IPP4 AI-Manakher Power Project - Environmental and Social Mitigation and Monitoring Programme

AES Levant Holding B.V Jordan PSC

July 2012

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Environmental Mitigation and Manitaring Dre

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CONTENTS



	YEARS		
EXECUTIVE SUMMAR	Ŷ	1	
SECTION 1		1	
INTRODUCTION		1	
1.1	Background	3	
1.2	Roles and Responsibilities	4	
1.3	Community Liaison Representatives and Community Engagement	5	
SECTION 2		7	
MITIGATION DURING THE CONSTRUCTION PHASE 7			
2.1	Introduction	g	
2.2	Site Development	9	
2.3	Air Quality	9	
2.4	Water Quality	11	
2.5	Noise and Vibration	11	
2.6	Stakeholder Engagement and Grievance Mechanism	12	
2.7	Waste	13	
2.8	Ecology and Biodiversity	13	
2.9	Transport and Infrastructure	13	
2.10	Cultural Heritage / Archaeology	14	
2.11	Labour and Working Conditions	14	
SECTION 3		17	
MITIGATION MEASURES DURING POWER PLANT OPERATION 17			
3.1	Air Quality	19	
3.2	Protection of Water Resources	21	
3.3	Noise and Vibration	22	
3.4	Stakeholder Engagement and Grievance Mechanism	23	
3.5	Labour and Working Conditions Error! Bookmark not defined	ned.	
3.6	Training	24	
3.7	Ecology and Biodiversity	24	
3.8	Transport and Infrastructure	25	
SECTION 4		27	
DECOMMISSIONING		27	
SECTION 5		31	
MITIGATION TABLES		31	
5.1	Overview	1	

EXECUTIVE SUMMARY



EXECUTIVE SUMMARY

This Environmental Mitigation and Monitoring Programme (EMMP) provides details of the monitoring and mitigations plans proposed by AES Levant Holding BV Jordan PSC, a project company incorporated in Amman, Jordan, to meet the environmental and social requirements of Jordanian law, Overseas Private Investment Corporation, and the European Bank for Reconstruction and Development. AES Jordan Levant Holding BV Jordan PSC proposes to construct a Power Project on the behalf of the Consortium AES Baltic Holdings B.V and Mitsui & Company Ltd near the village of Al-Manakher, approximately 14 km to the east of Amman on a site leased from the Ministry of Finance / Department of Lands and Survey. The Power Project will involve the construction of 16 x 18V50DF tri-fuel compression ignition engine power plant (able to fire on heavy fuel oil (HFO), distillate fuel oil (DFO) and natural gas when this becomes available). The Power Project will have a nominal output of up to 250 MWe at specified site rated conditions.

The EMMP provides information on the mitigation measures and monitoring that will be employed to minimize the environmental and social impact of the project in the construction, operational and decommissioning phases.

Adherence to this EMMP will reduce the risk of the potentially adverse impacts of the Power Project on sensitive environmental receptors and minimise social impacts.

The EMMP forms part of the overall project management for this Power Project and as such, activities will be integrated with other quality, sustainability and health and safety management procedures. In preparing the EMMP consideration has been given, as appropriate, to the World Bank / International Finance Cooperation (IFC) Performance Standards on Social and Environmental Sustainability; relevant Jordanian Standards, Laws and Regulations; and the EBRD's Environmental and Social Performance Requirements, as presented in this EMMP.

Specifically, the following issues have been addressed when developing this EMMP:

- Community health, safety, and security
- Worker health and safety
- Air emissions:
- Noise emissions;
- Impacts to surface water and groundwater;
- Impacts to ecology (flora and fauna); and
- Socio-economic impacts.

Detailed mitigation and monitoring procedures have been developed for each of the above potential impacts of the Power Project. In developing these mitigation measures it has been assured that no significant impacts will be caused to the surrounding receiving environment.

Key mitigation and monitoring objectives of the EMMP include:

- Corporate systems to manage environmental, health and safety, social, and human resources issues.
- Protection of nearby communities from noise, traffic hazards, electrical hazards, and other risks to human health, safety, and security.
- Selective Catalytic Reduction (SCR) system to ensure oxides of nitrogen (NO_x) levels to be in



accordance with World Bank / IFC and Jordanian requirements;

- Low sulphur fuel to limit emissions when firing on HFO and DFO;
- Use of a stack of sufficient height and flue gases of sufficient temperature and velocity to ensure good dispersion;
- The bunding of all storage tanks and containers with 110 per cent impermeable bunds to ensure that in the event that a tank were to leak all material is contained and could be safely removed and the tank was repaired;
- The use of dust suppression measures such as the use of water bowsers to minimize the potential for dust creation during the construction period;
- The encouraging of the use of public transport, car sharing or use of minibuses to minimize the impact of the projects construction and operational activities on the local traffic infrastructure;
- The installation of a continuous emissions monitoring system (CEMS) in the stack of the power station during operation to ensure that all emissions limits are adhered to; and
- The installation of fire protection measures to ensure that any fire can be combated effectively.
- Regular monitoring and reporting of all noise, emission to air, land and water.

To ensure that the monitoring and mitigation measures outlined in the EMMP are successfully implemented, an environmental and safety manager will be appointed during the construction and operational phases to oversee the process.

It is considered that so long as the plant implements the mitigation and monitoring measures outlined in the EMMP the project will comply fully with all relevant Jordanian Standards, Laws and Regulations as well as the applicable requirements of the World Bank / IFC and the EBRD as presented in this EMMP. .

SECTION 1

INTRODUCTION



1 INTRODUCTION

1.1 Background

- 1.1.1 This EMMP has been prepared for the IPP4 AI-Manakher Power Project on behalf of the Consortium AES Baltic Holdings B.V and Mitsui & Company Ltd. The Power Project will be located near the village of Al-Manakher, approximately 14 km to the east of Amman on a site leased from the Ministry of Finance / Department of Lands and Survey. The Power Project will involve the construction of 16 x 18V50DF tri-fuel compression ignition engine power plant that will be able to fire on heavy fuel oil (HFO), distillate fuel oil (DFO), and natural gas (when this becomes available). The Power Project will have a nominal output of up to 250 MWe at specified site rated conditions.
- 1.1.2 This document provides the management framework needed for planning and implementing the mitigation measures that are discussed in detail in the Environmental Statement (ES) to prevent any adverse environmental impacts arising from the project during construction, operation and decommissioning. It also identifies monitoring that will be necessary in order to ensure that these measures are successfully implemented.
- 1.1.3 In preparing the EMMP consideration has been given as appropriate to the World Bank / IFC's Performance Standards on Social and Environmental Sustainability and to the EBRD's Environmental and Social Performance Requirements as presented in this EMMP. Consideration has also been given to the relevant Jordanian Laws, Standards and Regulations as necessary including:
 - Instruction for Hazardous Waste Management and Handling (2003);
 - Civil Defence Law (No.35, 1999);
 - Public Health Law (No. 47, 2008);
 - Instruction for Management and Handling of Consumed Oil (2003); and
 - Management, Transport and Handling of Harmful and Hazardous Substances Regulations (No. 24, 2005).
- 1.1.4 Adherence to this EMMP will reduce the risk of adverse impact of construction on sensitive environmental receptors and minimise social impacts. Specifically, the following issues have been addressed when developing this EMMP:
 - Community health, safety, and security
 - Worker health and safety.
 - Air emissions;
 - Noise emissions;
 - Impacts to surface water and groundwater;
 - Impacts to ecology (flora and fauna); and
 - Socio-economic impacts.
 - Archeological protection plan



- Stakeholder engagement
- 1.1.5 The EMMP forms part of the overall project management for this Power Project and as such, activities will be integrated with other quality, sustainability and health and safety management procedures.

1.2 Roles and Responsibilities

1.2.1 Members of the project team will be assigned specific roles for environmental, health and safety and community liaison, as shown in Figures 1.1 and 1.2:



FIGURE 1.1 - CONSTRUCTION PHASE:



Project Company Plant Manager Plant Manager Community Liaison Representative

FIGURE 1.2 - OPERATIONAL PHASE:

- 1.2.2 The Consortium's environmental, health and safety responsibilities during construction and operation phases will be managed by appointed environmental, health and safety, and community liaison representatives. These responsibilities include:
 - Contractor to develop, and review the EMMP and any specialist procedures and method statements;
 - Delivery of environmental training to project personnel;
 - Review of method statements and provide any suggested improvements prior to work starting;
 - Construction activities and performance monitoring to ensure appropriate control measures are being implemented and are effective and ensure compliance with the EMMP;
 - Contractors interaction with the environmental coordinator to ensure mitigation and monitoring of environmental procedures;
 - Relevant instruction of all personnel on site;
 - Implementation of mitigating measures at the work site in collaboration with the public works contractors; and
 - Organisation and implementation of monitoring during the site works and subsequent operation.

