater due to leaching. More specifically, heavily used areas (e.g., any batching plant), long term construction sites, and access roads to workers' camps shall be paved and swept regularly with vacuum sweepers.

Considering the water scarcity facing Jordan, water dampening of roads with freshwater for dust dispersion prevention is not considered a sustainable option. However, treated domestic wastewater is understood to be used for side-road irrigation purposes in Jordan and this option may be used for dust control in certain areas of works especially where construction activities are executed within urban settings (e.g., Amman).

For any construction taking place in the urban areas, good site management practices shall be observed comprising measures such as the use of hoarding to shelter and screening of construction areas.

Access roads to Project worksites and camps shall not be made wider than that required for efficiency and safety reasons and, where possible, shall use existing tracks.

To confine traffic as much as possible, the use of one two-way access road is preferable to two separate one-way access roads. To confine vehicles to the approved paths as per the TTMP and eliminate unnecessary straying off-path, access roads shall be clearly delineated.

Truck trips on the highway during peak traffic flows shall be avoided.

Specific routes for construction traffic shall be agreed with competent national authorities especially for Project worksite areas within residential / urban settings (e.g., Amman).

Construction personnel shall be provided with organised bus commuting to and from Project worksites as a measure to prevent additional traffic by individual vehicular travel.

To prevent and/or to reduce traffic related accidents, the following actions shall be taken:

- Pedestrians and vehicles to be kept apart (e.g., through providing separate entrances, walkways, signals).

- Vehicle movements to be minimized to the absolutely needed for construction activities.
- Drivers to be adequately trained and have the appropriate permits for driving vehicles.
- Turning circles for turning vehicles to be installed.
- The night movements of heavy vehicles shall be prevented between 22:00 and 06:00 hrs within residential areas.
- Actions shall be taken for the control and check of speed limits for all construction vehicles and machinery to appropriate levels complying to the lowest limits as set out in national regulations or the following limits:
    - 20 km/h within the Project Areas.
    - 30 km/h in villages or hamlets, in towns, from 100m before the first house.
    - 80 km/h on unpaved roads outside of towns, villages, hamlets, and camps.

It shall be strictly prohibited to transport people, equipment, or products other than those required for the Project works and the management of Project Areas, on board any of the construction vehicles.

It shall be strictly prohibited to transport live animals and meat obtained from hunting, fishing, or poaching.

Given the above considerations, the TTMP shall be structured to include at minimum the following contents:

1. Introduction
    - *Purpose of the TTMP*
    - *Scope of Application of the TTMP*
2. Roles and Responsibilities
3. Regulatory Framework and Standards
4 Implementation Schedule of the TTMP
5. Project Transportation Activities and Related Hazards
    - *Transportation Activities*
    - *Hazards to H&S*
    - *Hazards to the Environment*
    - *Hazards Control Procedures*
6. Communication and Reporting Procedures
7. Audit and Review Procedures
8. Personnel Training Requirements/Procedures

#### 2.10.1.8. Chance Finds Management Plan

"Chance Finds" are defined as potential cultural heritage objects which are located outside the designated areas of cultural heritance protection and preservation by competent national authorities and which may be discovered unexpectedly during the implementation of the Project.

The BOT Developer shall develop a Chance Finds Management Plan (CFMP) as part of the CESMP, which shall detail the necessary mitigation measures to ensure the prevention of negative effects on cultural heritage, focusing on chance finds, as a result of the Project related activities during construction at all Project worksites (onshore and offshore). Where prevention is not technically feasible, the plan shall include procedures to minimise the negative effects on cultural heritance as far as reasonably practicable. The objectives of the CFMP shall be to ensure that the undertaking of the cultural heritage management related to the Project construction activities complies with applicable Jordanian laws and regulations, international best practices and all relevant EIB's and USAID's environmental and social standards and performance requirements.

Given the above considerations, the BOT Developer's Construction CFMP shall be structured to include at minimum the following contents:

1. Introduction
    - *Project Description*
    - *Purpose of the CFMP*
    - *Scope of Application of the CFMP*
    - *Terms and Definitions*
2. Involved Parties, Roles and Responsibilities
3. Regulatory Framework and Standards

- *Jordanian Legislation*
- *International Standards (EIB, USAID)*

4. Implementation Schedule of the CFMP
5. Chance Finds Mitigation and Management Procedures
6. Monitoring, Audit and Control Procedures
7. Reporting Procedures
8. Review and Updating Procedures
9. Personnel Training Requirements

## 2.10.2. Operation Plans, Mechanisms and Procedures

### 2.10.2.1. Pollution Prevention Management Plan

All necessary measures shall be taken to ensure that pollution to air, water or land is either prevented or, where this is not possible, reduced and mitigated as far as reasonably practicable through developing and implementing a PPMP as part of the OESMP. The PPMP outline shall be posted at appropriate points in all Project facility sites. In addition, the PPMP shall be evaluated and updated annually after operation start-up.

To this effect, training is necessary to ensure that all operations personnel are knowledgeable enough to follow the procedures outlined in the PPMP.

The BOT Developer shall be responsible for making equipment and materials for clean-up readily accessible, and for marking them clearly so that site personnel/operations personnel can follow procedures quickly and effectively.

The BOT Developer shall be responsible to rectify and/or compensate for any groundwater pollution resulting from seawater or brine leakages especially when said groundwater is used for water supply purposes. Mitigation may involve provision of alternate sources of water supply in case of identified pollution.

Environmental and/or occupational health and safety regulators will be notified and informed as required by applicable laws in Jordan about any environmental pollution. It shall be ensured that all appropriate environmental protection measures are adopted during the clean-up process and that clean-up activities are appropriately documented pursuant to the OESMP and available upon request by the competent authorities.

Strict compliance to the set mixing zone and end-of-pipe standards for brine discharge and drinking water quality standards pursuant to the provisions of Section 2.9.2 of this Project ESMP as included in the Project permit and national legal provisions.

The PPMP shall ensure:

- Immediate rectification measures in case of non-compliance, reporting and review procedures of the timely response and effectiveness of rectification.
- Strict adherence to the set monitoring plans in terms of execution frequency, parameters to be monitored, and reporting requirements pursuant to the Project ESIA study, Project permits, and national legal provisions.
- Effective regular maintenance of plant and equipment pursuant to manufacturer's specifications.
- Annual inspection and subsequent reporting of the structural integrity of submerged marine works (intake and outfall system).
- Full use of Project related SCADA controls and associated alarms.
- Strict adherence to effective maintenance practices for all Project plant and equipment (preventive and corrective) pursuant to manufacturer's specifications.

#### 2.10.2.1.1. Effluent Management

No effluent generated during Project operation activities will be discharged into water courses or bodies including the marine environment nor to ground surface or infiltrated into subsoils, without prior treatment and without monitoring the quality of the treatment's performance to guarantee the absence of pollution in the effluent. Effluent discharge and flow rates into natural water bodies shall be managed pursuant to the provisions of the Project permits, the Project ESIA study, national regulations, and EIB/USAID E&S standards.

All sources of effluents and outlets to the natural environment will be listed located, characterised (as per flow, expected quality, discharge frequency) and reported in the OESMP.

The operational monitoring requirements as set out in Section 2.11.2 of this Project ESMP shall be integrated into the PPMP and strictly observed.

**Process Wastewater**

The direct discharge pretreatment and posttreatment backwash effluents to the brine chamber for outfall disposal shall not be allowed unless treatment occurs at the onsite solids treatment system to the set Project permit standards related to turbidity. Posttreatment backwash effluents can be send to a buffering tank provided that the high solids content stream from the bottom of the buffering tank is first sent to the solids treatment system and not directly disposed with the brine.

The direct marine discharge of effluents generated during the cleaning-in-place of SWRO membranes (an/or UF pretreatment membranes) with inorganic acidic and basic solutions shall not be allowed unless neutralisation occurs and subsequent treatment to at the onsite solids treatment unit.

