Environmental & Social Impact Assessment Report for

B1. Al-Majd Bridge
B2. Al-Ibraheemiyia Bridge
B3. Al-Daraji Bridge
B4. Souq Shaalan Bridge

Executive Summary
June 2012
The objective of the Emergency Road Rehabilitation Project (ERRP) is to improve the condition of road assets by rehabilitating highly damaged segments of the country’s highway and rural road networks, reestablishing critical river crossings, and restoring the capacity to manage and maintain road assets. Under Component A3 of the project, four critical river crossings with old decaying floating bridges are being replaced with safer permanent concrete bridges. This Executive Summary of the Environmental and Social Impact Assessment was prepared specifically to cover the construction of the four bridges and to provide information on (i) key environmental and social issues associated with each of the four sub-projects, (ii) detail mitigation measures undertaken to address environmental issues, (iii) detail mitigation measures undertaken for people whose livelihoods would be negatively affected by project activities; and (iv) provide information on monitoring activities.

The ESIA study has been carried out according to requirements of the current ESIA requirements of the World Bank and Iraqi government. The aim of the ESIA study is to meet the requirements of the Iraqi MoE legislations and to ensure compliance with the World Bank’s safeguards requirements. In this report the World Bank, the EPA and the Iraqi Environmental standards and regulations were used to ensure the national and international acceptance and compliances for the ESIA.

The four Bridges (Project Component A3) that are located within Al-Najaf, Hilla and Samawa governorates and were all constructed on state-owned land. The four bridges are the following:

- Al-Majd Bridge (referred to as B1)
- Al-Ibraheemiya Bridge (referred to as B2)
- Al-Daraji Bridge (referred to as B3)
- Souq Shaalan Bridge (referred to as B4)

**Environmental Issues:**
With regards to environmental impacts specific to both the construction and operational phases, these might have included: (i) air pollution; (ii) increased noise pollution; (iii) impact which construction activities will have on flora, fauna and ecosystem with necessary mitigations; (iv) construction waste and solid waste; (v) worker and public health and safety aspects; (vi) groundwater and surface water quality; (vii) traffic and access patterns disruptions; and (viii) impacts on soil and geology, including erosion control. Corresponding mitigation measures for these impacts have included (i) dust and odor control as well as fire prevention; (ii) noise mitigations; (iii) fencing and minimization of clearing of vegetation cover; (iv) management of construction rubble and hazardous wastes; (v) occupational worker safety training, protective gear wearing; (vi) adequate sanitation facilities for workers, and local water resource management; (vi) traffic rerouting and public access management; (vii) minimization of topsoil movement and soil stripping, as well as stockpile fuel, and earthworks management; and (viii) wind screening.

However, no serious environmental impacts were determined for any of the 4 Bridges. And, in turn, some minor demanding mitigation measures were required. All the required mitigations for all possible environmental impacts turned out to be traditional, affordable and practical. Field visits to the sites and interviews with residents of those areas confirmed their agreements with these mitigations. No complaints were received from the communities, community councils, municipalities, Directorates, or the MoE Directorate in the Governorates on environmental issues relating to the construction of the Bridges.

Operational (post-construction) phase environmental impacts are, to date and as expected, much more limited in scope, and are specific to pedestrian-generated litter management, storm water pipe and drainage management in and around the bridges to ensure continuing levels of groundwater and surface water quality, and traffic safety, including appropriate lighting conditions and municipal services dedicated to responsive traffic flow and traffic accident management.

Environmental construction and operational phase impacts and mitigation measures have been monitored through the requisite technical interventions specified in the ESMP document.
**Socio-economic Issues:**

From the socio-economic perspective, no negative social safeguard effects were identified for B2 or B3; there will be no negative impacts on peoples’ livelihoods resulting from construction of these bridges. The reasons for these conclusions are discussed in the full ESIA Report, and aerial maps of the bridge sites are provided to support this.

However, in the case of the B1 and B4 sites, some negative impacts of the project activities were identified although these are relatively limited. These impacts were examined in detail, confirmed, and appropriate mitigation measures were undertaken.

The negative impacts included the following for B1:

a) A small mosque needed to be relocated because it would interfere with the bridge approach and accessing route. The required demolition of the mosque was discussed with the community and the “Imam” of the mosque and agreement was reached on the demolition of the mosque. The mitigating measure agreed to was to replace the mosque with a new one nearby. The new site for the mosque was examined and approved by the resident site engineer. The land on which the replacement mosque was to be built was donated by a local community member. (A signed statement of voluntary land donation is attached in the ESIA Report Annex). The original mosque was left intact until the new mosque had been completed and was ready for use by the community. The contractor building the mosque undertook the construction and covered the costs involved under this contract. The contractor built a significantly larger new mosque and provided furnishings, air coolers, carpets, etc. The local community expressed their full satisfaction with the new mosque and its furnishings.

b) One small store on the other side of the bridge from the mosque would interfere with the access approach to the bridge. This store was owned and operated by the same person. This person agreed to receive cash compensation for his shop which would allow him to build a replacement shop nearby. The contractor provided a cash compensation for the store paid for under his contract. The shop owner quickly built a replacement shop
nearby which was larger and better equipped than his original store. The compensation acknowledgement note was signed by the owner (This acknowledgement is included in the ESIA Report).

