The Egyptian Natural Gas Company

EG-GIZA North Power Project - Natural Gas Lines to Additional Power Plants in Egypt

6th of October Natural Gas Pipeline

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

December 2016

Final Report
Executive Summary

Introduction

The proposed project is considered as part of Egypt’s strategy which aims to expand the use of natural gas as a clean source of energy, a goal that will be achieved through delivering natural gas to houses, industrial facilities and power plants. In this regard, the EG-Giza North Power Project was undertaken by the Egyptian Government. The project consists of three main components:

- Component 1: The Power Plant Component, which is the construction of 2250 MW Combined Cycle Gas Turbine power plant;
- Component 2: The Construction of transmission lines to connect the power plant to the national grid
- Component 3: The construction of gas pipeline to strengthen the gas supply network to ensure supply gas to power plant.

Component 3 of the project, which involves gas pipeline construction to provide natural gas to North Giza power station, is implemented by the Egyptian Company for Natural Gas (GASCO) with the assistance of the World Bank. This component and was 96% concluded by the end of 2015.

After conclusion of the procurement of the Bank financed packages, there were still financial savings from the project that can be utilized by the Government of Egypt. In this regard, the World Bank received formal request from the government of Egypt to utilize these savings to procure pipelines required for upgrading the natural gas network and connecting to new and existing power plants.

As the objective of the new gas pipelines connections to the existing and new power stations is to improve the security and efficiency of electricity supply, the additional proposed scope by the Egyptian government is considered to be fully in-line with the original project objectives.

The proposed pipelines will also be implemented by GASCO and are composed of 9 pipelines, namely:

1. New Capital - Dahshour gas pipeline (70 km)
2. Dahshour – El Wasta gas pipeline (65 km)
3. El Wasta – Beni Suef gas pipeline (65 km) + gas decompression station (in BeniSuef Power Station)
4. Sixth of October Power Station (400 meters) + gas decompression station (in 6th of October power station)
5. El Gamel – Damietta gas pipeline (50 km)
6. El Suez Power Station (3 km) + gas decomposition station (in Suez Thermal Power Station)
7. Soumid import gas pipeline (4 km)
8. El Mahmoudiya Power Station (27 km + 17 km + 7 km) + gas decompression station (in Mahmoudiya Power Station)
9. Damanhour Power Station (2.5 km) + gas decompression station (in Damanhour Power Station)

Approach to Study

The preparation of the Environmental and Social Impact Assessment is done according to the following approach:

- Reviewing the available information and documents regarding the project;
- Reviewing national and international legislations and regulations relevant to the project, including the required governmental permits;
- Conducting site visits to the project site, to collect the baseline data regarding the current environmental and social situation;
- Holding a Scoping Session (first public consultation) to engage the community and different stakeholders in the process of identifying the expected impacts;
- Assessing the potential environmental and social impacts associated with proposed project activities;
- Developing an outline for the environmental and social management plan for the mitigation of the expected negative impacts and the monitoring activities to ensure compliance with the relevant environmental laws;
- Holding a Public Consultation Session based on the updated ESIA and RAP studies;
- Finalizing and submitting the ESIA and RAP studies.

Project description

**Pipeline Route**
The route starts from an existing room which is located originally in Abu Rawash station on Tanash / Dahshur 20” gas pipeline, then the pipeline will extend southwest parallel to Abu Rawash road from its western side until it reaches the pressure reduction station (PRS) inside 6th of October power station, with a total length of 400 m. There are no crossings along the whole route and the pipeline will be located underground.
Construction Phase
The project will be carried out by a contractor under GASCO's supervision and control. It is expected that the engineering, procurement and construction phases will collectively take about 19 months, during which the following activities will be conducted in the construction phase:

- Right of Way activities.
- Pipe transportation and storage.
- Trenching.
- Horizontal Directional Drilling (HDD) or boring for the road crossings
- Welding and inspection.
- Coating and inspection
- Wrapping of joints.
- Ditching.
- Installation of valves.
- Tie-ins
- Laying fiber-optic cables
- Backfilling.
- Pigging.
- Hydrostatic test.
- Dewatering.
- Purging& commissioning.
- Manufacturing and fittings for valves rooms (including civil, mechanical, and electric components).

Operation Phase
The operation phase is normally functioned through the central control unit through the SCADA system. Normal maintenance and monitoring work will be performed including patrolling to leakages and potential hazards detection. In case of leak detection, or damage in parts of the pipeline, the damaged part will be isolated and the necessary action will be taken according to the emergency response plan of GASCO.