Should cleaning-in-place involve the use of organic or proprietary chemicals, or chelating agents etc., the generated effluents shall not be allowed to be discharged to the marine environment through the outfall system. These effluents shall be diverted to the on-site evaporation ponds.

A zero residual chlorine concentration shall be continuously monitored at the outlet of the brine reservoir.

If chlorination is used for intake macrofouling control, a zero THMs increase above the limit concentration shall be monitored daily at the outlet of the brine reservoir, where the limit concentration for THMs will be ambient measured THMs multiplied by the plant concentration factor (at overall recovery).

The use of antiscalants, if needed, shall be confirmed through pilot testing which will also determine the effective minimum dosage of said chemicals. Antiscalants, if needed, shall be nitrogen-free and highly biodegradable to prevent the addition of these nutrients to a very low nutrient and sensitive marine environment.

Domestic wastewater shall be diverted to the on-site septic tanks or onsite wastewater treatment plant at the desalination plant site that meets national standards. The direct discharge of domestic wastewater into the marine environment shall not be allowed.

If septic tanks are selected, the condition of the septic tanks will be checked regularly and accumulated sludge will be pumped out and disposed to an appropriate regulated facility off-site as per the national regulations. Discharge of untreated wastewater or sludge to the sea, streams or wadi beds shall not be permitted.

If domestic wastewater treatment is selected, proper operation of the facility shall be ensured and effluent quality monitored regularly in line with national standards. Sludge generated from the process shall be treated onsite and transported to an approved waste disposal facility.

**Rainwater run-off**

The PPMP shall ensure that separate drainage exists for all platforms where generators, hydrocarbon storage tanks and refuelling stations which will be ultimately diverted to an oil-interceptor before discharge to any surface water course including the sea. Oily water discharges shall not be permitted.

The effluents from the washing of operation related vehicles and equipment shall be drained to the oil-separator before discharge to any surface water course including the sea.

Provisions for drainage in all Project sites shall be included in the PPMP. These will include measures to ensure that any surface water run-off is contained and managed appropriately pursuant to the Project permits and national legal requirements.

#### 2.10.2.1.2. Spill Prevention and Management

Vehicle/machinery and equipment operations, maintenance and refuelling shall be carried out to avoid spillage of fuels and lubricants and ground contamination. An “oil interceptor” shall be provided for wash-down and refuelling areas. Fuel storage shall be located in proper bunded areas.

All spills and collected petroleum products shall be disposed of in accordance with standard environmental procedures/guidelines or as directed by the competent national regulatory authorities.

Oil, chemicals, and other contaminants stored on the Project sites for operational purposes shall be properly stored, isolated and bunded, with secondary containment of adequate volume where appropriate, to prevent leakage or spillage to the sea, soil, wadis, and groundwater.

The PPMP shall include provisions for:

- Regular visual inspections of the structural integrity of the surfaces on which hydraulic equipment with immediate rehabilitation of any evident cracks.
- Regular visual inspections of the structural integrity of the surfaces and secondary containment related to hazardous chemicals/waste storage areas.
- Regular checks/replenishment of the inventory related to the containment and absorption of oil spills at sea.

Any event of oil spillage at sea and on the coast as a result of Project operations shall be reported to the competent authorities (ASEZA, MoEnv, Maritime Authorities) and the Project Promoter and the oil spillage shall be contained and absorbed immediately. Any other measures shall be avoided (such as the use of chemicals) without the prior approval of the competent regulatory authorities. This shall be addressed through the Project's EPRP developed as part of the OESMP (Refer to Section 2.10.3.1).

Any event of oil spillage at sea and on the coast as a result of the operations of other users shall be addressed according to the EPRP.

Any event of brine pipeline structural failure and associated brine leakage at sea and on the coast will be reported to the competent authorities (ASEZA, MoEnv, Maritime Authorities) and the Project Promoter and the brine leakage shall be addressed through proper pipe rehabilitation measures. This shall be addressed in the EPRP.

A regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors shall be included in the PPMP and implemented at all Project sites and reported as part of the OESMP.

#### 2.10.2.1.3. Documentation and Reporting

Detailed description of practices and procedures that will be used to prevent spills and other emergencies from occurring shall be included in the PPMP. These procedures shall provide for employee training, inventory monitoring, inspection, secondary containment, etc. and shall include:

- Facility site characterization comprising the following information:
  - Site data description inclusive of location, and nearby businesses or residences, site plan showing location of storage areas for hazardous materials/waste, location of storm drains, yard drainage, wadis, etc.
  - Products/Materials Lists comprising the types and amounts of hazardous materials stored at the particular facility site (wastes and products).
  - Emergency Contacts List of individuals who should be contacted in the event of a spill or other emergency. This list should include all relevant management and site personnel, police, fire, health department personnel, clean-up contractors, chemical treatment/disposal companies, and other local agencies and authorities, as necessary.
- Response actions comprising the following information:
  - Denomination of person(s) that will be responsible for responding to spills and notification of emergency response teams.
  - Description of equipment and material located on-site to be used in spills' response as well as marking of the location of said response equipment and material.
  - Description of plans for evacuation of employees and third parties.
  - Detailed description of procedures that will be followed in responding to emergency situations.
- Audit and Review Procedures
- Communications and Reporting Procedures
- Personnel Training Requirements/Procedures

### 2.10.2.2. Waste Management Plan

The BOT Developer shall develop a WMP as part of the OESMP, which will detail the amount and type of waste that will be produced at Project facilities and how this waste will be reduced, reused, recycled, or disposed of. The WMP shall be updated annually after operation commencement to record how waste is being managed and to demonstrate that any materials which cannot be reused or recycled are disposed of at a legitimate site and in a manner pursuant to the Jordanian regulations and international best practice, as well as EIB and USAID E&S standards.

The Operation WSP shall be disseminated to all Project sites.

Personnel at an appropriate level of seniority shall be nominated to be responsible for implementation of the WSP at the various Project facilities.

The WSP shall include the following provisions:

- Screenings generated at the IPS shall be collected and temporarily stored on-site and then disposed of at a dedicated landfill pursuant to Project permits.
- Overall, the amount of waste produced shall be minimized by efficient ordering of materials, and careful stock control. Waste generated shall be properly contained to prevent uncontrolled release into the environment, and segregated into different waste types to ensure the maximum potential for reuse and recycling. Local markets for recyclables (e.g., metals, cardboard, plastics, batteries, etc) shall be investigated and effectively used to this respect.
- All waste that cannot be reused or recycled shall be treated or disposed of in the most technically feasible and environmentally sound manner and pursuant to national legal provisions and EIB/USAID E&S standards.

Waste shall be categorised according to the following definitions:

- Non-hazardous solid waste
- Hazardous solid waste including any contaminated soils, or small amounts of machinery maintenance materials, such as oily rags, used oil filters, and used oil, as well as spill clean-up materials from oil and fuel spills.

#### 2.10.2.2.1. Non-hazardous and Domestic Waste

The WSP shall include specific measures to be implemented to achieve waste reduction and to maximise reuse and recycling of waste materials. These measures shall include segregation and storage of different types of waste in different containers to enhance reuse or recycling of material and their proper disposal; provision of separate labelled bins for collection of aluminium cans, plastics and waste paper to reduce the amount of waste to be disposed of at landfills, unused chemicals, paints, etc. will be recycled as far as possible; and ordering and stocking of materials needed in operation will be carefully planned to avoid unnecessary generation of waste.

Local recycling companies shall be contacted to arrange for the recycling of as many waste types as possible. The following materials maybe collected separately for recycling from each Project site ferrous and non-ferrous metal, plastic bottles, waste oils (all sites where vehicles are based), and paper/cardboard (all sites).

General waste shall be transported directly to the nearest local and approved landfill for final disposal.

#### 2.10.2.2.2. Hazardous Waste

The WSP shall comprise dedicated procedures for working with chemical products and hazardous materials and handling of hazardous waste.