In summary, the community at large, and also the people whose livelihoods were adversely affected by the B1 construction, expressed satisfaction with the mitigating measures and also with the newly completed bridge. The community at large believes that the improved bridge will enhance their livelihoods by increasing traffic flow which will stimulate commercial undertakings. The bridge also significantly improves their ability to move their own crops and products.

In the case of B4, the following negative social impacts were identified and satisfactorily resolved. The Governorate covered all compensation requirements relating to B4 negative impacts. The compensation amounts for project affected people were determined by a Technical Committee of 3 persons established specifically for this purpose by the Governorate. The negative impacts of the B4 construction activities were:

i. The removal of 12 date palm trees owned by two people because they would interfere with the access to the bridge. These 12 date palm trees were growing on state-owned land but were privately owned. The Technical Committee established a replacement value of 150,000ID for each palm tree. Since they were growing on state-owned land no compensation was provided for the land. The two people compensated were satisfied with the compensation (Signed compensation documents are attached in ESIA Report).

ii. 14 stores owned and operated by 3 people would affect the road access to the bridge and it was proposed that they be demolished. The Technical Committee determined the replacement value of each store according to its size. The Technical Committee determined that cash compensation equivalent to 170,000ID per m2 should be provided. The 3 store owners agreed to the compensation were fully satisfied with the cash compensation amount received. (Signed compensation forms are included in the ESIA Report). The affected store owners rebuilt their stores in nearby locations and were quickly back in business.
In the case of B4, all negatively affected persons all expressed satisfaction with the compensation provided. The community at large also expressed no complaints with the mitigating measures and, indeed, expressed great satisfaction with the new bridge saying they believed it would greatly benefit their economic and social circumstances. The B4 bridge is now complete and in operation.

As per meetings and interviews with different sectors of the communities, in the B1, B3, B2, B4 areas, the populations agreed that the bridges would benefit the communities at large by increasing work opportunities in the area adjacent to the bridges and will have a great positive impact, both on their current livelihoods and future possibilities. The population noted that the bridges would improve employment opportunities for many sections of the population, including taxi drivers, farmers, lorry owners, etc. Additionally, the traffic problems which were one of their major concerns regarding the previous floating pontoon bridges, were acknowledged as being very satisfactorily resolved. It also opens up new opportunities for employment as taxi drivers, etc. Also, the community believed the new bridges would reduce the rate of traffic accidents occurring on and around the bridges.

**Environmental management plan (EMP)**

The purpose of this Environmental Management Plan (EMP) is to propose environmental protection commitments to protect the environmental values that may be affected by the development of the project and to assist the administering authorities to decide the appropriate approval conditions for the project.

EMPs are designed to be dynamic, so they will be reviewed and revised as the project progresses through public consultation, detailed design, to construction, operational and decommissioning phases. It is envisaged that the final EMPs for each component of the project will provide additional, more detailed guidance for operational personnel, regulators and stakeholders prior to the application for the respective environmental authorities.

This preliminary EMP has been developed to cover the activities associated with the construction and operation of the access road and bridge.
This preliminary EMP has been structured to satisfy the requirements of the relevant EPA guidelines and related operational policies. The EMP proposes environmental management strategies to prevent or minimize environmental harm while allowing for environmentally sustainable development. Monitoring, corrective actions and reporting requirements form part of this EMP, which will ensure that the proposed management strategies are being properly implemented.

Objectives:-

The objectives of this EMP are to provide:-

- Evidence of practical and achievable plans to ensure that the project’s environmental requirements are complied with;
- An integrated plan for monitoring, assessing and controlling potential impacts;
- Local, State and authorities with a common focus for approval conditions and compliance with policies and conditions; and
- The community with evidence that the access road and bridge development will be managed in an environmentally acceptable manner.

EMP establishes a framework for the identification of environmental protection, mitigation, monitoring measures to be taken during operation phase of the project. EMP consists mainly of Project Description, mitigation Plan, Monitoring Plan, Instructional Strengthening, schedule, Institutional Arrangements, and Public Consultation. EMP clearly indicates the environmental monitoring to be applied the EMP will aim to achieve an exemplary environmental performance during operation. To meet this goal, the following activities, measures and programs must be implemented:

(i) Environmental policy.
(ii) Application of all mitigation and management measures.
(iii) An environmental monitoring program.
(iv) An emergency and contingency plan.
(v) An institutional plan.
(vi) An environmental and safety officer.
Environmental monitoring is an important component of the EMP. It provides the information for periodic review and refinement modification of the EMP as necessary, ensuring that environmental protection is optimized. All project phases through monitoring, unwanted environmental impacts are detected early and remedied effectively. It will also validate the impacts predicted in the Environmental Impact Assessment (EIA) and the effectiveness of the proposed mitigation measures. Lastly, it will also demonstrate compliance with national and international regulatory requirements.