Project Alternatives
The main target of the proposed project is to increase the natural gas supply to 6th of October Power Plant, in order to help meet the growing national demand. In case of having “No Action”, liquid fuel (Mazout (heavy fuel oil) or Diesel) can be used to compensate this shortage despite that there will be more polluting air emissions in case of transporting it through vehicles, and even during its burning. In addition, since there is a local shortage in supplying liquid fuels, it will be mainly imported, and accordingly increase the load on the national budget especially regarding the current foreign currency problems. Hence, the “No Action” alternative is not accepted.
From the environmental and social point of view, the best pipeline route is the one which minimizes the change in the land use, the interruption of the ecological nature, the intersection with residential areas and areas with special nature such as religious buildings and historical areas. This point of view intersects with GASCO’s strategy which aims to choose a route away from the residential areas, and in locations already containing other infrastructure pipelines/cables to minimize disturbance in new areas. GASCO has an unwritten strategy that avoids passing through any construction buildings including houses, religious buildings and historical areas.

The pipeline route has a specified start point and end point, and due to the small length of this particular pipeline, there are no much routing alternatives available. In addition, this pipeline will pass beside an existing natural gas pipeline that serves 6th of October power station. The chosen pipeline route achieves the environmental and social targets, and at the same time aligns with GASCO’s strategy which aims at choosing routes already containing existing infrastructure pipelines to minimize disturbance in new areas.

**Positive Environmental and Social Impacts**

Implementation of the proposed project is expected to lead to a number of positive social and economic benefits, for example:

- The project is expected to result in the creation of job opportunities in the construction phase, both directly and indirectly;
- Support the expansion of power generation projects;
- Expanding power generation will dramatically enhance the national electricity grid;
- Expanding the natural gas network will positively provide an energy source to local industries which will indirectly create job opportunities;
- Expanding the natural gas network will enhance the national plans to increase the number of natural gas household connections.
- Expanding the use of natural gas is a safer and more environmentally friendly source of energy;
- Reduction of risks related to fires and leakage compared to liquefied petroleum gas (LPG) used in “butagas cylinders”;
- Natural gas is relatively cheaper than LPG and electricity for the Egyptian economy;
- Foreign currency savings from minimizing imports of subsidized gas cylinders;
- Variation of the energy mix in order to reduce the dependency on imported fuel.
## Environmental Impact Rating Summary

<table>
<thead>
<tr>
<th>Phase</th>
<th>Impact category</th>
<th>Impact Rating</th>
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<td>Low</td>
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<td>Construction</td>
<td>Air Quality</td>
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<td>Aquatic Environment</td>
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<td>Natural disasters</td>
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<td>Waste disposal</td>
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<td>Public health</td>
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<td>Health and safety</td>
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<td>Existing infrastructure</td>
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<td>Operation</td>
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<td></td>
<td>Existing infrastructure</td>
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</table>
Main Construction Impacts

1. Dust emissions during the construction phase due to the on-site activities (site preparation, excavation, etc)
2. The aquatic environment can be impacted in case of improper disposal of construction wastes or debris in the waterways, and in case of improper disposal of water resulting from hydrostatic testing
3. Increase in noise level resulting from the construction equipment, and other excavation and construction works.
4. The possibility of affecting the existing infrastructure such as water and wastewater networks pipes, telephone connections.. etc. during the construction activities
5. Management of the different types of waste including domestic, hazardous and construction waste, such as Soil, Concrete, Welding belts, used oils, starting from their storage onsite until the final disposal.
6. Occupational Health and Safety aspects
7. Natural disasters that might lead to delays in the work schedule
8. Traffic impacts due to the increase in the number of trucks transporting construction materials and equipment to the site.

Main Operational Impacts

1. In case of pipeline failure due to maintenance activities, accidents, sabotage or trespass, this may lead to release of a significant amount of natural gas will cause major risks and to the surrounding communities and the environment.
2. Natural disasters might lead to pipeline failure and accordingly the release of natural gas, which will cause major risks to the surroundings and the environment

Social Impacts

During Construction

1. Potential temporary inconvenience as result of the construction activities. This could be in the form of accumulation of wastes (both construction and domestic waste in the construction areas, associated odor, air emissions, especially dust as a result of excavation. These impacts are of temporary nature and will be of very limited level of severity, particularly since the construction activities will be in desert area and not populated areas.

During Operation

- The possibility of a gas leakage or the occurrence of fires, which could affect the residents in the area, is a concern.
Environmental and Social Management and Monitoring Plan

The following Tables show the ESMP outline for the proposed pipeline during the construction and operation phases.

The general implementation and supervision cost for all the proposed mitigation measures will be approximately 13,000 EGP/month. Additional costs will be stated for some mitigation measures.