The generation of significant amounts of hazardous, non-hazardous, and household waste will be prevented though good management, housekeeping, and control actions at Project facilities.

Any hazardous waste generated at any of the Project facilities shall be temporarily stored safely for later disposal pursuant to the Project permits. Hazardous wastes shall be handled to avoid potentially dangerous incidents due to escape of the waste or mixing of incompatible waste. No hazardous waste shall enter the non-hazardous waste stream.

All fuel and hazardous chemicals/materials shall be stored in designated areas, except for quantities generated or required for the daily Project operation activities. Fuel, oil, or hazardous materials required to be temporarily stored onsite at any Project site will be stored within secondary containments.

Storage areas for hazardous waste shall be clearly labelled and used solely for the storage of hazardous wastes whereas the provided ventilation system shall be regularly checked.

The structural integrity of surfaces and secondary containments provided for hazardous materials/waste storage areas shall be regularly checked and any identified cracks will be timely rectified to avoid percolation of pollutants to soils and groundwater.

Should hazardous waste management be conducted by third parties, they must be reputable and accredited in Jordan for this activity such that the waste shall be disposed at the MoEnv operated Hazardous Waste Facility at Swaqa, should the type of hazardous waste indeed be accepted at this facility. The capability and track record of waste collectors shall be assessed and confirmed in coordination with the competent regulatory authorities prior to the appointment of any such sub-contractors.

Containers used for the storage of hazardous waste shall be suitable for the substance they are holding, resistant to corrosion; maintained in a good condition, and securely closed; display a label in Arabic and English to state clearly the nature of the waste, any hazards which it may pose, contact numbers of persons that can provide additional information in the case of an emergency, and display any international hazard warning sign as appropriate.

Hydrocarbons, lubricants, paints, solvents, and batteries shall be transported in drums to suitable waste management facilities where available.

Any contaminated land as a result of spills or leakage during Project operations, shall be managed/treated/disposed in a manner approved by the competent national regulatory authorities.

#### 2.10.2.2.3. Other Provisions

The open burning of any waste, hazardous and non-hazardous, at the Project sites shall be prohibited.

Hazardous and non-hazardous waste shall be securely transported from the point of arising to storage facilities and from there to treatment or disposal facilities so as to avoid spillages, windblown litter, and other potential environmental issues. The following precautions shall be observed:

The type, material, and integrity of transport packaging and containers shall be appropriate to the type and class of waste being transported.

Transportation vehicles shall be appropriate for the type, class and quantity of waste being transported in terms of its composition, load capacity, need for covering, etc.

Strict loading and unloading procedures shall be followed to avoid any waste loss.

Workforce shall be trained in the correct procedure to address accidents and emergencies related to transportation and waste handling.

All transportation vehicles shall be equipped with suitable materials or equipment to contain, handle, and remove accidental spillages.

Vehicles carrying hazardous waste to be labelled appropriately. If hazardous waste is mixed with non-hazardous waste, the entire mix will be considered and handled as hazardous.

A waste transfer note system shall be employed to provide evidence that all loads of waste have been taken to an approved treatment or disposal site pursuant to the WSP.A waste register shall be established since the commencement of Project operation. This register will record all waste management operations from production through to collection, transport, treatment, and final disposal. The following aspects shall be documented in this register: Type of waste; Waste quantities; Name and address of the third-party waste management facilities receiving waste or parties taking possession of the substances no longer considered as waste; Name and address of waste transport Contractors; Planned waste treatment; Final disposal locations.

All personnel shall be trained in proper waste management procedures as appropriate to their level of responsibility and duties. This will include training in concepts of site cleanliness and good housekeeping, and on appropriate waste management procedures, including waste reduction, reuse, and recycling under the waste management hierarchy.

Given the above considerations, the WSP shall be structured to include at minimum the following contents:

1. Introduction
   - *Project Description*
   - *Purpose of the SWMP*
   - *Scope of Application of the SWMP*
   - *Terms and Definitions*
2. Involved Parties, Roles and Responsibilities
   - *Client*
   - *Principal Operator*
   - *Principal Designer*
   - *Sub-contractors*
   - *Materials Suppliers*
   - *Waste management contractors*
3. Regulatory Framework
   - *Waste Management Principles*
   - *Jordanian Legislation*

- *International Standards (EIB, USAID)*

4. Implementation Schedule of the WMP
5. Determination of Types of Waste
   - *Construction and demolition waste*
   - *Excavated materials*
   - *Hazardous waste*
   - *Non-hazardous waste*
6. Estimation of Waste Generation
7. Waste Management Procedures
   - *Waste Prevention and Minimisation*
   - *Preparation for Reuse*
   - *Recycling*
   - *Other recovery*
   - *Disposal*
   - *On-site waste management*
   - *Off-site waste management*
8. Monitoring, Reporting, and Control Procedures
   - *Waste Register*
   - *Documentation for Waste Transportation*
   - *Reporting*
   - *Audit and Control*
   - *Quality Monitoring*
9. Review and Updating Procedures
10. Personnel Training Requirements/Procedures

#### 2.10.2.3. Biodiversity Management Plan

As part of the OESMP, a BMP shall be prepared and implemented taking into consideration the measures described in this section. The BMP shall also comprise a specific mitigation plan for endangered species in the adjacent areas surrounding Project facilities.

Sensitive areas, including Important Bird Areas and existing and proposed protected areas, and other areas identified as particularly sensitive in the ESIA study shall be protected through applying nature conservation legislation, including restrictions related to protected areas.

Precautions shall be taken to prevent the entry of pollutants into any bodies of water, wadi beds, sea, etc., as set out in hazardous chemicals/waste management provisions.

All operation personnel shall be informed and aware of the importance to protect species, habitats, fauna, and flora and are informed about wildlife encounter procedures. Provided information and awareness training shall be documented.

All operation personnel shall not approach, injure, hunt, capture, possess, feed, transport, rear, or trade wild animals and/or collect birds' eggs at any Project site.

All operation personnel shall avoid breeding, feeding, and nesting sites of endangered species.

All operation personnel shall not collect flora or fauna species at any Project site.

Any sighting or finding of dead wildlife killed by the Project operation activities shall be reported to the Project Promoter and the competent national authorities.

Natural habitats located outside the Project sites shall not be disturbed.

Forest fire prevention measures shall be adopted in facilities located close to forested land.

#### 2.10.2.4. Health and Safety Management Plan

Based on a risk assessment to be conducted, the BOT Developer shall develop a HSMP as part the OESMP, which shall identify and specify the following:

- All health and safety risks relating to the execution of the Project works, including gender-specific risks;
- Prevention and protection measures to control risks related to the execution of the works/operations, by differentiating, where necessary, measures concerning the protection of women and men;
- Human and material resources required;
- Works requiring a permit (e.g., blasting, working at height, working in confined spaces, etc.); and

- Emergency plans to be implemented in the case of an incident or accident.
- Training of staff.

The HSMP shall identify and specify the following:

- Understanding and managing of all health and safety risks relating to Project operations at all Project sites, including gender-specific risks based on Hazard Identification Risk Assessment (HIRA).
- Prevention and protection measures to control risks related to the Project operations at all Project sites, by differentiating, where necessary, measures concerning the protection of women and men.
- Human and material resources involved in the Project operation phase.
- Operation activities requiring a permit (e.g., confined spaces, hot works, working at height, etc.).
- Emergency plans to be implemented in the case of any fatal or serious accident, flood, major spillage at sea, seismic events, etc.
- Prevention, protection, and monitoring measures shall be implemented as described in the Operation HSMP.

H&S Officers shall be assigned as responsible for implementation and oversight of the HSMP.

The BOT Developer shall immediately rectify any situation or condition that could result in injury or a danger to the Project sites, person, property, or the environment. If the situation or condition cannot be corrected immediately, temporary barriers and appropriate warning signs and devices shall be provided and/or other appropriate action necessary shall be taken for the protection of persons, property, and the environment.