A comprehensive monitoring program for the plant must be developed, covering the measurement of relevant environmental indicators. At the plant, it will involve noise, safety concerns, site drainage, solid waste and wastewater disposal, groundwater abstraction...etc. The results of the monitoring program, which will be implemented by the Monitoring Team (MT) to be created for the project, will be used to optimize plant operations and adjust to management practices. The (EMP) may need to the following continuous activities:

**Monitoring:**

Regular monitoring of all significant, environmental parameters is essential to ascertain compliance to the country’s environmental laws and regulations. The objectives of the monitoring will be as follows:

- To verify the results of the plant’s environmental impact assessment
- To study the trend of construction values of the parameters, which have been identified as critical and accordingly planning the mitigation measures.
- To check and assess the efficiency of pollution control equipment.
- To ensure that any additional parameters, other than those identified in the impact, do not become critical after the commissioning of the new gas turbo generators.
- To ensure that all safety concepts were implemented properly during the bridge operation.

To ensure the proper implementation of the environmental mitigation measures, an environmental monitoring program has been established for both the construction and operation phases. The monitoring program will focus on noise impact, air...
quality, and water quality within the project area. More details are included in the full ESIA Report.

Routine environmental monitoring of the bridge will be conducted to ensure performance standards put in place are met. Monitoring, monitores operational and corporate personnel and specialist service providers will be periodically conducted in accordance with site-specific monitoring plans. Specialist studies to investigate particular aspects of the environment (e.g. flora and fauna, weeds, hydrological risk) will be periodically commissioned when a need is determined during environmental review and risk assessment.

**Reporting and Auditing:-**

Compliance audits must be conducted the construction procedures, relevant legislation, license and permit conditions and industry standards.

All inspection and audit reports of environmental performance will be stored in the Audit and inspection Manager (AIM). AIM is an electronic database that is used to enable corrective actions identified during the inspection \ auditing process to be recorded, tracked and closed out, the information will be made available to the relevant regulatory authorities as required. In addition to the monitoring and reporting requirements documented in the relevant sections of the EMP, the following auditing regime will be implemented:

a) All incidents or accidents during the bridge operation be reported immediately by legal authorizes and measures will be taken to comply with the environmental rules and regulations. Detailed reporting must be provided within days.

b) All corrective measures must be discussed to ensure compliance with laws and regulations.

c) Reports for personnel training on environmental issues or emergency practices must be produced.

d) Progress reports, environmental monitoring report and other inspections reports must be produced periodically and will include all necessary details.

**Institutional Requirements**
One of the key duties is to organize and supervise the implementation of all the environmental mitigation and monitoring measures developed or recommended in the ESIA report. Through these measures any adverse environmental impacts caused by the operation of the Project will be avoided or minimized in accordance with applicable national and local. To ensure that the mitigation and monitoring measures are being carried out effectively on a continuing basis a clearly defined and regular reporting and response system must be established.

**Training and Communications:**

All contractions personnel, contractors and visitors are required to undertake appropriate environmental training and induction programs

All managers and supervisors will be responsible for ensuring that personnel under their control have the requisite competencies, skill and training to carry out their assigned tasks in accordance with the requirements of the EMP. They will also be responsible for identifying additional training and competency requirements.

All staff will complete a comprehensive project induction. The induction will include a comprehensive review of environmental requirements and standards, safety, and access protocols.

All project supervisors and managers will have additional detailed training on the use and implementation of the EMP.

All managers and supervisors will hold regular toolbox meetings with personnel to discuss issues associated with their scheduled work. This will include highlighting and discussing relevant environmental issues.
MITIGATION MEASURES

The purpose impact is to look for alternative and better ways of implementing the proposed project or associated activities so that the negative impacts are eliminated or minimized, while benefits are enhanced. Impact mitigation requires that the full extent of the anticipated environmental problems are understood. In view of this, this section of the ESIA presents mitigation measures resulting from the impacts identified.
# The Mitigation Measures in the construction phase (B3&B4):

<table>
<thead>
<tr>
<th>Impact</th>
<th>Air Pollution</th>
<th>Responsibility</th>
<th>Frequency</th>
<th>Monitoring Requirements &amp;cost US$</th>
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</thead>
<tbody>
<tr>
<td><strong>Mitigation</strong></td>
<td>Dust Control</td>
<td>The contractor</td>
<td>Daily</td>
<td>180US$</td>
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1. Wheel washing and damping down of unsurfaced and un-vegetated area.
2. Retention of vegetation where possible will reduce dust travel.
3. Excavations and other clearing activities must only be done during agreed working times and permitting weather conditions to avoid drifting of sand and dust into neighboring area.
4. Damping down of all exposed soil surfaces with water sprinklers when necessary to reduce dust.
5. The contractor shall be responsible for dust control on site to ensure no nuisance is caused to the landowner or neighboring Communities.
6. A speed limit of 40km/h must not be exceeded on dirty roads.