Table 2 - Mitigation Measures and supervision responsibility during operation and construction phases

<table>
<thead>
<tr>
<th>Potential Environmental Impact</th>
<th>Proposed Measures</th>
<th>Mitigation</th>
<th>Responsibility of Mitigation</th>
<th>Responsibility of direct supervision</th>
<th>Estimated Cost</th>
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<tbody>
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<td></td>
<td></td>
<td></td>
<td>Contractor</td>
<td>GASCO HSE site supervisor</td>
<td>General Implementation/supervision cost: 13000 EGP/month</td>
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<tr>
<td><strong>Construction Phase</strong></td>
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<tr>
<td>Air emissions</td>
<td>• Implementation of regular maintenance schedule for machinery • Ensuring that vehicles and equipment will not be left running unnecessarily to reduce gaseous and exhaust emissions from diesel engines</td>
<td>Contractor</td>
<td>GASCO HSE site supervisor</td>
<td>General Implementation/supervision cost: 13000 EGP/month</td>
<td></td>
</tr>
<tr>
<td>Dust Emissions</td>
<td>• Water spraying before excavation, filling, loading and unloading • Spraying of stockpiles, storage in covered areas • Using paved routes to</td>
<td>Contractor</td>
<td>GASCO HSE site supervisor</td>
<td>General Implementation/supervision cost</td>
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<tr>
<td>Potential Environmental Impact</td>
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<td>Mitigation</td>
<td>Responsibility of Mitigation</td>
<td>Responsibility of direct supervision</td>
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<td>Risk of damaging existing infrastructure</td>
<td>• Consult maps before excavation work</td>
<td>Contractor</td>
<td>GASCOHSE supervisor</td>
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<td></td>
<td>• Use of trial pits</td>
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<td></td>
<td>• Analysis of accidents logs</td>
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<td>• If a line break occurs, the nearest police department and the corresponding</td>
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<td>authority shall be informed to repair the damaged line</td>
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<tr>
<td>Solid, Construction and</td>
<td>• Identification and use of</td>
<td>Contractor</td>
<td>GASCOHSE site</td>
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<tr>
<td>Hazardous Waste</td>
<td>• General Implementation/ supervision cost</td>
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<td></td>
<td>• Cost of infrastructure damage will vary according to the type of damage. The cost</td>
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<td>will be charged on the contractor.</td>
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<tr>
<td>Potential Environmental Impact</td>
<td>Proposed Measures</td>
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</table>
| hazardous waste generation    | approved nearby disposal sites through local authority  
• On-site segregation of wastes according to their types  
• Designation and use of appropriate stockpiling locations on site  
• Covering waste stockpiles to avoid ambient air pollution  
• Daily hauling of waste to disposal site in covered trucks  
• Activities involving fueling, lubricating or adding chemicals will not take place on-site (unless it is necessary) to avoid soil pollution and generation of additional hazardous wastes | supervisor | | Disposal: 3500 EGP/ton + transportation cost  
• General Implementation/supervision cost |
<table>
<thead>
<tr>
<th>Potential Environmental Impact</th>
<th>Proposed Measures</th>
<th>Mitigation Responsibility of Mitigation</th>
<th>Responsibility of direct supervision</th>
<th>Estimated Cost</th>
</tr>
</thead>
</table>
| Noise                          | • Containers of used chemicals and oil will be collected and disposed in an approved hazardous wastes facility  
• The hazardous liquid waste will be collected in specific drums and transferred by authorized companies | Contractor                              | GASCOHSE site supervisor             | General Implementation/ supervision cost    |

- Minimize the time of exposure of workers to noise  
- Ensuring the use of ear plugs in the field  
- Training all the workers before the commencement of construction activities about this hazard and how to avoid it  
- Construction activities will be minimized during night so as not to disturb the surroundings
<table>
<thead>
<tr>
<th>Potential Environmental Impact</th>
<th>Proposed Measures</th>
<th>Mitigation Responsibility of Mitigation</th>
<th>Responsibility of direct supervision</th>
<th>Estimated Cost</th>
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</thead>
</table>
| Traffic Congestion           | • Using signs for drivers before the commencement of any construction activities to inform drivers and ensure the safety of the roads  
• Planning alternative routes when roads are obstructed  
• Choosing a location for temporary storage of construction materials, equipment, tools, wastes and machinery before construction so as not to cause further traffic disruptions  
• Avoiding construction work at the traffic peak times whenever possible  
• Prohibiting uncontrolled | Contractor | GASCOHSE site supervisor | General Implementation/ supervision cost |