The BOT Developer shall ensure efficient and effective H&S communication and consultation with all personnel involved in the Project operations at all Project sites. This includes but is not limited to toolbox meetings prior to the start of any Project operations, H&S meetings at Project sites on a regular basis with all parties involved (including subcontractors, the Project Promoter, and third parties as the case maybe).

The BOT Developer shall ensure that supervision, directly in charge of operation activities, fully brief and discuss with operations personnel at H&S Toolbox Talks at the start of operations and prior to commencing any new activities. These talks shall be conducted in the language of communication defined in the contract. A checklist shall be utilised for this purpose. At a minimum the checklist shall include the following: Nature of the job; Associated hazards; Safe working methods to be adopted; Requirements of the Permit to Work.

#### 2.10.2.4.1. Safety and Security

The BOT Developer shall evaluate the security strategy and arrangements required for all Project sites including transport. This evaluation shall be performed by qualified security experts and shall be submitted as part of the OESMP. The Security Strategy and Plan shall describe:

- Security risks and the identified mitigation / management measures
- Roles and responsibilities including details of the Operator and its subcontractors
- Detection, monitoring and management procedures
- Escalation plans including resources allocation

The BOT Developer shall be responsible for the provision and inspection of integrity related to site fences equipped with lockable gates, lockable manholes for underground water valves, and displaying visible signs indicating danger and restricted areas for the public at all Project facilities.

Access to all Project facilities will be prohibited to unauthorized persons/third parties. The BOT Developer shall be responsible for the security and access control of all Project sites in close coordination with the national security authorities.

The BOT Developer shall be responsible for any damage to people and property caused by Project operation activities and associated compensation thereof.

#### 2.10.2.4.2. Personal Protective Equipment

PPE, such as hard hats, ear protection, safety glasses, and work boots must be provided by the Operator and used by operation personnel to prevent injuries on all Project sites.

All PPE clothing and equipment shall be of safe design and construction, and shall be maintained in a clean and reliable fashion. PPE shall be selected based on fitness, comfort and appropriateness for specific hazards.

All PPE shall meet the Jordanian safety standards or international standards (e.g., ANSI standards).

Project personnel who must use PPE shall be trained to know at least the following:

- When PPE is necessary;
- What PPE is necessary;
- How to properly put on, take off, adjust, and wear the PPE;
- The limitations of the PPE,
- Proper care, maintenance, useful life and disposal of PPE.

Training of employees required to wear or use PPE shall be documented by preparing a certification containing the name of each employee trained, the date of training and a clear identification of the subject of the certification.

The provision of mandatory PPE signs in various areas at the Project sites are an important visual reminder of the H&S policies and procedures in place.

Careful selection of materials and work practices shall be implemented to eliminate respiratory hazards. Appropriate PPE shall be made available to all operations staff involved in operations with inherent respiratory hazards and especially working in confined spaces (e.g., when cleaning the intake pipelines and IPS to SWRO plant seawater pipelines from macrofouling).

Regular inspection of ventilation systems shall be undertaken to all Project sites related to enclosed storage areas for chemicals/waste as well as confined spaces.

Appropriate PPE shall be made available to all operations staff that work near highly noise emissions sources in Project sites based on noise assessments and pursuant to the national H&S regulations.

#### 2.10.2.4.3. Hazardous Chemicals

The BOT Developer shall ensure and maintain proper in-house storage and handling of hazardous chemicals/waste to reduce or eliminate risks associated with their handling.

Chemicals shall be properly labelled and stored according to information specified on the Material Safety Data Sheet (MSDS).

Emergency equipment must be provided by the Operator when storing or handling chemicals. This equipment shall include, but not limited to, first aid supplies, emergency phone numbers, eyewash and shower facilities, fire extinguishers, spill clean-up supplies and PPE, all of which shall be readily available on-site at any Project site.

Basic training and written materials for applied hazardous chemicals in Project operation activities shall be available to operation staff.

All operation staff handling or using cylinders of compressed gases (e.g., chlorine gas) shall have basic training in the use of gas cylinders, emergency shutoffs, proper equipment design, leak-testing procedures, and the use of appropriate respiratory protection in the event of a release of a compressed gas.

When in storage, compressed gas cylinders must be restrained using straps, chains, or other suitable stand to prevent them from falling. Also, full cylinders must be segregated from empty cylinders and need to be legibly marked with the chemical or trade name of the gas.

Storage areas be well ventilated to prevent accumulation of explosive concentrations of gas. No ignition sources shall be permitted in these areas.

#### 2.10.2.4.4. Hazardous Waste

The BOT Developer shall develop and implement a written health and safety program to identify, evaluate, and control the health and safety hazards for his operations staff assigned to tasks related to hazardous waste operations and emergency response on all Project sites.

Adequate training shall be provided to all employees working on Project sites who may be exposed to harmful substances and situations. Employees shall be trained to prepare for the work to be done, including knowing what the hazards are at the site, learning how to use the PPE needed to perform tasks safely, understanding the work practices that will reduce risks, using safe engineering controls and equipment, and recognizing the signs that may indicate overexposure to a hazard.

Barricade and fence off active work sites to prevent unauthorized entry and public access. Posting warning and directional signs and safety instructions at active work sites and on roads will also alleviate the risk to the public and avoid traffic accidents caused by ongoing maintenance activities

Severe degradation of environmental resources, workforce and community H&S risks

#### 2.10.2.4.5. Incident Reporting

All accidents, dangerous occurrences and investigations shall be documented in a structured system (e.g., a dedicated Project Site Accident record sheet) which shall be available at all times for inspection by the Project Promoter and/or competent national authorities.

Any incident shall be investigated, recorded, and systematic follow-up of relevant findings and recommendations shall be reported.

A monthly H&S progress report shall be developed. This report shall contain the following data, as related to the Project operations at all Project sites:

- Progress against implementation of the Operator's HSMP
- A list, including a brief description, of all incidents and dangerous occurrences
- Number of fatalities if any
- Number of serious incident frequency
- Total Recordable injury frequency
- Number and type of accidents with and without lost-time
- Serious illness
- Total number of 'near miss events
- Number of theft incidents
- Number of security and number and type of other incidents

The Project Promoter shall be informed within one hour day/night of any accident involving serious bodily injury to a member of personnel, a visitor or any other third party, caused by the execution of the works or the behaviour of the personnel.

The Project Promoter shall be informed as soon as possible of any near-accident (near misses) relating to the Project operations at all Project sites which, in slightly different conditions, could have led to bodily injury to people, or damage to private property or the environment.

A report shall be prepared on each accident or dangerous occurrence and a copy of the report, together with witness statements and any other relevant information, shall be submitted to the Project Promoter as soon as possible.

A reportable accident shall include any accident to any person on site requiring medical attention or resulting in the loss of working hours or any incident that resulted, or could have resulted in injury, damage or a danger to the Project sites, persons, property, or the environment. A report of incidents of subcontractors and suppliers (in particular those for major supply items) shall also be prepared.

Reporting shall be done on any H&S accident, related to operation activities or personnel, to national or local authorities as required by relevant legislation. A copy of all such reports shall be provided to the Project Promoter.

The BOT Developer shall not notify or give any information to the media or other units or people without the Project Promoter's consent.