**Odor control**

7. Regular servicing of vehicles in order to limit gaseous emissions (to be done off-site).
8. Regular servicing of onsite toilets to avoid potential odors.
9. Allocated cooking areas must be provided.
10. The contractor must make alternative arrangement (other than fires) for cooking and/or heating requirements. LP gas cooker may be used provided that all safety regulations
Rehabilitation

11. The contractor should commence rehabilitation of exposed soil surfaces as soon as practical after completion of earthworks.

Fire prevention

12. The contractor must ensure that any grass left in a natural state during the construction of bridges should be cut in order to prevent veldt fires, especially during the dry months.

13. No open fires shall be allowed on site under any circumstance. All cooking shall be done in demarcated areas that are safe and cannot cause runaway fires.

14. The contractor shall have operational fire-fighting equipment available on site at all times. The level of fire-fighting equipment must be assessed and evaluated thorough a typical risk assessment process. It may be required to increase the level of protection, especially during the winter months.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Noise</th>
<th>Responsibility</th>
<th>Frequency Monitoring Requirements &amp;cost US$</th>
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<tbody>
<tr>
<td>Noise</td>
<td></td>
<td>The contractor</td>
<td>Daily</td>
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<tr>
<td>Mitigation</td>
<td>1. The construction phase must aim to adhere to the relevant noise regulations and limit noise to within standard working hours in order to reduce disturbance of residential areas in close proximity to the development.</td>
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<td>1280$</td>
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</tbody>
</table>
2. Construction site yards, workshops, and other noisy fixed facilities should be located well away from noise sensitive areas. One the proposed final layouts are made available by the contractor, the sites must be evaluated in detail and specific measures designed into the system.

3. Truck traffic should be routed away from noise sensitive areas, where possible.

4. Noise levels must be kept within acceptable limits.

5. Noisy operations should be combined so that they occur where possible at the same time.

6. Blasting operations (if required) are to be strictly controlled with regard to the size of explosive charge in order to minimize noise and air blast, and timings of explosions. The number of blasts per day should be limited, blasting should be undertaken at the same times each day and no blasting should be allowed at night.

7. Construction activities are to be contained to reasonable hours during the day and early evening. Night-time activates near noise sensitive areas should not be allowed.

8. With regard to unavoidable very noisy construction activities in the vicinity of noise sensitive areas, the contractor should liaise with local residents on how best to minimize impact, and the local population should be kept informed of the nature and duration of Nintended activities.

9. As construction workers operate in a very noisy environment, it must ensure that their working construction comply with the requirements of the Occupational Health and Safety Where necessary ear protection gear should be worn.

10. Noise from laborers must be controlled.
11. Noise suppression measures must be applied to all construction equipment. Construction equipment must be kept in good working order and where appropriate fitted with silencers which are kept in good working order. Should the vehicles or equipment not be in good working order, the contractor may be instructed to remove the offending vehicle or machinery from site.

12. The contractor must take measures to discourage laborers from loitering in the area and causing noise disturbance.

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<thead>
<tr>
<th>Impact</th>
<th>Flora</th>
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<tbody>
<tr>
<td>(This section deals with the impact construction activities will have on flora on site and in the surrounding areas)</td>
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<tr>
<td><strong>Mitigation/Method Statement</strong></td>
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<tr>
<td>1. During the construction phase workers must be limited to areas under construction and access to the undeveloped areas, especially the surrounding open areas must be strictly regulated (&quot;no-go&quot;) area during construction activities.</td>
<td><strong>The contractor</strong></td>
</tr>
<tr>
<td>2. The site should be fenced prior to construction activities and remain fenced off.</td>
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<td>3. Collection of firewood and traditional medicinal plants is strictly prohibited. No area should be cleared of trees, bushes and other vegetation for the purpose of a camping site.</td>
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<tr>
<td>4. The construction of the proposed bridge could result in limited opening-up of the vegetal</td>
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</table>
cover during the construction phase. The opening up of existing vegetated areas, thereby creating corridors along which animals can move, may result in increased predation levels on small mammals, reptiles, amphibians, arachnids and scorpions along these corridors.

5. The limitation of the disturbance of vegetation cover will ameliorate this impact.

6. All damaged areas as a result of construction shall be rehabilitated upon completion of the contract in accordance with satisfaction. Other methods of rehabilitating disturbed sites may also be used at the discretion of the project manager to comply with the conditions of the EMP, e.g. stone pitching, logging, etc. Contour banks shall be spaced according to the slopes. The type of soil shall also be taken into construction.

7. All natural areas impacted during construction must be rehabilitated with locally indigenous grasses typical of the representative botanical unit.

8. Fragmentation must be kept to a minimum.

9. Rehabilitation must take place as soon as construction is complete to avoid the edge effect, the infiltration of alien species and soil erosion within the servitude.

10. Rehabilitation process must make use of species indigenous to the area. Seeds from surrounding seed banks can be used for re-seeding.
This section deals with the impact construction activities will have on fauna in the areas.