1.3 Community Liaison Representatives and Community Engagement

- 1.3.1 The Consortium Community Liaison Representatives (as shown in Figure 1.1) shall during the construction and operations phases be responsible for:
 - Conducting scoping and disclosure meetings to engage with the general public and government authorities during the ESIA / EMMP process;



- Implementing the Stakeholder Engagement Plan, which includes an ongoing program of meetings with the general public and authorities;
- Implementation of a grievance process to ensure that stakeholders can share their concerns and understand how the company will respond;
- Training of Consortium personnel, including contractor personnel, in public relations, holding meetings and addressing grievances;
- Develop an auditable reporting progress which can be reviewed periodically by all parties; and
- Ensuring the general public are regularly informed of site activities, including any events with possible negative social impacts.

SECTION 2

MITIGATION DURING THE CONSTRUCTION PHASE



2 MITIGATION DURING THE CONSTRUCTION PHASE

2.1 Introduction

- 2.1.1 Potential environmental impacts due to construction activities are described in more detail in the sections below.
- 2.1.2 All monitoring and mitigation measures during the construction phase will be the responsibility of the EPC contractor. The cost of this mitigation is considered to be negligible during this phase and is in any case part of best working practices

2.2 Site Development

- 2.2.1 All plant and equipment during the construction period will be contained within the Power Project boundary and appropriate laydown areas.
- 2.2.2 The IFC EHS General Guidelines, under Section 4 (construction and decommissioning) state that soil erosion may be caused by exposure of soil surfaces to rain and wind during site clearing, earth moving and excavation activities. The mobilisation and transport of soil particles may in turn result in sedimentation of drainage networks which may result in impacts to the quality of natural water systems and ultimately the biological systems that use them. Therefore, the following mitigation measures will be implemented to prevent sedimentation and runoff:
 - Additional care and attention will be given to risk assessment for excavation during heavy rainfall;
 - The length and steepness of the slopes on the side of stockpiles will be limited to help prevent erosion;
 - Silt traps will be used where there is the potential for any sediment laden runoff to enter watercourses;
 - The gradient of access roads will be limited to reduce runoff-induced erosion and provide adequate road drainage based on road width, surface material, compaction and maintenance;
 - Excavation faces, when not being worked, will be sheeted;
 - The number of handling operations should be minimised, ensuring that dusty material is not moved or handled unnecessarily. Fine material will be delivered to site in bags or enclosed containers, otherwise they will be delivered in lorries and be offloaded and stored appropriately at site. Drop height must be kept to a minimum;
 - Stockpiles will be located as far away as practicable from potential sensitive receptors, with slopes at angles less than the natural angle of repose of the material. Stockpiles will be sheeted, contained within wind barriers or potentially damped down. If long term stockpiles are required, consideration will be given to the use of chemical bonding agents.

2.3 Air Quality

2.3.1 It is considered that the main potential air quality issues resulting from the construction phase of the development would be from dust generating activities and from exhaust emissions from vehicles.



- 2.3.2 The potential for dust to cause impacts is likely to be limited to a short distance from construction works that have dust generation potential. However, construction traffic and plant also have the potential to impact on human health and ecosystems via exhaust gas emissions. In addition, if particularly dry and windy conditions prevail, the potential for dust migration over longer distances cannot be discounted.
- 2.3.3 The potential for dust generation and its transport to sensitive receptors is highest during dry, windy conditions. In general, construction activities associated with the greatest potential for dust generation are:
 - Earthworks including excavation of topsoil, handling on site and deposition;
 - Handling and storage of materials (including loading and unloading);
 - Haulage roads and unsealed site surfaces (including vehicles travelling along them);
 - Wind blow across disturbed site surfaces and materials; and
 - Mechanical operations such as crushing, drilling, concrete mixing and cutting.
- 2.3.4 To ensure that atmospheric dust, contaminants or dust deposits generated by the construction work do not exceed levels which could constitute a nuisance to local residents or damage to ecosystems, or site equipment, it is proposed that visual inspections of dust, odours and exhaust emissions will be undertaken along approach roads and along the boundary of the construction works and appropriate best practices applied where needed to reduce dust. Additionally, the following mitigation measures will be applied to the construction phase of the works:
 - The prolonged storage of debris on site, in temporary stockpiles will be avoided;
 - Vehicles removing demolition or site clearance materials must have their loads effectively sheeted on all sides;
 - Crushing of material for reuse, transportation or disposal will be undertaken as far away as possible from sensitive receptors;
 - Burning of waste material will be avoided if possible;
 - Excavation faces, when not being worked, will be sheeted;
 - The number of handling operations will be minimised, ensuring that dusty material is not moved or handled unnecessarily;
 - Fine material will be delivered to site in bags or enclosed lorries with appropriate storage methods on arrival at site;
 - Drop height must be kept to a minimum;
 - Hard-standing areas for vehicles entering, parking and leaving the site should be provided, with wheel washing facilities at access points;
 - Site roads should be cleaned regularly, and damped down should the latter not be sufficient for dust suppression other options for dust suppression will be explored norder to prevent nuisance dust;
 - Site vehicle movements should be kept to a minimum and, where possible, restricted to paved haulage routes;



- Vehicle speeds should be limited to 20 km/h or less onsite surfaced roads, and 10 km/h on unpaved surfaces. The idling of vehicles will be kept to a minimum;
- To prevent excess exhaust fumes, equipment and plant will be maintained in a good state of repair and serviced regularly. Any vehicles and equipment with visible exhaust emissions will be removed from service and repaired immediately.

2.4 Water Quality

- 2.4.1 Water will be used during construction for mixing, sanitary purposes, washing equipment and to spray stockpiles on site to reduce dust. Measures will be employed to conserve water usage. The following mitigation measures will also be employed to limit impacts to the receiving environment:
 - Potentially polluted water will be treated in the oily water treatment unit before being discharged into the natural environment;
 - Sanitary water will be treated in septic tanks before being sent to a treatment unit;
 - Surface water may be discharged to the natural environment as allowed by Jordanian authorities, but will pass through silt traps;
 - Any refuelling will be undertaken over areas of hard standing;
 - Vehicles and site equipment will be checked regularly to ensure they are in good working order and do not have any leaks;
 - Monitoring of wastewater streams shall comply with Section 1.3 of the IFC general EHS guidelines, which require that the discharge characteristics of the process water are monitored over time. This monitoring will most likely comprise taking occasion grab samples during construction and subjecting them to assessment for a range of pollutants and suspended solids. Storm water samples would only be required during times of rainfall; and
 - Monitoring of watercourses in the vicinity of the site will also be undertaken during the construction phase to ensure that no off-site pollution is being caused by construction activities.

2.5 Noise and Vibration

- 2.5.1 The magnitude and significance of the effect of construction noise depends upon a number of variables, including:
 - The noise generated by plant or equipment used on site, generally expressed as sound power levels;
 - The periods of time site plant is operational, generally expressed as on time and measured as a percentage;
 - The distance between the noise source and the receptor; and
 - The level of attenuation likely due to ground absorption, air absorption and barrier effects.
- 2.5.2 Some construction activities can also be a source of ground-borne vibration, which can be a cause for concern at the nearest receptors.



- 2.5.3 The main mitigation measure to limit impacts of nuisance noise on human receptors is to agree appropriate noise levels with the relevant authorities and to undertake noise monitoring during construction to make sure these agreed thresholds are not breached. All reasonable effort will be made to ensure that noise will be kept to a minimum during construction.
- 2.5.4 All contractors and sub-contractors working on-site have a general duty to take all possible measures to minimise nuisance from noise and vibration that has potential to impact on the local community or environment. To achieve this, Best Practical Means (BPM), shall be employed and the following mitigation measures complied with:
 - Noisy plant or equipment should be sited as far away as is practical from noise sensitive receptors;
 - All machines in intermittent use shall be shut down in the intervening periods between work or throttled down to a minimum;
 - All items of plant shall be maintained in good working condition;
 - All vehicles and mechanical plant used for the purposed of the work must be fitted with effective exhaust silencers;
 - All compressors will wherever possible be "sound reduced" models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use. All pneumatic percussive tools shall be fitted with silencers or mufflers;
 - Where necessary and practical, equipment that breaks concrete by bending rather than by percussion must be used; and
 - Where practical, rotary drills and bursters actuated by hydraulic or electrical power should be used for excavating hard material.
 - Construction activities generating unsatisfactory noise levels during night time should be minimised.