• All machines and vehicles should be shut-off when not used
<table>
<thead>
<tr>
<th>Potential Environmental Impact</th>
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<th>Responsibility of direct supervision</th>
<th>Estimated Cost</th>
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</thead>
</table>
| Water use/Wastewater generation | • Acquire discharge permits from sewage/irrigation authority  
• liquid waste generated such as chemicals and sewage should be collected in suitable tanks  
• The water resulting from the hydrostatic test of the pipeline should be tested before being discharged in a water body or be transported directly to the nearest water treatment plant. Prior coordination with the Ministry of Water Resources and Irrigation (MWRI) is necessary | Contractor | GASCOHSE site supervisor | • General Implementation/supervision cost  
• 6500 EGP/sample |
<p>| Hazards and Accidents | • An emergency preparedness response plan, which is already prepared by GASCO, will be in place to give | GASCO HSE department | GASCO Headquarters | GASCO management cost (General Implementation/supervision cost) |</p>
<table>
<thead>
<tr>
<th>Potential Environmental Impact</th>
<th>Proposed Measures</th>
<th>Mitigation Responsibility of Enforcement</th>
<th>Responsibility of direct supervision</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use</td>
<td>instructions about the identification of the potential occurrence of accidents and emergency situations that may occur during the pipeline construction and how to respond to them to reduce the risks and impacts that may be associated with these emergency situations</td>
<td>Contractor</td>
<td>GASCO Headquarters</td>
<td>General Implementation/supervision cost</td>
</tr>
<tr>
<td>Occupational Health and Safety</td>
<td>• Restoring the land to its original condition at the end of the construction phase.</td>
<td>Contractor</td>
<td>GASCOHSE site supervisor</td>
<td>• Training Cost: 6000 EGP/training program</td>
</tr>
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<td></td>
<td>• Hazardous liquids have to be handled carefully in order to avoid the spilling or leaks to the ground</td>
<td></td>
<td></td>
<td>• General Implementation/supervision cost</td>
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<tr>
<td></td>
<td>• Ensure the adequate implementation of occupational health and safety provisions on-site such as providing the</td>
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<tr>
<td></td>
<td>instructions about the identification of the potential occurrence of accidents and emergency situations that may occur during the pipeline construction and how to respond to them to reduce the risks and impacts that may be associated with these emergency situations</td>
<td>Contractor</td>
<td>GASCOHSE site supervisor</td>
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</tr>
<tr>
<td>Potential Environmental Impact</td>
<td>Proposed Measures</td>
<td>Mitigation Responsibility of Mitigation</td>
<td>Responsibility of direct supervision</td>
<td>Estimated Cost</td>
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<tr>
<td>Personal protective equipment (PPE) to the workers.</td>
<td>• The site should be provided by all the protective and safety requirements stipulated by labor laws and occupational health.</td>
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**Operation Phase**

<table>
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<tr>
<th>Hazards and Accidents</th>
<th>Proposed Measures</th>
<th>Responsibility of Mitigation</th>
<th>Responsibility of direct supervision</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Scheduled patrolling activities, inspection and preventive maintenance activities</td>
<td>HSE department at GASCO (on-site section)</td>
<td>HSE department at GASCO (central unit and administration)</td>
<td>GASCO management cost</td>
<td></td>
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</table>
### Potential Environmental Impact

- Signs will be posted over the pipeline path showing the numbers to be called in case of emergency

### Proposed Measures

### Mitigation

<table>
<thead>
<tr>
<th>Impact</th>
<th>Monitoring Indicators</th>
<th>Responsibility for implementation</th>
<th>Supervision</th>
<th>Frequency/Duration</th>
<th>Location</th>
<th>Methods</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air emissions</td>
<td>Inspection of vehicle and machinery maintenance schedule</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Quarterly</td>
<td>Documentation office</td>
<td>Review of schedule</td>
<td>13000 EGP/month for General implementation and supervision cost</td>
</tr>
<tr>
<td>Exhaust emissions</td>
<td>Contractor (via third)</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Once before construction commencement</td>
<td>Vehicle maintenance site</td>
<td>Sampling of exhaust</td>
<td>10000 EGP/sample</td>
</tr>
</tbody>
</table>