Given the above considerations, the HSMP shall be structured to include at minimum the following contents:

1. Stated H&S policy, leadership, and commitment that meets MWI E&S policy
2. H&S Management System definitions
3. Scope, objectives, and targets of the H&S Management System
4. Organizational roles, responsibilities, and authorities
5. Planning procedures
    - *Hazard identification, risk assessment and determination of controls*
    - *Identification of legal and other requirements and their incorporation into the development, implementation and maintenance of the system*
    - *Setting and maintaining objectives, targets and plans*
6. Implementation and operation procedures
    - *Resources, roles, responsibility, accountability and authority*
    - *Competence, training and awareness*
    - *Communication, participation and consultation*
    - *Operational controls (PPE, first aid, fire safety, electricity safety, work in heights and confined areas, manual handling, labelling of hazardous materials, etc.)*
    - *Documentation procedures*

- *Development and updating of documentation*
- *Control of documentation and records*

7. Emergency preparedness and response procedures
    - *Performance evaluation procedures*
    - *Monitoring and measurement*
    - *Evaluation of compliance*
    - *Incident investigation*
    - *Nonconformity, corrective, and preventive actions*
    - *Internal (and external) audits*

8. Management review and improvement procedures

#### 2.10.2.5. Noise and Vibration Management Plan

The BOT Developer shall develop a NVMP as part of OESMP, which shall:

- Confirm an understanding of the legal requirements and management of all noise generating sources and associated risks relating to the execution of the Project works;
- Provide prevention, abatement, and protection measures to control noise and vibration emissions and related risks for both employees and the public; and
- Define human and material resources as required for the development and implementation of said NVMP.

The NVMP shall be developed pursuant to the national legal provisions and international standards related to noise/vibration effective abatement and workforce/community protection.

The NVMP shall comprise all feasible and reasonable methods to limit the noise emissions and minimise the noise impact on workforce and people/properties neighbouring the Project areas/sites. In outline, these shall include at minimum: selecting quiet(er) equipment, incorporating periods of respite, maintaining community consultation relations, managing noise complaints, and conducting noise and vibration monitoring in response to complaints.

Project plant and equipment shall be used and maintained pursuant to the manufacturer's specifications adopted in order not to generate noise levels in excess of values set out in national regulations or international recognised standards including those of the EIB/USAID.

Transport methods related to Project operations shall be adopted so that generated in order not to generate noise levels in excess of values set out in national regulations or international recognised standards including those of the EIB/USAID.

Noise complaints (a dedicated point of contact will be made available to members of the public) shall be investigated and recorded as part of the OESMP.

The Noise Monitoring Program to be developed operation shall comprise the following elements:

- Identification of noise/vibration sources and downstream sensitive receptors.
- Description of legal requirements related to noise/vibration measuring parameters, measuring locations, frequency of monitoring (intermittent or continuous).
- Description of arrangements for noise/vibration mitigation during operation in relation to identified noise sources and sensitive receptors.
- Reporting lines related to noise/vibration monitoring results.
- Communication/disclosure lines related to noise/vibration monitoring results.

#### 2.10.2.6. Traffic and Transport Management Plan

The BOT Developer shall develop a TTMP as part of the OESMP, which shall:

- Define the characteristics of the fleet of vehicles and site machinery with the aim to prevent facility site vehicle incidents by the effective management of transport operations throughout the Project construction/operation phases.
- Define the itineraries used on a map for each route between the different Project facility sites
- Describe the expected traffic created by the Project fleet of vehicles (frequency of trips between Project facility sites, working hours, convoys, etc.).
- Describe the number and positioning of flagmen.

- Include actions to limit and check the speed of all vehicles and machinery used to execute the works/operations at an appropriate level.

The TTMP shall include the following:

- Regular maintenance activities carefully planned and persons/communities who may be affected informed in advance.
- Proper warning signs installed on the road where maintenance activities are undertaken to warn the passing cars and ensure the traffic is not blocked.
- Clearly mark alternative roads if blocking a road is necessary
- Ensure that any material transported by trucks is well covered along transportation

Given the above considerations, the TTMP shall be structured to include at minimum the following contents:

1. Introduction
   - *Purpose of the TTMP*
   - *Scope of Application of the TTMP*
2. Roles and Responsibilities
3. Regulatory Framework and Standards
4 Implementation Schedule of the TTMP
5. Project Transportation Activities and Related Hazards
   - *Transportation Activities*
   - *Hazards to H&S*
   - *Hazards to the Environment*
   - *Hazards Control Procedures*
6. Communication and Reporting Procedures
7. Audit and Review Procedures
8. Personnel Training Requirements/Procedures

### 2.10.3. Overall Project Mechanisms/Procedures

#### 2.10.3.1. Emergency Preparedness and Response Plan

Suitable and sufficient steps shall be taken by the BOT Developer, to prevent, as far as reasonably practicable, the risk of major environmental incidents and the injury to any person during the execution of the Project related construction activities and operation.

To this effect, based on a risk assessment approved by ASEZA, suitable and sufficient arrangements shall be developed for dealing with any foreseeable emergency and shall include necessary evacuation measures. At all Project worksites, a suitable number of emergency routes and exits shall be provided to enable any person to reach a place of safety quickly in the event of danger, and, where appropriate, this route shall be suitably signed to assist quick evacuation.

The BOT Developer shall therefore develop an EPRP for the Project during both the construction and operation phases, which shall comprise specific procedures in the case of fire, earthquakes, major accidents, major spillages, oil marine pollution, etc., before any works commence. This EPRP shall be submitted to ASEZA for approval. The EPRP shall be kept up to date and shall be appropriate for the changing worksite conditions. The EPRPs shall be clear and unambiguous. Especially in the case of fire, travel distances to reach safety positions shall be considered because of the effects of smoke and heat, which can spread quickly, it is particularly important not to overestimate how far people can travel before they are adversely affected by fire.

As a minimum, the EPRP and their associated procedures shall include:

- Emergency contact numbers available on notice and information boards in each Project worksite areas/ Project site offices.
- Emergency procedures incorporated in the site inductions briefing.
- Emergency drills, which shall be properly recorded through developed template forms.

The emergency procedures shall be periodically reviewed by the BOT Developer on semester basis throughout the duration of the construction and annually during operation to ensure continued relevance. Moreover, the emergency and evacuation procedures shall be tested by the BOT Developer through appropriate drills that will be held every [4 months] along Project construction duration and on semester basis during operation, and, where possible, may involve all parties with interest in the Project.

For fixed locations, fire points, assembly points, spill kit, secondary containments, and means of warning shall be detailed on a site layout plan, which shall be displayed on each site office notice board. The requirements of the emergency plan at all Project worksites shall be made known to all employees as part of their site induction training.

The EPRP shall comprise procedures covering the following emergency situations as a minimum:

- Chemical spills
- Fire
- Flooding
- Extreme weather conditions
- Explosions
- Extended power loss
- Major structural failures
- Electrocution
- Toxic gas releases and respiratory/poisoning threats
- Medical injuries
- Force majeure

Procedures for first-aid, rescue, and evacuation shall be also developed and appropriate training shall be provided and documented for all Project personnel.

Fit-for-purpose Emergency Response Capability in terms of human resources and means shall be made available at the Project worksites/facilities and shall be clearly documented.

It shall be ensured that all Project personnel are informed and aware of how to react in an emergency situation, and responsibilities are defined. Information and awareness training shall be documented and available at all Project Areas.

Emergency simulation exercises (i.e., emergency drills) shall be organised, executed, and documented within 3 months of the physical start of the works, and subsequently twice per year up to construction completion. These exercises shall be organised, executed, and documented within 3 months of the operation commencement, and subsequently once per year.

Based on fire safety risk assessment, it shall be ensured that adequate and appropriate fire safety measures are in place to minimise the risk of injury or loss of life in the event of a fire. To this effect, appropriate actions shall include keeping sources of ignition and flammable substances apart, avoiding accidental fires, ensuring good housekeeping at all times, e.g., avoiding build-up of rubbish that could burn, installing fire warning systems, having in place correct and readily available fire-fighting equipment, keeping fire exits and escape routes clearly marked and unobstructed at all times, ensuring workers receive appropriate training on procedures they need to follow, including fire drills. In any case, the selected measures shall comply to the provisions of national regulations and official instructions by the competent national authorities.

All necessary communications and arrangements shall be made with the local fire-brigades for emergencies.

Contingency arrangements shall also be in place for medical injuries, which at minimum shall comprise calling for a doctor and transporting injured staff or people to the nearest hospital. The telephone numbers of the emergency services and the name, address and telephone number of the doctor and the nearest hospital shall be prominently displayed in the worksite offices.