2.6 Stakeholder Engagement and Grievance Mechanism

2.6.1 Implementation of the Stakeholder Engagement Plan is intended to ensure effective communications between the Project Company, the Contractor and key stakeholders, including the local community and including women as well as men. The plan is applicable to both the construction and operational phase of the project.

The Company will appoint a Community Liaison Officer(s) (CLO) who will be made known to the local community, and who will be responsible for ensuring effective and culturally appropriate communications. They will undertake a range of tasks including regular meetings with stakeholders; providing updates on the progress of the project and any key issues (eg noise or night-time working). The CLO will be based in a location that is accessible for stakeholders.

- 2.6.1 A grievance mechanism, tied in with a public information process, is essential for the success of this project and will also serve as an early warning system for wider problems, yield insight from individual grievances that highlight changes which may be required and indicates potential recurring issues. The CLO will be responsible for the implementation of the grievance mechanism, which will include:
 - Maintaining a central contact person for coordinating and ensuring all grievances are resolved with the period specified in the mechanism;



- Reporting back to those who submit grievances, and providing information to the Company on key issues; and
- Maintaining a log to monitor grievances and resolutions. The log will remain confidential though the Company will summarise the issues raised in their annual report to lenders.

2.7 Waste

- 2.7.1 During construction all wastes will be recovered and treated in conformity with World Bank / IFC and Jordanian regulations.
- 2.7.2 Additionally, where possible, the Company will re-use and recycle wastes where possible. Burning of waste, on site will not be allowed and only inert waste (e.g. excavated soils) will be stored on site.
- 2.7.3 It is not anticipated that on site incineration of waste lubricating oil or fuel oil sludge shall be necessary.

2.8 Ecology and Biodiversity

- 2.8.1 The construction of the Power Project will result in the loss of the existing vegetation on the site. However, the Power Project site does not contain any plant species that are notable or rare.
- 2.8.2 Indirect impacts which could result from aqueous effluent and runoff from site activities during construction will be carefully monitored and kept to an absolute minimum. This will ensure that there is no contamination of habitats and ecosystems outside the Power Project boundary. Additionally, the following mitigation measures will also be applied during the construction phase of works:
 - The Construction Contractor will not allow workers to hunt or kill animals. Any accidents resulting in the death of wildlife will be reported to the Ministry of Environment and the Royal Society for Conservation of Nature;
 - The destruction of bird nests will be prohibited. Any ground nests found inside the site boundary will be moved to an appropriate area in coordination with Ministry of Environment and the Royal Society for Conservation of Nature. Construction activity which is particularly noisy will be kept to a minimum during night-time to decrease disturbance. The planting of exotic or invasive plants for landscaping inside and around the Power Project site boundary will be prohibited; and
 - A preference will be given to the planting of native species where landscaping is deemed necessary.

2.9 Transport and Infrastructure

2.9.1 During construction regular servicing and maintenance of vehicles will be employed to help minimise noise and emissions to air. All vehicles will be well maintained and remain with the applicable Jordanian standards and guidelines for noise and exhaust emissions.



- 2.9.2 Wheel washing may be employed to help prevent mud and earth being carried from the site onto local roads. In dry periods onsite roads may be dampened to reduce the potential for dust creation. Signs will be put in place as necessary to warn of the presence of construction traffic entering and leaving the site.
- 2.9.3 Car sharing and the use of minibuses and public transport will be encouraged by all staff. In addition the contractors appointed would be encouraged to provide a minibus service for construction staff.
- 2.9.4 A traffic management plan will be prepared to help minimise the volume of additional traffic requiring use of the local traffic network. The plan will include provisions for the movement of any heavy plant or machinery which could include timing of the transport to outside of the hours of peak demand. The assistance from authorities may be sought, as necessary.
- 2.9.5 Duties will be designated to all parties involved in the transportation of oils/fuels up to and including the receipt of the deliveries at the site. These duties may include:
 - Correct labelling and classification of the substance;
 - Ensuring that all consignments are fully documented;
 - The use of suitable transport vehicles including the provision of all necessary safety equipment, such as fire extinguishers, spill kits and warning signs; and
 - All drivers must hold a valid and appropriate licence for driving the particular delivery vehicles.
- 2.9.6 A designated safety representative will monitor all of the above (including the compliance of suppliers). Safety training will be provided to vehicle drivers and all drivers will be instructed to comply with all relevant speed limits and other relevant laws.
- 2.9.7 Construction traffic movements will be reviewed to avoid sensitive receptors such as schools and residential areas to reduce the potential for impact on local traffic safety. Signs will be provided to warn of heavy vehicles using roads in the area of the site.

2.10 Cultural Heritage / Archaeology

- 2.10.1 The Construction Contractor shall contact the Department of Antiquities (DOA) if any potentially significant archaeological antiquities / sites are encountered during the construction period.
- 2.10.2 Following initial consultation, the Construction Contractor will also secure the written approval of the DOA before the removal of any building / foundation / structure / fence / obstruction over 50 years old.
- 2.10.3 Designated salvageable material shall be removed, without causing unnecessary damage, in parts or pieces which may be readily transported. Any salvageable material removed shall be stored by the Construction Contractor at approved locations, for later use or possession by the DOA.

2.11 Labour and Working Conditions

2.11.1 The Company and all contractors will develop or adopt an occupational health and safety programme that includes at least the following:



- Analysis of hazards for tasks/workers.
- Identification, implementation and enforcement of protective measures needed to protect worker health and safety, including personal protective equipment (PPE).
- Training of all workers on specific hazards to which they may be exposed, and protective measures.
- Provision of PPE and enforcement of its use.
- Maintenance of health and safety records, including working hours, incidents (lost time, sever injuries and fatalities) and near misses. Semi-annual reports to financiers on the status of the OHS programme, including workers trained, working hours, incidents, and other key statistical measures of programme success.
- 2.11.2 The Project Company will encourage the EPC contractor to employ, where possible, men and/or women from the local community by advertising job opportunities locally provided the candidates hold relevant skills and experience.AES will record all employment opportunities offered to residents of the local area. In addition, the Company will encourage local communities to develop skills and/or small businesses to provide services for the plant. EBRD intends to mobilise support to enhance and/or support any such initiatives.
- 2.11.3 The Company will maintain records on employment with the aide of the EPC Contractor where applicable, including all contractors during construction. This will include breakdowns by skill level (management vs skilled vs unskilled), origin (local vs Jordanian versus expatriate), gender, status (permanent vs permanent), and other relevant categories.
- 2.11.4 The Company will develop a system to manage occupational health and safety consistent with AES Safety system and the EPC Safety system, and a system to manage human resources.

SECTION 3

MITIGATION MEASURES DURING POWER PLANT OPERATION



3 AIR QUALITY

3.1 Air Quality

- 3.1.1 The Power Project will involve the construction of a 16 x 18V50DF tri-fuel compression ignition engine power plant (able to fire on HFO, DFO and natural gas when this becomes available) with a nominal output of up to 250 MWe at specified site rated conditions.
- 3.1.2 The combustion of these oils will result in the emission of NO_x, SO₂, carbon monoxide (CO), Particulate Matter (PM_{10}/PM_{25} ,) Total Suspended Particulates (TSP), Hydrogen Sulphide (H_2S) and hydrocarbons.
- 3.1.3 The anticipated operating regime of the proposed Power Project will be to provide short-term support to the National Transmission System (NTS).
- 3.1.4 Accordingly, the potential impacts on local air quality will be limited to short-term averaging periods.
- 3.1.5 During operation, the combustion of fuel oil will comply with limits provided by the World Bank / IFC. The fuel quality utilised in the power plant will be as provided in the Environmental Statement.
- 3.1.6 In particular, The World Bank / IFC EHS Guidelines for Thermal Power Plants state:

"[the environmental assessment] may justify more stringent or less stringent [emissions] limits due to ambient environment, technical and economic considerations provided there is compliance with applicable ambient air quality standards and incremental impacts are minimized"

- 3.1.7 The results of the atmospheric dispersion modelling have been compared to the air quality objectives presented in the World Bank / IFC Guidelines. Key findings from the analysis of normal operation of the proposed Power Project, in isolation, are:
 - The predicted maximum process contribution to short term NO₂ concentration is 159.3 μg/m³ and is within the short term limit of 200 μg/m³.
 - The predicted maximum increase to short-term PM_{10} concentration is 7.8 µg/m³ and is well within the prescribed limit for a 24-hour averaging period.
 - The predicted maximum increases to short-term SO_2 concentrations is 90.9 μ g/m³ and within the prescribed limit for a 24-hour averaging period.
 - The predicted maximum concentrations of CO, TSPs, H₂S and hydrocarbons are negligible.
- 3.1.8 The location of maximum increments is indicative of the prevailing meteorological conditions (i.e. predominately north-westerly winds). The predicted maximum short term concentrations of NO₂, SO₂, CO and PM₁₀/PM_{2.5} are below the applicable air quality objectives in all locations.
- 3.1.9 The air dispersion modelling described above has assumed that particulate matter will be emitted at a maximum of 50 mg/Nm³, in accordance with the World Bank / IFC Guidelines.