<table>
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<tr>
<th>Impact</th>
<th>Fauna</th>
<th>Responsibility</th>
<th>Frequency Monitoring Requirements &amp; cost (US$)</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>The contactor must ensure that no faunal species are disturbed, trapped, hunted or killed during the construction phase.</td>
<td>Contractor in collaboration with environmental authority in the governorate.</td>
<td>1800</td>
</tr>
<tr>
<td>2.</td>
<td>Construction activities must be planned carefully so as not to interfere with the calving and lambing season for most animal species.</td>
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<td>3.</td>
<td>Care should be taken when removing stumps, logs or rock material. Any scorpions encountered on the site should be left alone and allowed free access away from the activity or safely removed from the area.</td>
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<td>4.</td>
<td>Safety precaution measure must be implemented especially during the vegetation clearance phase which could result in encounters with several venomous snake species.</td>
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<tr>
<td>5.</td>
<td>The frequent burning of the vegetation will have a high impact on remaining reptiles. Fires during the winter months will severely impact on the hibernating species, which are extremely sluggish. Fires during the early summer months destroy the emerging reptiles as well as refuge areas increasing predation risks.</td>
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<tr>
<td>6.</td>
<td>All necessary mitigation measures must be implemented to minimize impacts on the environment.</td>
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<tr>
<td>Impact</td>
<td>Waste Management</td>
<td>Responsibility</td>
<td>Frequency</td>
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<tr>
<td>Mitigation</td>
<td>Construction rubble</td>
<td>The contractor</td>
<td>Weekly</td>
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</table>

1. Contraction rubble shall be disposed of in pre-agreed, demarcated spoil dumps that have been approved by the relevant Municipality. All building rubble must be removed to a registered landfill site.

**Litter management**

2. Refuse bins must be placed at strategic position to ensure that litter does not accumulate within the construction site.

3. A housekeeping team should be appointed to regularly maintain the litter and rubble situation on the construction site.

4. If possible and feasible, all waste generated on site must be separated into glass, plastic, paper, metal and recycled. An independent contractor can be appointed to conduct this recycling.

5. Littering by the construction workers shall not be allowed under any circumstances.

6. Skip waste containers should be maintained on site. These should be kept covered and arrangements made for them to be collected regularly form the site by the local council.

7. All waste must be removed from the site and transported to a landfill site as approved by the relevant Municipality.
**Hazardous waste**

8. All waste hazardous materials must be carefully stored, and then disposed of offsite at a licensed landfill site.

9. Contaminants to be stored safely to avoid spillage.

10. Machinery must be properly maintained to keep oil leaks in check.

**Sanitation**

11. The contractor installs mobile toilets on the site.

12. Staff shall be sensitized to the fact that they should use these facilities at all times. No indiscriminate sanitary activities on site shall be allowed.

13. Toilets facilities shall be within 100m from workplaces but not closer than 50m from any natural water bodies or boreholes. There should be enough toilets available to accommodate the workforce.

14. Potable water must be provided for all construction staff.

**Remedial actions**

15. Depending on the nature and extent of the spill, contaminated soil must be either excavated or treated on-site.

16. Excavation of contaminated soil must involve careful removal of soil using appropriate tools/machinery to storage containers until treated or disposed of at licensed hazardous landfill site.
17. If a spill occurs on impermeable surfaces such as cement or concrete, the surface spill must be contained using oil absorbent materials.

18. If necessary, oil absorbent sheets or pads must be attached to leaky machinery or infrastructure.

19. Materials used for the remediation of petrochemical spills must be used according to product specifications and guidance for use.

20. Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment, and stored in adequate containers until appropriate disposal.

Impact | Health and Safety |
---|---|
| (This section deals with the safety of workers and the public exposed to construction activity hazards) |

<table>
<thead>
<tr>
<th>Phase</th>
<th>Construction</th>
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<tbody>
<tr>
<td>Responsibility</td>
<td>The contractor</td>
</tr>
<tr>
<td>Frequency Monitoring Requirements &amp; cost (US$)</td>
<td>Daily</td>
</tr>
</tbody>
</table>

Environmental Management plan

Mitigation | Worker safety |
---|---|
1. Implementation of safety measures, work procedures and first aid must be implemented on site.

2. Workers should be thoroughly trained in using potentially dangerous equipment.

3. The contractor must ensure that all equipment is maintained in a safe operating condition.

4. A safety officer must be appointed.

5. A record of health and safety incidents must be

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kept on site.

6. Any health and safety incidents must be reported to the project manager immediately.

7. First aid facilities must be available on site at all times.

8. Workers have the right to refuse work in conditions.

9. Material stockpiles or stacks, such as, pipes must be stable and well secured to avoid collapse and possible injury to site workers.

Worker facilities

10. Eating areas should be regularly serviced and cleaned to ensure the highest possible standards of hygiene and cleanliness.

11. Fires are not to be allowed.

Protective gear

12. Personal Protective Equipment (PPE) must be made available to all construction staff and must be compulsory. Hard hats and safety shoes must be worn at all times and other PPE worn were necessary i.e. dust masks, ear plugs etc.