Table 3 - Monitoring indicators and responsibility during operation and construction phases
<table>
<thead>
<tr>
<th>Impact</th>
<th>Monitoring Indicators</th>
<th>Responsibility for implementation</th>
<th>Supervision</th>
<th>Frequency/Duration</th>
<th>Location</th>
<th>Methods</th>
<th>Estimated Cost</th>
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</thead>
<tbody>
<tr>
<td>Dust Emissions</td>
<td>Inspection of the construction activities</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Daily</td>
<td>Construction site</td>
<td>Site observation</td>
<td>General implementation and supervision cost</td>
</tr>
<tr>
<td>Risk of damaging existing infrastructure</td>
<td>Frequency and location of damage incidents</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Monthly</td>
<td>Documentation office</td>
<td>Documentation in the monthly HSE reports and accidents logs</td>
<td>• General Implementation/supervision cost</td>
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Cost of infrastructure damage will vary according to the type of damage. The cost will be charged on the
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<tr>
<th>Impact</th>
<th>Monitoring Indicators</th>
<th>Responsiblity for implementation</th>
<th>Supervision</th>
<th>Frequency/Duration</th>
<th>Location</th>
<th>Methods</th>
<th>Estimated Cost</th>
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<tbody>
<tr>
<td>Solid, Construction and hazardous waste generation</td>
<td>Use of on-site allocated stockpile locations</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Weekly</td>
<td>Construction site</td>
<td>Site observation</td>
<td>General implementation/supervision cost</td>
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<td></td>
<td>On-site segregation of hazardous waste components from construction wastes and other non-hazardous wastes</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Daily</td>
<td>Construction site</td>
<td>Site observation</td>
<td>General Implementation/supervision cost</td>
</tr>
<tr>
<td></td>
<td>Quantities and types of waste generated</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Daily</td>
<td>Construction site</td>
<td>Recording of daily transportation statistics and records from</td>
<td>Hazardous waste disposal: 3500 EGP/ton +transportation</td>
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</table>
| Noise                  | Sound intensity levels and exposure durations              | Contractor                        | GASCO Environmental Officer       | Quarterly, at least one measurement per contractor / subcontractor | Construction site | Noise recording, reporting in monthly reports                          | • General Implementation/supervision cost  
|                        |                                                            |                                   |                                   |                     |                    | • Sampling Cost: 5000 EGP/sample                                        |                                     |
|                        | Complaints from neighboring residents                    | Contractor                        | GASCO Environmental Officer       | Quarterly           | Construction site | Assessment of the filed complaints                                    | General Implementation/supervision cost |
|                        | Use of earmuffs by Construction workers                   | Contractor                        | GASCO Environmental Officer       | Weekly              | Construction site | Site observation                                                     | General Implementation/supervision cost |
| Traffic Congestion     | Traffic congestions                                       | Contractor                        | GASCO Environmental Officer       | Weekly              | Construction site | Obstructed roads observation                                           | General Implementation/supervision cost |

The waste disposal sites cost is calculated based on the waste generated and disposed of during the construction phase. The sampling cost is determined by the frequency and duration of the sampling activities, with a rate of 5000 EGP per sample.
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<td>Surveying of structural status of buildings and performing soil investigations</td>
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<th>Full Form</th>
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</thead>
<tbody>
<tr>
<td>AADT</td>
<td>Average Annual Daily Traffic</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute</td>
</tr>
<tr>
<td>API</td>
<td>American Petroleum Institute</td>
</tr>
<tr>
<td>ASME</td>
<td>American Society of Mechanical Engineers</td>
</tr>
<tr>
<td>ASTM</td>
<td>American Society for Testing Materials</td>
</tr>
<tr>
<td>BP</td>
<td>Bank Procedure</td>
</tr>
<tr>
<td>CAA</td>
<td>Competent Administrative Authority</td>
</tr>
<tr>
<td>dB</td>
<td>Decibel</td>
</tr>
<tr>
<td>EEAA</td>
<td>Egyptian Environmental Affairs Agency</td>
</tr>
<tr>
<td>EGAS</td>
<td>Egyptian Natural Gas Holding Company</td>
</tr>
<tr>
<td>EGPC</td>
<td>Egyptian General Petroleum Corporation</td>
</tr>
<tr>
<td>EHS</td>
<td>Environmental Health and Safety</td>
</tr>
<tr>
<td>EM</td>
<td>Environmental Management</td>
</tr>
<tr>
<td>EMS</td>
<td>Environmental Management System</td>
</tr>
<tr>
<td>EMU</td>
<td>Environmental Management Unit</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
</tr>
<tr>
<td>ESIA</td>
<td>Environmental and Social Impact Assessment</td>
</tr>
<tr>
<td>ESMP</td>
<td>Environmental and Social Management Plan</td>
</tr>
<tr>
<td>GARBLT</td>
<td>General Authority for Roads, Bridges and Land Transport</td>
</tr>
<tr>
<td>GASCO</td>
<td>The Egyptian Natural Gas Company</td>
</tr>
<tr>
<td>GRM</td>
<td>Grievance Redress Mechanism</td>
</tr>
<tr>
<td>HC</td>
<td>Hydrocarbons</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>HDD</td>
<td>Horizontal Directional Drilling</td>
</tr>
<tr>
<td>HSE</td>
<td>Health and Safety Environment</td>
</tr>
<tr>
<td>IEC</td>
<td>International Electrotechnical Commission</td>
</tr>
<tr>
<td>IFC</td>
<td>International Finance Corporation</td>
</tr>
<tr>
<td>ILO</td>
<td>International Labor Organization</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
</tr>
<tr>
<td>IUCN</td>
<td>International Union for the Conservation of Nature</td>
</tr>
<tr>
<td>LAeq</td>
<td>Equivalent noise level; the average acoustic pressure at the level of measurement</td>
</tr>
<tr>
<td>LCpeak</td>
<td>Peak sound pressure level</td>
</tr>
<tr>
<td>LPG</td>
<td>Liquefied Petroleum Gas</td>
</tr>
<tr>
<td>MMSCMD</td>
<td>Million Metric Standard Cubic Meters per Day</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-governmental Organization</td>
</tr>
<tr>
<td>OP</td>
<td>Operational Policy</td>
</tr>
<tr>
<td>OSH</td>
<td>Occupational Safety and Health</td>
</tr>
<tr>
<td>OHSAS</td>
<td>Occupational Health and Safety Management Systems</td>
</tr>
<tr>
<td>PM</td>
<td>Particulate Matter</td>
</tr>
<tr>
<td>PPE</td>
<td>Personal Protective Equipment</td>
</tr>
<tr>
<td>QRA</td>
<td>Quantitative Risk Assessment</td>
</tr>
<tr>
<td>RAP</td>
<td>Resettlement Action Plan</td>
</tr>
<tr>
<td>R.O.W</td>
<td>Right of Way</td>
</tr>
<tr>
<td>RPF</td>
<td>Resettlement Policy Framework</td>
</tr>
<tr>
<td>SCADA</td>
<td>Supervisory Control and Data Acquisition System</td>
</tr>
<tr>
<td>TSP</td>
<td>Total Suspended Particles</td>
</tr>
<tr>
<td>UNESCO</td>
<td>United Nations Educational, Scientific and Cultural Organization</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td>WB</td>
<td>World Bank</td>
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</tbody>
</table>
1 Introduction