- 3.1.10 A continuous ambient air monitoring station for measurement of SOx, NOx and particulate matter shall be installed in line with WB/IFC guidelines. Results of the continuous monitoring will be made available to the local authority, and villagers on request. The Company will produce an annual report summarizing the mean monthly air quality data.
- 3.1.11 The following mitigating measures have been 'built-into' the design of the Power Project:
 - Installation and operation of the Selective Catalytic Reduction (SCR), will be utilised to control NO_x emissions levels as stipulated in the Environmental Statement. The use of stacks of sufficient height and flue gases of sufficient temperature and velocity to ensure good dispersion; and,
 - The reservation of a development area for the installation of Flue Gas Desulphurisation (FGD) equipment should this be considered necessary.
- 3.1.12 The Consortium will require a manufacturer's guarantee regarding the performance of the NO_x abatement system. If NO_x values are outside the permitted levels, the operation and calibration of the instrument will be checked. If proved to be accurate, corrective action shall be taken immediately to identify cause and to reduce emissions level to within the permitted levels.
- 3.1.13 Emissions will be controlled during operation in accordance with the manufacturer's recommendations, taking account of the Technical Guidance and Local Legislation and Guidance applicable. Efficient and regular operation and maintenance of the engine units will ensure that the emissions of CO are controlled.
- 3.1.14 Whilst the design of the Power Project allows for the future installation of FGD equipment if necessary it is considered that the primary method for the control of SO₂ emissions (from any thermal power plant) is to reduce the sulphur content of the fuel.
- 3.1.15 Similarly, the emission of PM should be limited by the ash content of the fuel.. However, complete conversion of any fuel is not possible in any combustion system, and some small amount of un-burned hydrocarbons will be emitted from the engines that can form soot and add to the emissions of PM. It is considered that the engines will be able to comply with the emissions standards described earlier.
- 3.1.16 The stack will be fitted with continuous emissions monitors for NOx, SOx, CO, and dust. The measured values will be recorded and displayed both remotely and in the control room. Routine calibration checks will be carried out as recommended by the manufacturer and as agreed with the Relevant Authorities. Any other ad-hoc calibration checks required by such Authorities will be carried out. An oxygen monitor will also be supplied and results from this will be used to correct the measured values to the required reporting formats.
- 3.1.17 Sampling points and safe access adjacent to the continuous monitoring points will be installed during construction.
- 3.1.18 Regular observation of chimney emissions will also be made.
- 3.1.19 In combination, these measures will ensure that the impact of operation of the Power Project, both in isolation and in conjunction with IPP1, will have an insignificant impact on local air quality.



3.1.20 The CO₂ emissions from the plant will be calculated on an annual basis and reported; based on the type of fuel used. This data will be included the annual report.

3.2 Protection of Water Resources

- 3.2.1 All water required by the Power Project will be provided by the Water Authority of Jordan (WAJ) and Miyahuna through a connection point on the IPP1 site. The water pipeline will likely be made of steel and will be buried such that it is an appropriate depth below ground level. The agreement with WAJ will allow the plant to use on the order of 240 m³ of water per day though the plant may ultimately use less than this during operation.
- 3.2.2 It is not proposed that water will be removed from on-site bore holes or local wells and the plant will therefore not impact on the water resource or water quality of the local community. The quantities of water to be taken from the Jordanian water pipeline network will be easily accommodated by WAJ and will not impact on the availability of water to other users.
- 3.2.3 On a day to day basis, the primary requirements for water will be as make-up water for the exhaust gas boiler and SCR system. The make-up water must be of high purity and will be treated in a new on-site water treatment plant.
- 3.2.4 Process effluents from the proposed plant are summarised below as are the quantities that represent a worst case that may not ultimately reflect the plants normal day to day operation.

Boiler blowdown	0.3 kg/sec
Water treatment plant effluent	1.3 kg/sec
SCR effluent	1.4 kg/sec

- 3.2.5 The boiler blowdown will essentially be pure water with some trace anti-corrosion chemicals used to prevent fouling in the energy recovery systems.
- 3.2.6 The effluent from the water treatment plant will contain salts removed from the raw water, which will provide the make-up to the water treatment plant, and also some additional sodium sulphate produced by neutralisation of the spent regenerants. This effluent will discharge to the on-site collection pond.
- 3.2.7 SCR effluent will be treated and reused, with any residues managed according to the Environmental Statement. During commissioning and at infrequent intervals during the life of the plant it will be necessary to chemically clean the water side of the boiler tubes. All effluents will be tankered off-site by a licensed contractor for treatment and disposal at an appropriately licensed disposal facility.
- 3.2.8 During maintenance it may be necessary to drain down the boiler, the closed circuit cooling water system or parts of these systems. All such wastes will be discharged to the collection pond after treatment. The cooling water will be identical to boiler blowdown and will be high purity water containing only small amounts of corrosion inhibitor.
- 3.2.9 During maintenance it may be necessary to drain down the engine cooling water system or parts of these systems. All such wastes will be discharged to the maintenance tank and returned after maintenance has been completed.



- 3.2.10 All oil and chemical storage tanks and areas where drums are stored will be surrounded by an impermeable bund. Single tanks will be within bunds sized to contain 110 per cent of capacity and multiple tanks or drums will be within bunds sized to contain 110 per cent of the capacity of the largest tank. Permanently fixed taps, filler pipes, pumping equipment, vents and sight glasses will also be located within the bunded area. Taps and valves will be designed to discharge downwards and will be shut and locked in that position. Manually started electrically operated pumps will remove surface water collected within the bunded areas will be made to ensure the effectiveness of these systems.
- 3.2.11 Adequate facilities for the inspection and maintenance of the interceptors will be provided and the interceptors will be regularly emptied to ensure efficient operation. A suitably qualified contractor will dispose of all sludges off-site.
- 3.2.12 Any waste oils will be removed by a licence contractor and disposed of at an appropriate disposal site in the event that the oil cannot be recovered/reused/recycled.
- 3.2.13 All elements of the treatment systems will be regularly monitored to ensure optimum performance and maintenance.
- 3.2.14 Designated waste areas will be used to store the minimal amounts of solid waste (generally office/domestic waste) generated by the plant.
- 3.2.15 The plant will be designed taking into consideration the danger of flash floods. This may include such measures as construction of a diversion channel or berm surrounding the plant facilities.
- 3.2.16 Emergency response plans will be developed and include for the leaking of any hazardous substances stored/used on-site.

3.3 Noise and Vibration

- 3.3.1 The predicted operational noise level at the school NSR is compliant with the current background. Predicted operational noise levels at the two nearest residential NSR locations are in the order of 0.2 dB(A) to 1 dB(A) above the current background. The noise modelling has been undertaken in accordance with ISO9613-2, which has a stated accuracy between 100 m and 1000 m of +/- 3 dB. The current background level is already exceeding the required noise regulation limits and the increase is negligible as noise changes of less than 1 dB are not perceptible by humans, there is no demonstrable environmental impact associated with a noise increase of 1 dB. World Bank / IFC guidelines permit an increase of upto 3 dB(A) above the existing background noise, the predicted noise levels are well within these guidelines.
- 3.3.2 The following measures would also serve to continually monitor and minimise the impact of noise from the proposed power plant:
 - A computer model of the proposed plant items will be produced at the detailed design stage, to calculate the predicted noise levels at the Noise Sensitive Receptors (NSRs) locations and others deemed appropriate, and ensure that planning limits are adhered to. Detailed design will ensure that site noise is mitigated as far as possible, through site layout and orientation of noisy plant items.