13. No person is to enter the site without the necessary PPE.

14. The construction camp (if required) must remain fenced for the entire construction period.

15. Potentially hazardous areas such as trenches are to the be demarcated and clearly marked.

16. Adequate warning signs of hazardous working areas.

17. Uncovered manholes and excavations must be
clearly demarcated.

18. Emergency numbers for local police and fire department etc must be placed in a prominent area.

19. Firefighting equipment must be placed in prominent positions across the site where it is easily accessible. This includes fire extinguishers, a fire blanket as well as a water tank.

20. All speed limits must be adhered to.

21. Staff that will be handling hazardous materials must be trained to do so.

22. Any hazardous materials (apart from fuel) must be stored within a lockable store with a sealed floor.

23. All storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces.

Procedure in the event of a petrochemical spill

24. The individual responsible for or who discovers the petrochemical spill must report the incident to the project Manager.

25. The problem must be assessed and the necessary actions required will be undertaken.

26. The immediate response must be to contain the spill.

27. The source of the spill must be identified, controlled, treated or removed.

Fire management

28. Firefighting equipment should be present on site at all times.

29. All construction staff must be trained in fire
hazard control and firefighting techniques.

30. All flammable substances must be stored in dry areas which do not pose an ignition risk.

31. No open fires will be allowed on site.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Social Environment</th>
<th>Responsibility</th>
<th>Frequency Monitoring Requirements &amp; cost (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitigation</td>
<td></td>
<td>The contractor</td>
<td>Bi-Monthly</td>
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1. All contact with affected parties shall be courteous at all times. The rights of the affected parties shall be respected at all times.

2. A complaints register should be kept on site. Details of complaints should be incorporated into the audits as part of the monitoring process. This register is to be tabled during monthly site meetings.

3. No interruptions other than those negotiated shall be allowed to any essential services. Damage to infrastructure shall not be tolerated and any damage shall be rectified immediately. A record of all damage and remedial actions shall be kept on site.

**Influx of Job Seekers**

4. Ensure those employment procedures/policy are communicated to local stakeholders, especially community representative organizations and ward councilors.

5. Construction workers should be clearly identifiable by wearing proper construction uniforms displaying the logo of the construction company. Construction workers could also be issued with identification tags.
Direct formal employment opportunities

6. Unskilled job opportunities should be afforded to local resident’s local trade unions could assist with the recruitment process to counteract the potential for social mobilization.

7. Equal opportunities for employment should be created to ensure that the local female population also has access to these opportunities.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Groundwater and Surface Water Pollution (This section deals with the impacts of construction activities could have on ground and surface water pollution)</th>
<th>Responsibility</th>
<th>Frequency Monitoring Requirements &amp; cost (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>As mentioned in article 7.1.2.4 the construction activates will have no impact on the surface and ground water, however, the following mitigations (may/may not) needed and as follows.</td>
<td>The contractor</td>
<td>Weekly</td>
<td></td>
</tr>
<tr>
<td>Mitigation/Method</td>
<td>Sanitation</td>
<td>1. Adequate sanitary facilities and toilets must be provided for construction</td>
<td>3000</td>
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<tr>
<td>Statement</td>
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<tr>
<td>-----------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>workers.</td>
<td></td>
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</tr>
</tbody>
</table>

2. The facilities must be regularly serviced and emptied to reduce the risk of surface or groundwater pollution.

**Hazardous materials**

3. Use and or storage of materials, fuels and chemicals which could potentially leak in to the ground must be controlled.

4. All storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces.

5. Any hazardous substances must be stored at least 20m from any of the water bodies on site.

6. The Environmental Control officer should be responsible for ensuring that potentially harmful materials are properly stored in a dry, secure, ventilated environment, with concrete or sealed flooring and a means of preventing unauthorized entry.

7. Contaminated wastewater must be managed by the contractor to ensure existing water resources on the site are not contaminated. All wastewater from general activities in the camp shall be collected and removed from the site for appropriate disposal at a licensed commercial facility.

**Public areas**

8. Food preparation areas should be provided at the construction camp with adequate washing facilities and food refuse should be stored in sealed refuse bins which should be removed from site on a regular basis.