All Project sites shall be clearly mapped and known by all construction and operation personnel. This will help in clearly defining the emergency evacuation routes. The map shall include the location of fire extinguishers, medical first aid kits, alarm system, and assembly points that the employees working at the construction site and project facilities should use. The worksite employees shall be familiar with at least two emergency evacuation routes.

Chemical spills shall be immediately contained. The designated emergency coordinator shall be notified. The site shall be secured. The spill shall be cleaned only by trained personnel. Proper equipment shall always be used for

the cleaning process. If trained personnel are not available, a professional chemical spill clean-up company shall be used.

Clear guidance shall be in place about what should be done in case of a medical emergency. The paramedics shall be given vital information about the nature of the emergency and the exact location of the response. Worksite employees shall be given first aid and CPR training. This is of utmost importance when a hospital or a clinic is not near the worksite.

Rescue plans shall always be implemented by trained personnel. If works take place in confined spaces, an emergency action plan shall be in place that includes rescue procedures in the confined spaces.

A written emergency medical procedure shall be provided to all employees before their work begins. This will help avoid confusion in the event of an accident.

Given the above considerations, the EPRP shall be structured to include at minimum the following contents:

1. Scope and Purpose of the EPRP
2. Categorisation of Incidents and Emergencies
   - *Personnel injury incidents and accidents*
   - *Facilities damage incidents and accidents*
   - *Pollution incidents and accidents*
3. EPRP Organisation and Application Procedures
   - *Mobilisation of the Plan*
   - *Control Point (Location, roles and responsibilities, control supervisor)*
   - *Coordination Point (Location, roles and responsibilities, coordination manager)*
   - *Management procedures of minor incidents*
   - *Management procedures for major injuries (poisoning by inhalation of chemicals, major injuries by malfunctioning equipment, medical care, and transportation to hospital)*
   - *Management procedures for personnel loss in the sea*
   - *Management procedures for fatalities*
   - *Management procedures for damage in facilities (activation of emergency procedures, control and H&S measures)*
   - *Firefighting Management Procedures*
   - *Earthquake Management Procedures*
   - *Spill Management Procedures*
   - *Fugitive gases Management Procedures*
   - *Evacuation Procedures*
   - *Marine pollution Management Procedures*
4. Organisation of Human Resources
5. Organisation of Equipment
6. Accountability
7. Communication Procedures
8. Personnel Training Requirements and Drill Procedures

#### 2.10.3.2. Labour Conditions

The BOT Developer shall develop and adhere to labour conditions as part of CESMP and OESMP. The purpose of these conditions are to ensure that the construction and operation of the AAWDC Project provides:

- fair treatment for all workers;
- non-discrimination and equal opportunities of workers;
- a sound worker-top management relationship;
- compliance with national labour laws;
- protection and promotion of the safety and health of workers;
- prevention of the use of forced labour and child labour (as defined by the ILO and Jordanian legislation).

The implementation of labour conditions is essential to maximize the opportunity for local employment and ensuring access to jobs to all affected communities. This will assist in promoting a positive relationship between the Project and the local community.

Decent labour conditions shall be ensured for workers in compliance with applicable national laws and regulations, the EIB / USAID E&S standards, and the fundamental conventions of the ILO. This will include workers' rights related

to wages, working hours, rest and leave, overtime, minimum age, regular payment, compensation and benefits, equal opportunities, a non-discriminatory workplace, best practice on human resource management and occupational health and safety. Wages, benefits, and conditions of work will be comparable to employers operating in the water sector in Jordan.

The workers' right to be organised in unions shall be respected and facilitated.

A system shall be developed and implemented for Project employees (including those of main sub-contractors) to monitor hours worked on the Project, which will also identify and remedy any practices that lead to long working hours in excess of national legislation.

The CESMP and OESMP shall comprise policies and procedures related to the following aspects:

- Workforce accommodation (including sanitary facilities), meals, and transport.
- Workforce health screening and access to health care and medical services.
- Workforce health and hygiene awareness on waterborne diseases, transmissible diseases (e.g., STD), etc.
- Workforce awareness on first aid.
- Workforce awareness of the Code of Conduct and interactions with local communities.
- Workforce awareness on occupational safety, and environmental, biodiversity, and cultural resources.

The following overarching principles shall be abided by the BOT Developer throughout the Project duration.

#### 2.10.3.2.1. Non-Discrimination and Equal Opportunity

The BOT Developer shall:

- Not make employment decisions on the basis of personal characteristics such as gender, race, nationality, ethnic origin, religion or belief, disability, age, or sexual orientation, unrelated to inherent job requirements.
- Base the employment relationship on the principle of equal opportunity and fair treatment, and will not discriminate with respect to all aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline.
- Establish mechanisms to ensure non-discrimination of women in accessing recruitment procedures. To this effect, an incentive mechanism to increase the share of women recruited for the Project may be established.

#### 2.10.3.2.2. Local Recruitment

Local recruitment shall be promoted as much as possible. Local recruitment is defined as the number of positions actually allocated to people residing in the region of the Project activities (i.e. less than two hours by land transport to Project Areas/Facilities) for more than one year and citizen of Jordan.

The BOT Developer shall coordinate and implement public awareness campaigns for workers regarding dealing with the local population to minimize friction caused by contacts between the Project workforce and communities

Local labour needs shall be estimated prior to the commencement of works and shall be described in the CESMP and OESMP with the following information:

- Identification of positions that could be filled by local staff and the level of qualification required.
- Definition of the planned procedure for the effective recruitment of these members of staff. This may also include the establishment of a recruitment office at a location that covers effectively the Project Areas/Facilities.
- Deployment schedule for these positions.
- Initial training to be provided for each job description.

Considering that the Project Areas/Facilities are located near several different communities, a fair distribution of local recruitment between the different communities shall be ensured through the establishment of mechanisms to ensure equal opportunities. To this effect, recruitment campaigns may be undertaken in the different local communities ensuring that said recruitment campaigns have been spread to women and that the latter have not been discriminated in recruitments.

#### 2.10.3.2.3. Preventing Discrimination at the Workplace

The BOT Developer shall ensure that employees responsible for recruitment decisions are applying the criteria developed by the organization for the position equally to all applicants or candidates. For example, if the Project

Contractor/Operator requires some of its applicants to have a certain amount of experience, that requirement shall be applied equally to all groups of applicants.

Additionally, the BOT Developer shall review their compensation policies to make sure employees are not subject to wage discrimination. They should also examine employee access to opportunities affecting compensation, such as: work assignments, training, preferred or higher paid shift work, access to overtime hours, pay increases, and incentive compensation.

Women shall receive equal pay for work of equal value. This means that rates of remuneration (including the basic wage and any additional cash or non-cash benefits) must be established without any discrimination based on sex.

Measures shall be taken to enable workers with disabilities to retain their jobs and make accommodations required by national law for physically disabled persons.

Providing a formal anti-harassment training for all employees shall also be ensured to prevent discrimination in the workplace.

Practices that may lead to discriminatory recruitment that the BOT Developer shall avoid include:

- Failing to prevent sexual harassment directed at female employees, and then failing to take adequate corrective action;
- Failing to prevent racial or ethnic harassment, including the use of racial and ethnic language, and then failing to take adequate corrective action;
- Terminating employees for complaining about a hostile work environment;
- Denying women regular and overtime work hours comparable to those of their male counterparts;
- Failing to provide adequate restroom facilities for female employees, for example by not allowing restroom breaks or failing to furnish sanitary facilities to female workers;
- Assigning certain employees (such as women or non-nationals) to the most difficult, dirty, and least desirable jobs; and
- Systematically excluding certain employees (such as women or non-nationals) from promotion opportunities.