- Since tonal or impulsive noises are considered more annoying than continuous noise sources, plant items should be silenced or otherwise controlled through regular maintenance to ensure no such emissions are audible at NSR locations.
- Inherently quiet plant items will be selected wherever practicable. High performance silencers should be fitted to achieve maximum noise attenuation on plant and ductwork. Acoustic lagging and low noise trims will be fitted to all pipe-work and noise generating steam valves.
- High performance acoustic enclosures will be considered for all plant items and used where practicable, not overlooking smaller plant items such as compressors and pumps.
- Internal surfaces within the Engine enclosures will be treated to control internal reverberant noise levels if possible. An appropriate treatment would consist of dense mineral wool panel behind perforated sheet steel, or a spray on cellulose fibre treatment.[Plant items that are used for periods of shorter duration such as at the start-up and shut down willbe afforded the same consideration for noise control as all other plant.
- Wherever possible, all noisy plant will be positioned such that it faces towards the existing plant or towards new plant such that all sensitive receptors benefit from screening and/or directivity corrections.
- 3.3.3 These measures will help to ensure that noise at nearest sensitive receptors is kept to a minimum.
- 3.3.4 The Company will monitor noise levels upon receipt of any reasonable request by a person or representative who may be exposed to noise from the plant(s). Should unacceptable levels of noise be detected, based either on measured levels or perceived disturbance, the Company will work with the affected party to identify and resolve the noise issue if it is outside the levels stipulated in the Environmental Statement.

3.4 Stakeholder Engagement and Grievance Mechanism

3.4.1 The Stakeholder Engagement Plan and Grievance process will be implemented throughout the plant life. The stakeholder engagement process implemented during construction (see Section 2.6 above) will remain in place during the operation of the plant. The Community Liaison Offices (CLOs) will continue to be employed by the Company, and will maintain responsibility for providing information to all stakeholders and implementing the grievance process.

3.5 Labour and Working Conditions

- 3.5.1 The Company will develop or adopt an occupational health and safety programme that includes at least the following:
 - Analysis of hazards for each task/worker.
 - Identification, implementation and enforcement of protective measures needed to protect worker health and safety, including personal protective equipment (PPE).
 - Training of all workers on specific hazards to which they may be exposed, and protective measures.



- Maintenance of health and safety records, including hours worked, incidents (lost time, sever injuries and fatalities) and near misses. Semi-annual reports to financiers on the status of the OHS programme, including workers trained, working hours, incidents, and other key statistical measures of programme success
- Analysis of hazards for tasks/workers.
- Identification of protective measures needed to protect worker health and safety, including personal protective equipment (PPE).
- Training of all workers on specific hazards to which they may be exposed, and protective measures.
- Provision of PPE and enforcement of its use.
- 3.6 During operation the Company will continue to look for further opportunities to provide employment for suitably skilled men and women in the local community. The Company shall seek to encourage the development of skills and/or small businesses to provide services for the plant if possible. EBRD intends to mobilise support to enhance and/or support any initiatives.

3.7 Training

- 3.7.1 All workers will receive training as necessary, including:
 - Fire fighting;
 - Spill prevention and clean up methods;
 - Health and safety;
 - First Aid;
 - Training regarding chemical hazards;
 - Manual Handling; and
 - Public relations.

3.8 Ecology and Biodiversity

- 3.8.1 Operation of the Power Project site may lead to the disturbance of created habitats through noise, movement and lighting. This may limit the value of these habitats to some species (e.g. small mammals and birds). However these effects will be minimized by directional lighting and buffer planting.
- 3.8.2 Workers will be prevented from hunting or killing local wildlife. Any accidents resulting in the death of wild life will be reported to the Ministry of Environment and the Royal Society for Conservation of Nature.
- 3.8.3 Disposal of domestic / industrial wastes will be to appropriate disposal sites. The disposal of wastes on-site, and in the in the surrounding area especially at the near shallow wadies, will not be allowed.
- 3.8.4 All parking for the Power Project will be within the site boundary. Parking on areas outside the site boundary will not be allowed unless strictly necessary.


3.9 Transport and Infrastructure

- 3.9.1 The anticipated additional traffic generated by operation of Power Project is minimal compared to the capacities of the local road network.
- 3.9.2 The delivery of HFO and DFO and oils to the site would be timed to avoid the peak traffic congestion rush hours at 6:30 am and 4.30 pm, as far as is practical, to minimise the impact to the local traffic network.
- 3.9.3 As per the construction phase, similar duties will be designated to all parties involved in the transportation of oils/fuels and a Safety Advisor will monitor the compliance of all staff and suppliers/contractors throughout the operating lifetime of the Power Project.

SECTION 4

DECOMMISSIONING



4 DECOMMISSIONING

- 4.1.1 The development is planned to have a 30 year lifespan. At this time, detailed decommissioning procedures have not been developed, as they will follow best practice at the time. However, as an indication, the following measures will be applied:
 - All wastes will be eliminated from the site;
 - Dismantling of all production units and associated technical installations under conditions ensuring the prevention of pollution; and
 - Cleaning of zones where necessary, emptying and rendering inert tanks.
- 4.1.2 All works completed with the aim of minimising noise disturbance, dust emissions and waste.
- 4.1.3 Prior to finalising the decommissioning plans, consultation will be undertaken with all stakeholders. This will ensure that all stakeholders are informed of the timing of the project's closure, and are able to make informed decisions about employment and livelihood opportunities.

SECTION 5

MITIGATION TABLES



5 MITIGATION TABLES

5.1 Overview

5.1.1 The mitigation measures above have been tabulated below to give an easy reference guide for the implementation of the EMMP.

That status of each item in the mitigation tables will be reported to the financial institutions, bi-annually during construction and annual during operation.



CONSTRUCTION IMPACT MITIGATION, MONITORING, AND MANAGEMENT MEASURES

Concern	Significance	Mitigation Measure	Monitoring
Air Quality			
	Moderate Significance	A water bowser will be used if required (following tests to determine the moisture content of material)	
Dust creation from soil movements, emissions from vehicles etc		Excavation faces not being worked will, if required, be either sheeted or treated with a chemical dust suppressant	To ensure that atmospheric dust, contaminants or dust deposits generated by the construction do not
		All operatives working in areas of potential dust emission will be provided with paper facemasks.	exceed levels which could constitute a health hazard or nuisance to those persons working on
		All stockpiles will be located away from sensitive receptors wherever possible.	the site or living nearby a dust monitoring programme will be carried out throughout the construction period.
		Materials deposited on stockpiles on-site will be closely monitored for any possible emission of dust and if required they will be damped down, covered or treated with a dust suppressant.	
		All vehicles carrying bulk materials into and out of the site will be sheeted so as to contain any material that may be dispersed during transit. Minimum drop heights will be used during material transfer	Daily visual inspections will be made to ensure that good practice is employed at all times. Inspections will include monitoring of exit points and the immediate area outside the site entrance.
		If finely ground materials are delivered, these will be in bag form, enclosed lorries or stockpiled in specified locations where the material can be suitably covered.	
		Engines will be switched off when not in use.	
		All vehicles will be properly maintained to reduce air emissions. Vehicles and equipment with visible emissions will be removed from service until repaired.	



Water Quality and Soils			
Protection of ground waters	Moderate Significance	Water inflows to excavated areas to be minimized by the use of lining materials, good housekeeping techniques and by the control of drainage and construction materials in order to prevent the contamination of ground water. Site personnel to be made aware of the potential impact on ground and surface water associated with certain aspects of the construction works to further reduce the incidence of accidental impacts.	
Potential leakage of storage tanks	Moderate Significance	Refuelling of construction vehicles and equipment to be restricted to a designated area with properly designed fuel tanks and bunds and proper operating procedures.	Daily visual inspection of bunded areas will be made to ensure the effectiveness of these systems.
		Spill kits will be kept on-site to clean up any spills of fuels or oils. Spills would be reported and responded to as quickly as possible.	
		Maintenance of construction machinery will not be allowed on-site unless absolutely necessary to help to prevent the accidental leakage of lubricating and hydraulic fluids.	
		Pass all site drainage and runoff through oil and/or silt traps	
		Conserve water use where possible	
Protection of ground and surface waters	Moderate Significance	Construction Contractor to dispose of any construction effluents in accordance with Jordanian law, as described by EIA.	EPC contractor to monitor and report to Project Company any incidents involving ground or surface water
		Locate stockpiles away from watercourses	
		Storage of construction materials will be in assigned areas and follow standard best working practices.	
		Disposal of excavated materials will either be off-site at an appropriate landfill site or in areas of the site that will not give rise to surface run off during wet periods.	
		Portable toilets will be provided during the construction period with any waste tankered of site and disposed of in an appropriate manner.	