1.1 Background

The current Egyptian strategy aims to increase the amount of electricity generation in power plants to meet the increasing energy demand in the residential and industrial sector. Most of the power plants operate using fossil fuels, and it is the country’s role to determine the type and source of fuel to be used.

Compared to other fossil fuel types, Natural Gas is considered a cleaner fossil fuel. Additionally, after the new successful gas explorations in the Mediterranean, Egypt is expecting the abundance of natural gas to be used for the different sectors including power generation. Therefore, Natural Gas was selected as the main fuel source for most of the power plants throughout the country.

The main entity responsible for the management of the natural gas in Egypt is the Ministry of Petroleum. The Ministry’s responsibility starts with the excavation projects for new fields and continues with the discovery, processing, transportation and delivery of gas to the different users (residential, industrial and power production sectors) with the aim of satisfying the local requirements of natural gas. The Egyptian Natural Gas Company (GASCO) was established in March 1997 with its main mission is natural gas transmission & Distribution according to the plan of the Ministry of Petroleum.

One of the projects implemented to support the generation of electricity in Egypt is the EG-Giza North Power Project, which is an existing project financed by the World Bank. The aim of the project is to contribute towards improving the security and efficiency of electricity supply to the different users by adding new generation capacity based on the most efficient thermal power generation capacity. To achieve this objective, the project has three main components:

- **Component 1**: The Power Plant Component, which is the construction of 2250 MW Combined Cycle Gas Turbine power plant;
- **Component 2**: The Construction of transmission lines to connect the power plant to the national grid
- **Component 3**: The construction of gas pipeline to strengthen the gas supply network to ensure gas supply to the power plant.

After the completion of the procurement of all the packages financed by the Bank, there were financial savings available as part of the project to be utilized by the Government of Egypt.

The World Bank received formal request from the Government of Egypt to utilize the savings from the Giza North Power Plant project to procure pipelines required for
upgrading the Natural Gas pipeline network in order to enable the connection to new and existing power plants. The proposed pipelines will also be implemented by GASCO and are composed of 9 pipelines, namely:

1. New Capital - Dahshour gas pipeline (70 km)
2. Dahshour – El Wasta gas pipeline (65 km)
3. El Wasta – BeniSuef gas pipeline (65 km) + gas decompression station (in BeniSuef Power Station)
4. Sixth of October Power Station (400 meters) + gas decompression station (in 6th of October power station)
5. El Gamel – Damietta gas pipeline (50 km)
6. El Suez Power Station (3 km) + gas decomposition station (in Suez Thermal Power Station)
7. Soumid import gas pipeline (4 km)
8. El Mahmoudiya Power Station (27 km + 17 km + 7 km) + gas decomposition station (in Mahmoudiya Power Station)
9. Damanhour Power Station (2.5 km) + gas decompression station (in Damanhour Power Station)

GASCO has prepared an updated ESIA for the gas pipeline which addressed the general impacts which are expected from the construction and operation of all the gas pipelines. The updated ESIA required that a site specific ESIA including a site specific ESMP should be prepared to provide detailed assessment, mitigation measures and monitoring activities along the subject route. The updated ESIA was disclosed in Egypt and internationally on the World Bank infoshop on February 2016. This ESIA is studying the environmental and social impacts of the 6th of October gas pipeline.