In addition, subjective hiring practices that may result in discriminatory practices and shall be avoided by the BOT Developer as much as possible include:

- Word-of-mouth recruitment or referrals where the workforce predominantly consists of one race, sex, or ethnicity;
- Job announcements, application forms or interviews that refer to an applicant's gender, marital status, age, race, disability, or other personal characteristic that is irrelevant to the job;
- Use of an "eyeball test," where an employer looks at an applicant to determine whether that person appears to be strong;
- Requesting job applicants or workers to undertake health or pregnancy tests (except as strictly required by health and safety laws); and
- Not posting or giving notice of hiring or promotional opportunities, vacancies and/or selection criteria, and relying too heavily on friends of supervisors or of current employees to fill positions.

#### 2.10.3.2.4. Best Recruitment Practices

The BOT Developer shall adopt best recruitment practices including:

- Regularly reviewing their outreach and hiring practices to learn whether certain groups are being excluded, not just from being hired, but from even entering the applicant pool.
- Considering whether practices such as word-of-mouth recruiting, hiring only previous workers when new positions or opportunities for work arise, or picking up day laborers in particular locations are having an adverse impact on hiring.
- Working with local apprenticeship programs and community-based organizations to seek a diverse pipeline of qualified workers. Worker referral programs located within the same geographic area as the project can also help contractors draw from the available workers in the recruitment area.

#### 2.10.3.2.5. Forced Labour

The BOT Developer shall ensure that:

- Employees are paid their wages in full and on time.

- Employees are not charged recruitment, processing, or placement fees to obtain employment which entail a significant debt that can only be repaid by continued employment with the same employer.
- Only reputable recruitment and employment agencies are used, and there are procedures in place to check their practices and policies.
- Employees are provided with an employment contract which will include, at minimum, the following:
  - Expected working hours
  - Overtime requirements
  - Annual leave entitlements
  - Total salary and payment frequency
  - Notice period and conditions of termination by each party
  - Disciplinary procedures
  - Confirmation that the employer will cover the worker's medical insurance
- Employees retain control and possession of their passports and other personal documents.
- Employees are free to leave the worksite and their accommodation when they are not working.
- Employees are free to leave their employment without penalty on giving reasonable notice (in accordance with national law).
- Employees are not forced to work overtime above national limits.

#### 2.10.3.2.6. Child Work

The BOT Developer shall at minimum:

- Comply with minimum age requirements set out in the national legislation (whichever offers the greatest protection to young people under the age of 18) and keep records of the dates of birth of all employees verified by official documentation.
- Check the activities carried out by young workers and ensure that under-18s are not employed in hazardous work as defined in national legislation.
- Assess the safety risks relating to any work by under-18s and carry out regular monitoring of their health, working conditions and hours of work.

#### 2.10.3.2.7. Employee Grievance Mechanism

The BOT Developer shall develop and implement an employee/worker grievance mechanism that will allow employees to address workplace disputes or concerns in a fair, easily accessible, and transparent manner as described in the Project SEP (Section 7.2) annexed to the ESIA. A standardised procedure to this effect is as follows:

- When a concern or an action has occurred the employee/worker must file a written grievance to his or her supervisor.
- The supervisor must respond back. If the employee/worker was not satisfied with the supervisor's response, he/she can direct the grievance to the HR Department of the BOT Developer.
- The HR must respond back. If the employee/worker was not satisfied with the response and wishes to appeal, he/she can direct the grievance to the higher level of management.
- If the employee was not satisfied with the response of top management, then he/she can approach the workers organization (that he/she belongs to) where applicable for further advice and assistance.
- The employee can approach the client / client representative for an amicable resolution.
- If an employee is not satisfied with the final determination of the internal grievance procedure, the employee can still hire a lawyer and resolve the issue at court.

The grievance mechanism shall be available to all workers, including the workers of subcontractors. All workers shall receive an induction on their rights and on the Worker Grievance Mechanism whereas the contact details of the Worker Grievance Mechanism shall be displayed at well visible places in all worksites and accommodation camps

#### 2.10.3.2.8. Code of Conduct

The BOT Developer shall develop and commit to a Code of Conduct for the Project related worksites/facilities, which should address safety rules, zero tolerance for substance abuse, environmental sensitivity of areas around the Project worksites and facilities, the dangers of STDs and HIV/AIDS, gender issues (and in particular sexual harassment) and respect for the beliefs and customs of the populations and community relations in general.

The emanating rules of procedure shall be clearly displayed at the different Project Areas/Facilities and posted in the Project vehicles and machinery driving cabs.

Any existing or new personnel shall be made aware and acknowledge their understanding of the rules of procedure. To this effect, the document comprising the rules of procedure shall be initialled by all Project personnel prior to the start of any work.

The rules of procedure will include a list of acts that are considered as serious misconduct and which must result in dismissal from any Project Area/Facility., should a Contractor's Personnel repeatedly commit an offence of serious misconduct despite awareness of the rules of procedure, and this is without prejudice to any legal action by any public authority for non-compliance with applicable regulations and more specifically:

- Drunkenness during working hours, leading to risks for the safety of local inhabitants, and personnel.
- Punishable statements or attitudes, and sexual harassment in particular.
- Violent behaviour.
- Intentional damage to the assets and interests of others, or the environment.
- Repeated negligence or imprudence leading to damage or prejudice to the environment, the population or properties, particularly breaching provisions intended to prevent the spreading of STD and AIDS.
- Drug use.
- Possession and/or consumption of meat or any other part of an endangered animal or plant as defined in the national regulations and the Washington convention (CITES).
- Entering property of neighbouring people without permission of the landowners or of those cultivating/renting the land.

Serious misconduct, such as organization of sex trade, committing sex offenses, physical aggression, drug trafficking, deliberate and severe pollution, trading and/or trafficking in all or part of protected species, shall lead to immediate dismissal as of the first report of misconduct is detected, in application of the rules of procedure and labour laws.

A record for each case of serious misconduct shall be established, and a copy will be provided to the personnel in question, indicating all action taken to terminate the misconduct personnel in question and to bring the attention of other personnel to the type of incident detected. This record will be provided to the Project Promoter.

The Project Promoter shall be informed without delay in case of any serious misconduct.

#### 2.10.3.3. Community Engagement and Grievance Mechanism

Commensurate with the size of construction activities and unsolved potential disturbances of the community and risks to public health and safety, the BOT Developer shall develop a Community Engagement Plan in line with the Project SEP (Section 7.1) annexed to the ESIA.

The plan shall include a schedule of planned activities that may impact a neighbouring community and describe (a) the activities per task and phase which may impact the neighbouring communities, (b) the approach to engage and communicate with stakeholders related to the works defined in (a); and (c) responsibilities for community interaction per task and phase.

When meeting stakeholders in neighbouring communities, minutes of meetings shall be produced and recorded.

The BOT Developer shall disclose relevant information related to the involved impacts and risks to communities (e.g., related to Traffic Management or e.g., to entering of private property for surveys) in Arabic and at a level of complexity that is commensurate with local realities to ensure that stakeholders fully understand the content.

The BOT Developer shall include information about the Community Grievance Mechanism described in the SEP and the contact details in all community communication materials.

## 2.11. Environmental and Social Monitoring Plans

The following Sections aim at providing the requirements related to the E&S Monitoring Plans that shall be developed by the BOT Developer as part of the CESMP and OESMP for the monitoring of the Project related E&S impacts as identified in the Project ESIA study.

### 2.11.1. Marine Environmental Monitoring during Construction

For the establishment of baseline conditions before and after construction commencement, the following surveys shall be undertaken by the BOT Developer:

- Bathymetry survey.
- Seawater column vertical profiling through conductivity (salinity) – temperature – depth at the proposed diffuser location and 100 m from the diffusers and at an ambient control location.
- Marine species survey through underwater video recording and species identification / mapping repeated once per season during project design and construction and then repeated once after construction completion to establish the "new" baseline conditions in the near field path of the brine plume.
- Seawater quality sampling survey once per season with focus on salinity, temperature, hydrocarbons, and nutrients ($NH_3$ and phosphates near sources where pollution is suspected).
- Continuous monitoring of turbidity, temperature, pH, DO, and conductivity/salinity during design and construction phases, by setting up a monitoring buoy (at the proposed intake location).
- WET testing shall be designed and implemented during construction on the principal corals and fauna identified in the brine plume path area of the near field dispersion.
- Detailed analyses for benthic fauna abundance and diversity and sediment distribution.