		Water inflows to excavated areas to be minimized by the use of lining materials, good housekeeping techniques and by the control of drainage and construction materials in order to prevent the contamination of ground water.	
		Reuse excavated material within the site boundary where practicable to reduce the volume of excavated material going off-site to landfill.	
		No materials will be disposed of in the wadi to the north- west of the site.	
		Segregation of contaminated excavated material (should this be encountered), from non-contaminated excavated material will be made with the contaminated soils removed to an appropriate disposal site.	
Noise and Vibration			
	Moderate significance	All vehicles and mechanical plant used for construction will be fitted with effective exhaust silencers, and regularly maintained.	Daily auditory inspection/walk round to ensure best practicable means are being employed
		Inherently quiet plant will be used where appropriate	
Construction noise		All major compressors will be sound-reduced models fitted with properly lined and sealed acoustic covers which would be kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools would be fitted with mufflers or silencers of the type recommended by the manufacturers.	Noise monitoring undertaken at selected locations around construction site. Periodic monitoring at Al-Manakher school and elsewhere in village throughout construction
		All machines in intermittent use shall be shut down in the intervening periods between work or throttled down to a minimum.	Note: IPP4 is encouraged to collaborate with IPP1 Amman East plant to design and implement a
		Where possible, avoid pile-driving	throughout construction.
		All ancillary plant such as generators, compressors and pumps will be positioned so as to cause minimum noise disturbance. If necessary, temporary acoustic barriers or enclosures would be provided.	



		Monitor noise levels upon request by person or representative who could reasonably be exposed to noise from the plant(s). Should unacceptable levels be detected, either by measurement or perception, work with affect party to identify and resolve the noise issue if it is outside the levels stipulated in the Environmental Statement	
		Construction activities generating unsatisfactory noise levels during night time should be minimised.	
Ecology and Biodiversity			
Aqueous effluent and runoff	Moderate Significance	Potential aqueous effluent and runoff from site activities will be kept to an absolute minimum so as to ensure that there is no contamination of habitats and ecosystems outside the project boundary.	Visual inspection to ensure that construction impacts do not spread onto other land.
Removal of existing natural	Low	Unnecessary removal of existing natural vegetation will be avoided.	
vegetation	Significance	Workers will be required not to cut down plants in the surrounding area for fires etc.	
Destruction of bird nests	Low Significance	The destruction of bird nests will be prohibited. Any ground nests found inside the site will be moved in coordination with MoE and the Royal Society for Conservation of Nature (RSCN) to an appropriate area.	
Planting of exotic or invasive plants	Low Significance	The planting of exotic or invasive plants for landscaping inside and around the plant will be prohibited	
Hunting or killing of animals	Low Significance	The contractor will not allow workers to hunt or kill animals. Any accidents resulting in the death of wild life will be reported to the MoE and RSCN.	Any accidents resulting in the death of wild life will be reported to the MoE and RSCN.
Transport and Infrastructur	e		
Construction traffic	Moderate Significance	Car sharing and the use of minibuses and public transport will be encouraged	
		The contractors appointed will be encouraged to provide a minibus service for construction staff	
		Car sharing and the use of minibuses and public transport will be encouraged by all staff	
Vehicle emissions	Moderate Significance	Regular servicing and maintenance of vehicles will be employed to help minimize emissions to air	



Dust and dirt generation	Moderate Significance	Wheel washing may be employed to help prevent mud and earth being carried from the site on to local roads In dry periods on-site roads may be dampened to reduce the potential for dust creation	Visual checks will be made to ensure that dust creation and mud carry are not encountered to any significant degree.
		Adequate signage will be put in place as necessary.	The plant operator will check that all signage is in place as necessary.
Road Safety	Moderate Significance	Drivers accessing the site will be obliged to comply with all Jordanian road safety laws	Where locals report cases of law breaking by staff with regard to speed limits etc this will be internally investigated as necessary.
Construction traffic management	Moderate Significance	A Traffic Management plan will be prepared to help minimize the impact to the local traffic network.	
Cultural Heritage / Archaeo	logy		
		Construction staff will report any finds that may have cultural or archaeological significance.	
Archaeological site finds	Moderate Significance	If any site is found during construction and will be damaged by construction activities, the DOA will be invited to assess the discovered remains and may carry out an emergency salvage excavation salvage excavation which entails that archaeological excavation is conducted during construction phase. The contractor would be obliged to wait for a period of 10 days before commencing construction activities in the vicinity of an archaeological find to allow the DOA to respond to the sites identification.	Construction staff will be required to report any archaeological finds to an appropriate manager.
		The Contractor shall seek the written approval of the DOA before the removal of any chance find building, foundation, structure, fence and other obstruction over 50 years old, any portion of which is in the quarrel.	
Labour and Working Condi	tions		
Worker rights	NA	Labour law (No. 8, 1996) will be applied and complied with throughout the duration of the project as necessary.	
Worker grievance N/A		A grievance mechanism will be made available to all workers, including contractors and subcontractors	Grievances will be resolved within a reasonable time. Resolutions will be reports in EHS reports.
Safety	N / A	Equipment, tools and substances will be suitable for their use and selected to minimize dangers to safety or health when used correctly.	



Work places will where possible receive natural light and be supplemented with sufficient artificial illumination, and signage will appropriately mark hazards, exits, materials etc. Ventilation design factors will consider physical activity, substances in use and process related emissions. Temperatures will be maintained at levels appropriate for the purpose of the facility.	
Fire prevention and protection will be adequate for the dimensions and use of the premises, equipment installed, physical and chemical properties of substances present, and the maximum number of people present. Fire detection and protection systems will be provided throughout the plant and site area. These will include fixed foam protection systems, fire alarms, portable appliances, etc.	
The plant will also store firewater sufficient to meet the requirements of the Jordan Fire Department and the local fire code requirements.	
Places of work, traffic routes and passageways shall be kept free from waste and spillage, regularly cleaned, and maintained. First aid facilities will be provided and will be easily accessible throughout the place of work. Welfare facilities will include locker rooms, an adequate number of toilets with washbasins, and a room dedicated for eating. An ample supply of drinking water will be provided at all places of work.	
Buildings and structures will be designed according to local and internationally recognized standards. They will be structurally safe, provide appropriate protection against the climate and have acceptable light and noise conditions.	



	The Company and all contractors will develop or adopt an OHS plan that will include: Job hazard analysis for all job functions Protective measures to reduce hazards to acceptable levels. Training for all workers in hazards and protective measures. Provision, use and enforcement of PPE Recordkeeping of key statistics, including working hours, training, lost time incidents, serious injuries, and fatalities.	Daily visual inspection of use of PPE equipment would be made.
	Exposure to vibration from equipment will be controlled through selection of equipment and limitation of time of exposure. The limits for vibration and action values will conform to those provided by the IFC guidelines for Occupational Health and Safety.	
	Indoor temperatures will be maintained such that they are reasonable and appropriate for the work at site. Risks of heat related stress will be adequately addressed and feasible control measures implemented for work.	
	First aid facility adequately and appropriately stocked A health and safety plan would be prepared with the aim of preventing accidents and injuries for both and construction and operation stages of the project. Sufficient training will be provided to all workers to ensure health and safety in the work place	A register of accidents on-site will be maintained with prevention training sessions held. A training register for employees will be maintained and kept up to date.
Community Health and Safety		
	The plant will be located within a security fence ensuring to prevent trespass or accidental entry of the site by local peoples. The plant will also be fitted with security cameras	
	Construction materials will be managed safely with any stockpiles etc placed in areas to prevent any risk to local communities such as the materials becoming airborne through exposure to the wind.	
	Transport during all phases of the project will be managed so as to minimize impact to the local community.	Accidents and incidents involving the public will be documented and reported to management.



	The transport of raw materials and the transport and disposal of waste will be undertaken in an appropriate manner.	
	Project vehicles and equipment will be well maintained with project-related traffic will be requested to travel no faster than the speed limit.	
Stakeholder Engagement		
Communications	Implement the SEP in order to maintain effective and culturally appropriate communications with stakeholders, including the local community	
Grievances	Implement the grievance mechanism in the SEP.	Maintain log of grievances and resolutions



CONSTRUCTION MONITORING PROGRAMME

Monitoring Issue	Monitoring Method	Monitoring Frequency	
Air Quality			
Dust creation from soil movements, emissions from vehicles etc	Dust monitoring programme will be carried out	Upon receipt of complaint from local peoples/MoE etc	
Inspections will include monitoring of exit points	Visual inspections	Daily during construction contract	
Inspection of bunded areas	Visual inspections	Daily during construction contract	
Noise and Vibration			
Construction noise	Auditory inspection/walk round to ensure best practicable means are being employed	Daily during construction contract	
Water Quality			
Aqueous effluent and runoff	Visual inspection to ensure that construction impacts do not spread onto other land.	Daily during construction contract	
Ecology and Biodiversity			
Hunting or killing of animals	Any accidents resulting in the death of wild life will be reported to the Ministry of Environment and RSCN.	As necessary	
Geology, Soils and Waste			
Visual impact of construction	Visual inspections will be made to ensure that plant wastes are not escaping to the surrounding environment.	to ensure that o the surrounding Daily during construction contract	
Dust and dirt generation	Visual checks will be made to ensure that dust creation and mud carry are not encountered to any significant degree.	Daily during construction contract	
Traffic and Infrastructure			
Road Safety	The plant operator will check that all signage is in place.	As necessary	
	Where locals report cases of law breaking by staff with regard to speed limits etc this will be internally investigated.	As necessary	