9. The contractor should take steps to
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ensure that littering by construction workers does not occur and persons should be employed on site to collect litter accumulating at fence lines.</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>No washing or servicing on vehicles.</td>
</tr>
<tr>
<td><strong>Water resources</strong></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Site staff shall not be permitted to use any other open water body or natural water source adjacent to or within the designated site for the purposes of bathing, washing of clothing or for any construction or related activities.</td>
</tr>
<tr>
<td>12.</td>
<td>Municipal water should instead be used for all activities such as washing of equipment or disposal of any type of waste, dust suppression, concrete mixing, compacting, etc.</td>
</tr>
<tr>
<td>13.</td>
<td>The Department of the environment should be contacted in order to deal with spillages and contamination of aquatic environments.</td>
</tr>
<tr>
<td>14.</td>
<td>Proper compaction of backfilled material to attain low permeability.</td>
</tr>
<tr>
<td>15.</td>
<td>Ensure that surface/storm water is diverted away from excavation trenches.</td>
</tr>
<tr>
<td>16.</td>
<td>If necessary ensure that stream flow bypasses the construction area within drainage lines.</td>
</tr>
<tr>
<td>17.</td>
<td>Ensure that contaminants are safely stored and away from the construction site.</td>
</tr>
<tr>
<td>18.</td>
<td>Silt traps should be installed (as required) downstream of the construction works to trap any silt that is mobilized by the construction activities.</td>
</tr>
<tr>
<td>19.</td>
<td>Water in the river channel that needs to</td>
</tr>
</tbody>
</table>
be pumped around the construction site and discharged back into the river, this must be done with care must be taken to ensure that water is discharged in a manner that does not cause siltation or erosion into the water course.

20. After the construction process of the bridge, the disturbed banks should be returned to their original profiles as far as possible.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Construction Traffic and Access</th>
<th>Responsibility</th>
<th>Frequency Monitoring Requirements &amp; cost (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction traffic</td>
<td>(This section deals with the impact construction traffic and access has on the site and surrounds)</td>
<td>The contractor</td>
<td>Weekly</td>
</tr>
</tbody>
</table>

1. Contraction routes must be clearly defined.

2. Access of the construction and material delivery vehicles should be strictly controlled, especially during wet weather to avoid compaction and damage to the topsoil structure.

3. The construction trucks routes and times of operation should be carefully planned.

4. Wheel washing and damping down of un-surfaced roads must be implemented to reduce dust.

5. Vehicles and equipment shall be serviced regularly to avoid the contamination of soil from oil and hydraulic fluid leaks etc.

6. Servicing must be done off-site.

7. Oil changes must take place on a concrete
platform or on a drip tray.

8. Soils compacted by construction shall be deep ripped to loosen compacted layers and regraded to even running levels.

Access

9. Temporary access roads that might be required must be rehabilitated prior to the contractor leaving the site.

10. Strategic positioning of entry and exit points to ensure as little impact/effect as possible on the traffic flow.

11. The main routes to the site must be clearly signposted.

Road maintenance

12. The contractor should ensure that access roads are maintained in good condition by attending to potholes, corrugations and storm water damage as soon as these develop.

13. If necessary, staff must be employed to clean surfaced roads adjacent to construction sites where materials have spilt.

General

14. The contractor shall meet safety requirements under all circumstances. All equipment transported shall be clearly labeled as to their potential hazards according to specifications. All the required safety labeling on the containers and trucks used shall be in place.

15. The contractor shall meet these safety requirements under all circumstances. All equipment transported shall be clearly labeled as to their potential hazards according to specifications. All the required safety labeling on the containers and trucks used shall be
As mentioned in article 7.1.11 there are no significant impact on the soil and geology, however, the following measures (may/may not) be needed in different stages of the construction.

<table>
<thead>
<tr>
<th>IMPACT</th>
<th>Soils and Geology</th>
<th>Responsibility</th>
<th>Frequency Monitoring Requirements &amp; cost (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>This section deals with the impact from that the construction activities will have on soil</em></td>
<td>The contractor</td>
<td>Monthly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mitigation / Method Statement</th>
<th>Topsoil</th>
</tr>
</thead>
</table>
|                               | 1. The contractor should, prior to the commencement of earthworks determine the average depth of topsoil, the full depth of topsoil should be stripped from areas affected by construction and related activities prior to the commencement of major earthworks. This should include the building footprints, working areas and storage areas. Topsoil must be reused where possible to rehabilitate disturbed areas.  
  2. Care must be taken not to mix topsoil and subsoil during stripping.  
  3. Removed polluted topsoil should be transported to a licensed landfill site.  
  **Soil Stripping**  
  4. No soil stripping must take place on areas within the site that contractor does not require for construction works or areas of retained vegetation.  
  5. Subsoil and overburden should, in all construction and lay down areas, be stockpiled separately to be returned for backfilling in the correct soil horizon order.  
  6. Construction vehicles must only be allowed to utilize existing tracks or pre-planned access routes.  
  **Stockpiles** | 3400 |
7. Stockpiles should not be situated such that they obstruct natural water pathways and drainage channels.

8. Stockpiles should not exceed 2m in height.

9. If stockpiles are exposed to windy conditions or heavy rain, they should be covered either by vegetation or cloth. Stockpiles may further be protected by the construction of beams or low brick walls around their bases.

10. Stockpiles should be kept clear of weeds and alien vegetation growth by regular weeding.

11. Where contamination of soil is expected, analysis must be done prior to disposal of excess soil to determine the appropriate disposal route.

**Fuel storage**

12. Topsoil and subsoil to be protected from contamination.

13. Fuel and material storage must be away from stockpiles.

14. Cement, concrete and chemicals must be mixed on an impermeable surface and provisions should be made to contain spillages or overflows into the soil.