The following principles for WET testing shall be considered:

- Selected species for testing shall be representative of the discharge area at the end of the near field mixing zone as established by baseline monitoring.
- Selected species shall be representative of trophic levels (e.g., 3 to 4 trophic levels to be covered), to cover early life cycle stages (e.g., fertilisation and larval growth), and be known for their sensitivity (e.g., corals, crustaceans, echinoderms, etc.)
- Tests shall be conducted to establish both acute and chronic toxicity tolerance of examined species.
- Tests shall ensure seasonal replicability.
- Tests shall establish the Species Protection Trigger Value, which represents the safe brine dilution ratio that protects a certain percentage of species (Species Protection Level) from adverse impacts. Although the AAWDC Project discharge area is a modified ecosystem due to human interventions (pursuant to EIB and IFC classification), a recommended Species Protection Level for the AAWDC Project is 99% (i.e., 99% of species will be protected, ANZECC Guidance) under the precautionary approach for increased protection of the Gulf of Aqaba.
- There are no legal requirements and standardised protocols in Jordan for the execution of WET tests. A competent and accredited national laboratory shall be contracted to develop and execute a suitable execution approach.
- It is understood that no explicit approvals are required by ASEZA or MoEnv for the execution of WET tests.

### 2.11.2. Marine Environmental Monitoring during Operation

The following surveys shall be undertaken by the BOT Developer after operation commencement related to the monitoring of marine brine discharge:

- **Operation monitoring:**
  - Seawater column vertical profiling through conductivity (salinity) – temperature – depth loggers at the same locations as baseline monitoring. Surveys shall map the brine plume after the diffusers and its concentration profile for the different stages of the sea stratification. Surveys shall be repeated every 4 months in the first 3 years and annually henceforth.
  - Marine species survey through underwater video recording and species identification / mapping along outfall, brine plume and to selected reference locations with similar characteristics to the brine discharge site. These surveys shall be repeated annually. The video recording of marine flora and fauna to include (a) the nearfield path of the brine plume to 100 m from the diffusers, (b) the area around the intake towers, and (c) the pipeline paths of the intake and outfalls.
  - Long term in-situ measurement and monitoring programs with particular attention to understanding of seasonal / annual larvae concentrations at the intake head locations.
  - Continuous measurements of flow, pH, temperature, conductivity, turbidity, and residual chlorine at the total combined flow before brine discharge.
  - Annual condition assessment of outfall integrity by divers/ROVs with video cameras. After 5 years of records indicating no damage or malfunction of the outfalls, the frequency can be once per 2 years.

- Bi-annual condition assessment of intake towers integrity by divers/ROVs with video cameras.

- **Brine dispersion and discharge compliance monitoring:**
  - Use the Roberts and Abessi's semi empirical equations and brine discharge measurements (i.e., flow, conductivity, temperature) to demonstrate dilution compliance at the brine impact point (i.e., where the brine plume hits the seabed) and at the boundary of the near field mixing zone.
  - 24-hour flow proportional composite sampler on the brine outfall (at the outlet of brine reservoir of the SWRO Desalination Plant). Daily onsite laboratory sampling for COD, Total Nitrogen, Total Phosphorus, Turbidity, and Total Iron. Monthly laboratory analyses of Total Suspended Solids.
  - Dedicated flow, turbidity, and pH, total iron, temperature, and salinity (PSS-78) monitoring at the brine outfall reservoir. Total iron can be measured by using a grab sample instead of online monitoring provided that a flow proportional composite sampler is used.
  - Continuous residual chlorine monitoring at the brine outfall reservoir.
  - Daily Composite THM monitoring at brine reservoir only when chlorine for Intake macrofouling control is used.
  - Continuous flow, turbidity, and pH monitoring of the solids processing supernatant.
  - Continuous flow, turbidity, and pH monitoring of the sludge dewatering supernatant.
  - RO CIP neutralisation tank pH monitor.

- **Annual reporting to the regulatory authorities (ASEZA, MoEnv) with records on:**
  - Daily production, continuous (15mins intervals) intake flow record, seawater feed temperature, turbidity, pH and Salinity (Practical salinity scale), Number of RO membrane CIPs used, chemical and volumes used for CIPS, chemicals and volumes used for the coagulants, antiscalant. RO CIP Neutralisation record.
  - Sludge processing liquors: Continuous Flow record, pH, Turbidity.
  - Outfall flow data: Continuous flow record, pH, turbidity, conductivity, salinity (PSS-78), temperature, total iron, residual chlorine, THMs (if chlorination is used for intake macrofouling control).
  - Daily brine outfall sample laboratory analysis composite samples: Total COD, Turbidity, Total Iron, Total Phosphorus, Total Nitrogen.

- **WET testing:**
  - WET tests to be repeated on the same tested organisms after one year of full operation with operational plant brine effluent.

### 2.11.3. Terrestrial Biodiversity during Construction

The frequency of monitoring for terrestrial biodiversity is mostly Periodical (every three months) combined with follow up on daily basis and Annual Auditing. The following are the biological environment monitoring indicators and responsibilities:

- Maintained pre-project land utilization and access
- Maintained natural conditions of the habitat and geomorphology, and occurrence of habitat deterioration
- Monitor of key herpeto-faunal, avifaunal and mammalian species, with emphasis on threatened species and identified flagship species.
- Monitor incidents of hunting and accidental kills of wildlife
- Monitor worker bites by venomous snakes and scorpions, parasitic infections and other epidemiological accidents

The following components shall be monitored on a regular basis to conserve the agricultural and pastoral resources.

- Availability of safe passage-ways dedicated for the use of Herders.
- Removal from the construction corridor and/or cutting of Acacia, Tamarix and other natural trees or parts of trees for wood collection.

- Removal of trees within farms along the route and from forested areas.
- Number of direct or indirect killing of pastoral animals by the project activities, workers or machinery

### 2.11.4. Drinking Water Quality Monitoring during Operation

The sampling parameters regime shall meet the Jordanian Standard for Drinking Water, i.e., JS 286:2015, Latest Edition, and shall also include the following:

- Continuous online measurement of the following parameters: pH, temperature, conductivity, turbidity, and residual chlorine.
- Daily composite sample laboratory analysis for the following parameters: pH, calcium, boron, total alkalinity, total hardness, total dissolved solids, chlorides, sodium.
- Daily measurement of Langelier Saturation Index
- Weekly measurement of Calcium Carbonate Precipitation Potential.

### 2.11.5. Domestic Wastewater Treated Effluent Monitoring

If the BOT Developer selects to provide a domestic WWTP within the SWRO site, then the treated effluent quality as well as monitoring parameters and frequency have to comply with the Jordanian Standard for Reclaimed Domestic Wastewater, i.e., JS number 893/2021 and according to the targeted use.

Should ASEZA permits the mixing of the treated domestic wastewater to the brine reservoir for outfall disposal, the following treated effluent quality standards shall be met continuously before mixing:

- Ammonia: 95 percentile value ≤ 2 mg/L
- BOD: 95 percentile value ≤ 25 mg/L
- COD: 95 percentile value ≤ 125 mg/L
- Total P: Average value ≤ 2 mg/L
- Total Nitrogen: Average value ≤ 15 mg/L as N
- Turbidity: Maximum value ≤ 30 NTU

### 2.11.6. Air Quality and Noise Monitoring during Construction

Where applicable, visual inspections of atmospheric emissions shall be conducted, especially dust and emissions from vehicles and machinery. The inspections shall identify areas where the implementation of dust reduction measures is required.

Noise monitoring shall be undertaken daily when works are located near sensitive receptors including residential areas and natural habitats.

### 2.11.7. Noise Monitoring during Operation

Every 2 years, a noise survey shall be carried out at the desalination plant, the IPS and the conveyor's pumping stations.