Monitoring Issue	Monitoring Method Monitoring Frequency	
	Maintain records of accidents involving serious property damage or injuries.	Continuous
Cultural Heritage / Archaeology		
Archaeological site finds	Construction staff will be requested to report any archaeological finds to an appropriate manager.	As necessary
Health and Safety		
	Visual inspection of use of PPE equipment.	Continuous
	A register of accidents on-site would be maintained with prevention training sessions held: at a minimum, working hours, lost time incidents, serious injuries, fatalities should be recorded	As necessary
Safety	Review site specific health and safety plan would be made on an appropriately regular basis.	Annually
	A training register for employees will be maintained and kept up to date with evaluation of training sessions made.	As necessary
	Accidents and incidents involving the public will be documented and reported to management.	As necessary
i. Stakeholder Engagement.		
Grievance management	Maintain log of grievances and resolution	As necessary
Implementation of the Stakeholder engagement plan	Record of communication and consultation; evidence of efforts to engage with men and women.	As necessary, at least annually.



Significance Monitoring Concern Mitigation Measure Air Quality The use of Selective Catalytic Reduction (SCR), which ensures NO_x levels to be in accordance with World Bank / IFC requirements Operation on fuel with maximum sulphur and ash content as specified in EIA. A stack of sufficient height and flue gases of sufficient temperature and velocity to ensure good dispersion. Stack emissions will be monitored continuously for NO_x , O_2 and CO, and SO_2 Emissions to air from by the proponent. Sampling burning DFO, HFO and High significance points and safe access natural gas. adjacent to the continuous monitoring points will be The reservation of a development area for the installed. installation of FGD equipment should this be considered necessary. The Consortium will require a manufacturer's guarantee regarding the performance of the NO_x abatement system . If NO_x values are outside the permitted levels, the operation and calibration of the instrument will be checked. If proved to be accurate, corrective action shall be taken immediately to identify cause and to reduce emissions level to within the permitted levels.

OPERATIONAL IMPACT MITIGATION, MONITORING, AND MANAGEMENT MEASURES



Concern	Significance	Mitigation Measure	Monitoring
		Emissions will be controlled during operation in accordance with the manufacturer's recommendations, taking account of the applicable Technical Guidance. Efficient operation and maintenance of the engine units will ensure that the emissions of CO, TSPs, H ₂ S and hydrocarbons are controlled.	
		Whilst the design of the Power Project allows for the reservation of an area for the installation of FGD equipment, it is considered that the primary method for the control of SO_2 emissions (from any thermal power plant) is to reduce the sulphur content of the fuel.	
Fugitive dust emissions	Low significance	General good housekeeping to prevent fugitive dust emissions	
Cumulative emissions	Moderate to major significance	As part of any assessment of IPP1 emissions and ambient air quality, ensure that IPP4 emissions are also evaluated so as to ensure ambient ir quality standards may be met. Take necessary steps to reduce emissions should any ambient air quality standard be exceeded.	
		Calculate CO2 emissions on an annual basis, in total and on the basis of fuel used, and include in	



Concern	Significance	Mitigation Measure	Monitoring
Potential leakage of storage tanks	High significance	All oil and chemical storage tanks and areas where drums are stored will be surrounded by an impermeable bund. Single tanks will be within bunds sized to contain 110 per cent of capacity and multiple tanks or drums will be within bunds sized to contain 110 per cent of the capacity of the largest tank. Permanently fixed taps, filler pipes, pumping equipment, vents and sight glasses will also be	Daily visual inspection of bunded areas will be made to ensure the effectiveness of these systems. All elements of the treatment systems will be regularly monitored to ensure optimum performance and
		Iocated within the bunded area. Taps and valves will be designed to discharge downwards and will be shut and locked in that position. Manually started electrically operated pumps will remove surface water collected within the bund and its composition will be verified prior to disposal (for maintenance of the system)	maintenance. The inspection of oil interceptors will be undertaken on a regular basis.
		An oily waste water drainage system will drain all areas where oil spillages could occur. The design will incorporate oil interceptors and traps. These will discharge with the other surface water discharge to the storm water discharge system. The discharge from each oil interceptor will contain no visible oil or grease	
		Disposal of the sludge will be undertaken by an appropriate contractor and disposed of off-site at an appropriate disposal site.	
Waste disposal	Low significance	Sludge removed in the oily waste separation will be removed by road tanker and disposed of at an appropriate disposal site.	



Concern	Significance	Mitigation Measure	Monitoring
		Wastewater containing detergent will be discharged to the oily waste separation pond and oil separators prior to discharge to an on-site chemical wastewater collection pond.	
		All collection ponds will be appropriately bunded to ensure that no water leaches in to the ground.	
		Emergency response plans will be developed for the leaking of any hazardous substances stored/used on-site.	
Hazardous substances	Moderate significance	All elements of the treatment systems will be regularly monitored to ensure optimum performance and maintenance.	
Proper waste water treatment	Moderate significance	Designated waste areas will be used to store the minimal amounts of waste (principally office wastes generated by the plant.	
Noise and Vibration			I
Operational noise	Moderate	A computer model of the proposed plant items will be produced at the detailed design stage, to calculate the predicted noise levels at the NSR locations, and ensure that planning limits are adhered to. Detailed design will ensure that site noise is mitigated as far as possible, through site layout and orientation of noisy plant items.	Provisions to be put in place for the monitoring of noise at sensitive receptors (on and off site) in the event that there is a complaint or reason for concern.
	significance	Since tonal or impulsive noises are considered more annoying than continuous noise sources, plant items will be silenced or otherwise controlled through regular maintenance to ensure such emissions minimized at NSR locations	Site walkover surveys and occasional noise monitoring at sensitive receptors will be undertaken as deemed appropriate



Concern	Significance	Mitigation Measure	Monitoring
		Inherently quiet plant items will be selected wherever practicable. High performance silencers will be fitted to achieve maximum noise attenuation on plant and ductwork. Lagging and low noise trims will be fitted to all pipe-work noise generating steam valves as required to reduce noise.	
		High performance acoustic enclosures will be considered for all plant items where practicable, not overlooking smaller plant items such as compressors and pumps.	
		Internal surfaces within the Engine enclosures should be treated to control internal reverberant noise levels. An appropriate treatment would consist of dense mineral wool panel behind perforated sheet steel, a spray on cellulose fibre treatment, or materials providing the same level of acoustic abatement.	
		Plant items that are used for periods of shorter duration such as at the start-up and shut down willbe afforded the same level of noise control as all other plant.	
		All noisy plant will be positioned such that it faces towards the existing plant or towards new plant such that all sensitive receptors benefit from screening and/or directivity corrections.	
		Monitor noise levels upon request by person or representative who could reasonably be exposed to noise from the plant(s). Should unacceptable levels be detected, either by measurement or perception, work with affected party to identify and resolve the noise issue if it is outside the levels stipulated in the Environmental Statement.	As necessary



Concern	Significance	Mitigation Measure	Monitoring	
Removal of existing natural vegetation	Low Significance	The proponent will avoid any unnecessary removal of existing natural vegetation.		
Hunting or killing of animals	Moderate Significance	The proponent will not allow workers to hunt or kill animals.	Any accidents resulting in the death of wild life will be reported to the MoE and RSCN.	
Destruction of bird nests	Low Significance	The destruction of bird nests will be prohibited.		
During night disturbance of wildlife	Low Significance	Not relevant given low level of wildlife		
Planting of exotic or invasive plants	Low Significance	The planting of exotic or invasive plants for landscaping inside and around the plant will be prohibited with a preference given to the planting of native species where landscaping is deemed necessary		
Dispassed of domestic or	Low Significance	Disposal of domestic or industrial wastes will be to appropriate disposal sites.		
industrial wastes	Moderate Significance	No materials will be disposed of on-site and in the in the surrounding area especially at the near shallow wadies.		
Light pollution	Moderate Significance	Directional lighting and buffer planting to screen the plant.		
Traffic and Infrastructure				



Concern	Significance	Mitigation Measure	Monitoring
Unauthorized /	Low Significance	Use of machinery will be restricted to the proposed site as will parking of vehicles unless authorised parking area provided outside proposed site	
inappropriate parking	Low Significance	Parking on areas outside the dedicated parking area will not be allowed unless strictly necessary.	
Contamination by vehicle maintenance	Low Significance	Any maintenance of vehicles or machinery will be performed off-site unless strictly necessary.	
Vehicle emissions	Moderate Significance	Regular servicing and maintenance of vehicles will be undertaken to minimize emissions to air, noise, leaks etc.	
	Moderate Significance	Safety training may be provided to vehicle drivers if considered necessary	
Safety	Moderate Significance	Transport of HFO and DFO to the site willendeavourto avoid peak traffic congestion rush hours at 6:30 am and 4.30 pm to minimize the impact to the local traffic network.	
Traffic management	Moderate Significance	Drivers will be instructed to obey all relevant speed limits and other relevant laws.	
Labour and Working Conditions			
Worker rights	NA	Labor law (No 8, 1996) will be applied and complied with throughout the duration of the project as necessary.	