1.2 Project Overview

The focus of this study is the 6th of October pipeline, which is one of the 9 pipelines proposed to be implemented by GASCO. The aim of this pipeline is to expand the network and support the connection to 6th of October power plant. The planned path will mainly extend southwest parallel to Abu Rawash road from its western side until it reaches the pressure reduction station (PRS) inside 6th of October power station, therefore, the pipeline may potentially cause disruptions to sites of general cultural or ecological importance along the path.

The construction and laying down of the pipeline is usually done through digging trenches, except in areas of intersections with major waterways and roads, where the Horizontal Directional Drilling (HDD) technology will be mostly used. The project will also include expansion of an existing valve room and the pressure reduction station.

EcoConServ has been awarded the consultancy service for the preparation of an Environmental and Social Impact Assessment (ESIA) including a Resettlement Action
Plan (RAP) for the project. The ESIA examines the potential environmental and social impacts expected from the proposed project activities on the surrounding areas, and the proposed mitigation and monitoring measures to ensure the elimination or reduction of any possible adverse effects.

1.3 Study Approach and Methodology

1.3.1 Approach to the Study
The ESIA is prepared in accordance with the requirements of the Egyptian Environmental Affairs Agency (EEAA) for the Environmental Impact Assessment studies for the oil and gas sector projects, and the relevant World Bank (WB) Environmental and Social Safeguard operational policies and the Environmental Health and Safety guidelines.

1.3.2 Study Methodology
The study preparation is done according the following methodology:

- Obtaining the information and documents available regarding the project and familiarization with the project objectives.
- Conduct site visits to the project site, to collect the baseline data regarding the current environmental and social situation.
- Holding a Scoping Session (first public consultation) to engage the community and different stakeholders in the process of the identification of the environmental and social aspects that should be taken into consideration during the study preparation.
- Reviewing the relevant national and international legislation and regulations relevant to the scope of the project.
- Assess the potential environmental and social impacts associated with proposed project activities.
- Develop a screening criteria for the characterization of the potential impacts and identifying the most important environmental and social impacts.
- Analyzing the project alternatives with the potential of minimizing the environmental health and safety risks.
- Proposing mitigation measures for the expected environmental and social impacts of the project.
- Preparing an environmental and social management plan for the mitigation of the potential negative impacts and monitoring the compliance with the relevant environmental laws.
• Holding the Second and final public consultation session to present the findings of the study to the community and stakeholders, and assess their perception of the project and any concerns or issues raised during the session.
• Production of comprehensive ESIA

1.3.3 Data Collection Methodology

1.3.3.1 Data concerning the path and surrounding areas
The data required for the report preparation were gathered through meetings WITH GASCO detailing the route path and crossings, in addition to the engineering details of the pipeline lines, construction and operation activities, and governmental approvals. Other project-specific data were gathered from the site visit conducted to inspect the land use in the areas surrounding the pipeline route. The site visit was conducted in a way to cover as much area as possible along the pipeline path designed by GASCO, through moving on the roads adjacent to the path whenever possible.

A preliminary desk review and study of the maps with the designed pipeline path was carried out to identify the potential sensitive receptors around the project site, and during the visit, the sensitive receptors were confirmed and the baseline measurements (Air quality and noise) were conducted. Also, during the site visits, the study team had several stops to photograph areas of importance around the proposed pipeline locations and identify the different flora and fauna species in the areas which will potentially be affected by the project implantation.

Data concerning the meteorological conditions, soil topography and geology as well as surface water availability and quality were collected through desk review of recent studies conducted in the area of the path.

1.3.3.2 Social Project-related Data
EcoConServ has adopted a multistage analysis strategy, several data collection methods and tools were applied using the Participatory Rapid Appraisal approach. This approach ensures that local community groups participated to the study. Data was collected in coordination with relevant stakeholders including local administration units (district and village levels) and the local NGO’s.

The consultant has also reviewed relevant secondary data sources such as: studies, reports and previous literature. The research team has conducted several field visits to assess the baseline conditions.

1.3.4 Stakeholders’ Consultations
Stakeholder’s analysis is one of the tools that helped the consultant identify relevant groups of stakeholders and their interest in the project as which may facilitate different project activities. Stakeholder’s analysis is an important tool at the initial stages of the project which might contribute to define and mitigate several negative impacts at an early stage. Stakeholder’s can help enhance the social benefits related to the project at the local community level.
## Table 1-1 - Stakeholder’s Analysis of the project