15. Contaminated soil must be contained disposed of offsite at an approved landfill site.

**Earthworks**

16. Soils compacted during the construction of the bridge should be deeply ripped to loosen compacted layers and re-graded to even running levels. Topsoil should be re-spread over landscaped areas.

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**Impact** | **Erosion Control**
--- | ---

(This section deals with the impact construction activities will have with regards to potential erosion)

--- | ---

**Responsibility**

--- | ---

**Frequency Monitoring Requirements**
<table>
<thead>
<tr>
<th>Mitigation</th>
<th>The contractor</th>
<th>Bi-Monthly</th>
<th>&amp; cost (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Wind screening (i.e. erection of barriers, shade nets etc) and storm water control (i.e. gabions, sandbags etc) should be undertaken to prevent soil loss from the site.</td>
<td></td>
<td></td>
<td><strong>5500</strong></td>
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<tr>
<td>2. The use of silt fences and sand bags must be implemented in areas that are susceptible to erosion.</td>
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<tr>
<td>3. All erosion control mechanisms need to be regularly maintained.</td>
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<tr>
<td>4. Seeding of topsoil and subsoil stockpiles to prevent wind and water erosion of soil surfaces.</td>
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<tr>
<td>5. Retention of vegetation where possible to avoid soil erosion.</td>
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<tr>
<td>6. Vegetation clearance should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time.</td>
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<tr>
<td>7. Re-vegetation of disturbed surfaces should occur immediately after the construction activities are completed.</td>
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<tr>
<td>8. No impediment to the natural water flow other than approved erosion control works is permitted.</td>
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</tbody>
</table>
## Mitigation measures in the operational phase: B1, B2, B3, B4

<table>
<thead>
<tr>
<th>Impact</th>
<th>Air Pollution</th>
<th>Responsibility</th>
<th>Frequency Monitoring Requirements &amp; cost (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitigation/Method Statement</td>
<td>Dust control</td>
<td>Municipality (must be followed up by the environmental authority)</td>
<td>Monthly 300</td>
</tr>
<tr>
<td></td>
<td>Continuous watering and cleaning of the bridge is required in order to reduce the distribution of dust and suspended particles.</td>
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<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Impact</th>
<th>Noise</th>
<th>Responsibility</th>
<th>Frequency Monitoring Requirements &amp; cost (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitigation/Method Statement</td>
<td>Traffic police and governorate authority (must be followed up by the environmental authority &amp; CRGB)</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Noisy trucks and equipments may not allow to passing across the bridge.</td>
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<tr>
<td></td>
<td>Some noise barriers may be needed (optional)</td>
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</table>

<table>
<thead>
<tr>
<th>Impact</th>
<th>Flora &amp; Fauna</th>
<th>Responsibility</th>
<th>Frequency Monitoring Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitigation/Method Statement</td>
<td>No Mitigation needed</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Impact</td>
<td>Waste management</td>
<td>Responsibility</td>
<td>Frequency Monitoring</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Mitigation / Method Statement</td>
<td></td>
<td>Requirements &amp; cost (US$)</td>
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<td></td>
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<tr>
<td><strong>Impact</strong></td>
<td><strong>Health and safety</strong></td>
<td></td>
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<tr>
<td></td>
<td>(This section deals with the impact that the operation activities will have on health and safety)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mitigation / Method Statement</td>
<td>No mitigation needed</td>
<td></td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Impact</th>
<th>Socio-Economic</th>
<th>Responsibility</th>
<th>Frequency Monitoring Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mitigation / Method Statement</strong></td>
<td>As for B1, a satisfactory financial compensation were implemented paid by the contractor due to the relocation of a store, also, a new mosque was built by the contractor on his own for the same project, while for B4, another satisfactory financial compensation were paid for the relocation of some stores and removing of number of trees</td>
<td>Contractor, the official authority in the area</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Impact</th>
<th>Groundwater &amp; surface water</th>
<th>Responsibility</th>
<th>Frequency Monitoring Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mitigation / Method Statement</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mitigation / Method Statement</td>
<td>Impact</td>
<td>Responsibility</td>
<td>Frequency Monitoring Requirements &amp; cost (US$)</td>
</tr>
<tr>
<td>-------------------------------</td>
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<td>---------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>Surface water</td>
<td>Traffic</td>
<td>Traffic police and municipality, directorate of electricity</td>
<td>400</td>
</tr>
<tr>
<td>1. Checking the storm water pipes and drainage.</td>
<td></td>
<td></td>
<td>Monthly 300</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mitigation / Method Statement</th>
<th>Impact</th>
<th>Responsibility</th>
<th>Frequency Monitoring Requirements &amp; cost (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Mitigation needed</td>
<td>Soil</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>(This section deals with the impact that the operation activities will have on soil)</td>
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</table>

<table>
<thead>
<tr>
<th>Mitigation / Method Statement</th>
<th>Impact</th>
<th>Responsibility</th>
<th>Frequency Monitoring Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>No mitigation needed</td>
<td>Climate &amp; metrology</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

N/A: Not Applicable