Concern	Significance	Mitigation Measure	Monitoring
Local employment and economic benefit	Major significance	Where possible the Company will look for further opportunities to employ men and/or women from the local community provided they have the necessary skills for the relevant roles. The Company will seek to encourage the development of skills and/or small businesses to provide services for the plant if possible. EBRD intends to mobilise support to enhance and/or support any initiatives.	Maintain records of employment by categories (men/women, management/skill/unskilled, local/domestic/expatriate, etc.)
Worker health and safety	Major significance	Equipment, tools and substances will be suitable for their use and selected to minimize dangers to safety or health when used correctly.	
		Work places will where possible receive natural light and be supplemented with sufficient artificial illumination, and signage will appropriately mark hazards, exits, materials etc.	
		Ventilation design factors will consider physical activity, substances in use and process related emissions. Temperatures will be maintained at levels appropriate for the purpose of the facility.	
		Fire prevention and protection will be adequate for the dimensions and use of the premises, equipment installed, physical and chemical properties of substances present, and the maximum number of people present. Fire detection and protection systems will be provided throughout the plant and site area.	



Concern	Significance	Mitigation Measure	Monitoring
		These will include fixed foam protection systems, fire alarms, portable appliances, etc. The plant will also store firewater sufficient to meet the requirements of the Jordan Fire Department and the local fire code requirements.	
		Places of work, traffic routes and passageways shall be kept free from waste and spillage, regularly cleaned, and maintained. First aid facilities will be provided and will be easily accessible throughout the place of work. Welfare facilities will include locker rooms, an adequate number of toilets with washbasins, and a room dedicated for eating. An ample supply of drinking water will be provided at all places of work.	
		Buildings and structures will be designed according to local and internationally recognized standards. They will be structurally safe, provide appropriate protection against the climate and have acceptable light and noise conditions.	
		Personal protection equipment will be identified and provided, that will offer adequate protection to the worker, co-workers and occasional visitors without incurring unnecessary inconvenience. The use of PPE will be actively enforced if alternative technologies, work plans or procedures cannot eliminate or sufficiently reduce a hazard or exposure. The employer shall ensure that PPE is cleaned when dirty, properly maintained and replaced when damaged or worn out. Proper use of PPE shall be part of the recurrent training programs for employees.	



Concern	Significance	Mitigation Measure	Monitoring
		Exposure to vibration from equipment will be controlled through selection of equipment and limitation of time of exposure. The limits for vibration and action values will conform to those provided by the IFC guidelines for OHS.	
		Indoor temperatures will be maintained such that they are reasonable and appropriate for the work at site. Risks of heat related stress will be adequately addressed and feasible control measures implemented for work.	
		First aid facility adequately and appropriately stocked	
		A health and safety plan would be prepared with the aim of preventing accidents and injuries for both and construction and operation stages of the project. Results will be reported annually, including working hours, incidents, major injuries, fatalities (major injuries and fatalities should be reported as soon as practicable).	
Community Health and S	afety	1	
		The plant will be located within a security fence ensuring to prevent trespass or accidental entry of the site by local peoples. The plant will also be fitted with security cameras. Security personnel will receive proper training for their responsibilities and authority.	



Concern	Significance	Mitigation Measure	Monitoring
		Construction materials will be managed safely with any stockpiles etc placed in areas to prevent any risk to local communities such as the materials becoming airborne through exposure to the wind.	
		Transport during all phases of the project will be managed so as to minimize impact to the local community.	Accidents and incidents involving the public will be documented and reported to management.
		The transport of raw materials and the transport and disposal of waste will be undertaken in an appropriate manner.	
	Project vehicles and em maintained with project requested to travel no	quipment will be well t-related traffic will be faster than the speed limit.	
Stakeholder	Engagement		
Stakeholder engagement		Implement the Stakeholder Engagement Plan, including notifying local communities of major plant activities. Continue to employ community liaison officer/s.	
Grievance management	ment Implement the grievance mechanism in the SEP throughout operation. Investigate and resolve all grievances within the specified timeframes, and report results.		Summary of grievances and resolutions to be included within annual report.



OPERATIONAL MONITORING PROGRAMME

Monitoring Measure	Monitoring Method	Monitoring Frequency		
Air Quality				
Emissions to air from burning of HFO,DFO and natural gas	Stack emissions will be monitored for PM, NO _x , O_2 and CO	Continuous		
Fuel quality	Require suppliers to certify sulphur content of HFO, undertake periodic independent verification that sulphur content remains below 1 percent	Proof of regular certification		
Water Quality				
Potential leakage of storage tanks	Visual inspection of bunded areas will be made to ensure the effectiveness of these systems.	Daily		
Poor performance of the water treatment system	All elements of the treatment systems will be regularly monitored to ensure optimum performance and maintenance.	Weekly		
Effectiveness of the oil interceptors	The inspection of oil interceptors will be undertaken on a regular basis.	Weekly		
Noise and Vibration		-		
	Provisions to be put in place for the monitoring of noise at sensitive receptors (on and off-site) in the event that there is a complaint or reason for concern.	As necessary		
Operational noise	Site walkover surveys and occasional noise monitoring at sensitive receptors will be undertaken as deemed appropriate	Weekly/As necessary		
	On-demand noise monitoring as requested by any person who could reasonably be exposed to noise. IPP1 and IPP4 will carryout monitoring jointly where possible.	As necessary.		
Ecology and Biodiversity				
Hunting or killing of animals	Any accidents resulting in the death of wild life will be reported to the MoE and RSCN.	As necessary		



Monitoring Measure	Monitoring Method	Monitoring Frequency		
Landscape and Visual				
Visual impact of power station	Visual inspection will be made to check for any degradation of the power stations appearance.	Monthly		
	Visual inspections will be made to ensure that plant wastes are not escaping to the surrounding environment.	Weekly		
Labour and Working Conditions	Labour and Working Conditions			
Employment	Maintain registry of employment in various categories (see above)	Continuous		
Occupational health and safety	Maintain records of work hours, safety incidents involving lost time serious injuries, fatalities	Continuous		
Community Health and Safety				
Community Health and Safety	Accidents and incidents involving the public will be documented and reported to management.	As necessary		
	A complaints register will be maintained.	As necessary		
Implementation of the Stakeholder Engagement Plan	Record of communication and consultation; evidence of efforts to engage with men and women	Continuous		



DECOMMISSIONING IMPACT MITIGATION, MONITORING AND MANAGEMENT MEASURES

Concern	Significance	Mitigation Measure	Monitoring	
Geology, Soils and Waste				
Waste	Minor	Remove all waste from the site, recycle as many materials as possible		
Site conditions	Moderate	Site reinstated to condition prior to development		
Water Quality				
Water	Moderate	As for construction. Best Available Techniques followed at the time to account for relevant guidance.	Post-decommissioning monitoring of water quality	
Noise and Vibration				
Noise	Moderate	As for construction. Best Available Techniques followed at the time to account for relevant guidance.		






CONCLUSION

SECTION 6



6 CONCLUSION

- 6.1.1 This EMMP has been prepared to ensure that there are measures in place to mitigate against any potential impacts from the Power Project on the surrounding environment.
- 6.1.2 Mitigation measures have been developed for the construction, operational and decommissioning phases of the project and monitoring procedures have been developed which will allow accurate and timely reporting of emissions to air, land and water as well as any other potentially adverse impacts.
- 6.1.3 To ensure that the monitoring and mitigation measures outlined in the EMMP are successfully implemented a environmental and safety manager will be appointed during the construction and operational phases to oversee the process.
- 6.1.4 It is considered that so long as the plant implements the mitigation and monitoring measures outlined in the EMMP the project will comply fully with all relevant Jordanian, Standard, Laws and Regulations as well as the requirements of the World Bank / IFC.