<table>
<thead>
<tr>
<th>Stakeholders group</th>
<th>Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>GASCO</td>
<td>Is the owner of the project, the main government authority concerned with supervising the project activities and implementation of the project.</td>
</tr>
<tr>
<td>EEAA</td>
<td>Is the authority responsible for approving the ESIA study as part of the implementation requirements.</td>
</tr>
<tr>
<td>EEAA regional office in North Upper Egypt region</td>
<td>Environment department is responsible for monitoring the implementation of ESMP.</td>
</tr>
<tr>
<td>Local Governmental Units at main and satellite villages</td>
<td>Are responsible for providing and financing infrastructure services at local areas. They are also able to coordinate among different development projects and initiatives.</td>
</tr>
<tr>
<td>Beneficiaries (6 October Power Station)</td>
<td>Are the main beneficiaries from the project, may be subject to some positive/negative impacts. They play a significant role in project success and sustainability.</td>
</tr>
</tbody>
</table>
2 Project Description

2.1 Project Background
The proposed project is as an integral part of the country's energy strategy which calls for greater use of natural gas. This initiative will contribute to achieving the government plan for extending natural gas usage to help meet the increasing demand in the power sector. This project will have a significant role in delivering the natural gas to 6th of October power station.

2.2 Project Components

2.2.1 Pipeline Route
The route starts from an existing room which is located originally in Abu Rawash station on Tanash / Dahshur 20” gas pipeline, then the pipeline will extend southwest parallel to Abu Rawash road from its western side until it reaches the pressure reduction station (PRS) inside 6th of October power station, with a total length of 400 m. The figure below shows the pipeline location and route. There are no crossings along the whole route and the pipeline will be located underground. The technical details of the pipeline, valve room and pressure reduction station will be presented in the following sub-sections.

Figure 2-1 - 6th of October pipeline location and route
2.2.2 Sensitive Receptors
The pipeline moves south along with Abu Rawash road. The line extends 400 m parallel to Abu Rawash power station to reach finally the valve room.

![Valve room at Abu Rawash Power Station](image1)

Figure 2-2 - Valve room at Abu Rawash Power Station

![The route of the pipeline along Abu Rawash road](image2)

Figure 2-3- The route of the pipeline along Abu Rawash road

The main sensitive receptor is the Power plant, the area located along the external wall will be impacted during the construction.
2.2.3 Pipeline Specifications

- Length: 0.4 km
- Diameter: 20”
- Pipe Thickness: Class4: “0.562
- Material: API 5L X 52
- Maximum operating pressure: 70 bar
- Minimum operating pressure: 25 bar
- Pipeline capacity: 4 MMSCMD
2.2.4 Pipeline Design Considerations

The pipeline shall be designed, constructed and tested in general accordance with ASME B31.8 along with the other relevant codes and standards adopted by GASCO in its designs in addition to any other additional local regulations. Thus, it will be free from significant defects. The following standards will be followed:

- The pipeline should be protected against rust and corrosion.
- The pipeline should be protected against external trespass.
- The pipeline should not be adversely influenced by ground movement, as a result of natural or human activities.
- Modification, maintenance and repair of the pipeline should be carried out in such a way that doesn’t negatively affect its safety measures.

In addition, the following codes and standards will be followed for the design of the different pipeline components

- API 5L for line pipes
- API 6D for valves
- ANSI B 16.9 and MSS SP 75 for fittings
- ANSI B 16.5 and MSS SP 44 for flanges
- ASME B 31.8 and GASCO local regulations for construction and pipeline design.

Moreover, the pipeline design takes into consideration the location class of the pipelines according to the population density along the pipeline route will be shown later in this chapter. The location class is also used to determine the patrolling activity to be conducted on the site.

2.2.5 Valve Room

Existing valve rooms are constructed so as to control the flow of the natural gas through the pipeline. Such control can be applied by changing the percentage opening of the valves, or by changing the path of the natural gas by operating the bypass valves. The main technical data of the valve rooms are:

- Number of Valve Rooms: 2
  - Room 1: Expansions for the existing room
  - Room 2: Inside 6th of October power station
- Operation conditions: temperature varies between 30°C-38°C

2.2.6 Pressure Reduction Station

The pressure reduction station at the 6th of October power station aims to reduce the pressure of natural gas to the operational pressure of the power station. The sub-
components and detailed description of the pressure reduction station are presented in Annex 2

2.3 Activities of Construction Phase
Construction will be carried out by qualified and approved contractors under the supervisions and monitoring of GASCO. The work will broadly be split into the following phases:

- Right of Way activities.
- Pipe transportation and storage.
- Trenching.
- Horizontal Directional Drilling (HDD) or boring for the road crossings
- Welding and inspection.
- Coating and inspection
- Wrapping of joints.
- Ditching.
- Installation of valves.
- Tie-ins
- Laying fiber-optic cables
- Backfilling.
- Pigging.
- Hydrostatic test.
- Dewatering.
- Purging & commissioning.
- Manufacturing and fittings for valves rooms (including civil, mechanical, and electric components).

The following table shows the types of equipment to be used in the construction phase. The exact number of equipment used will be specified by the contractor during the construction phase.

Table 2-1 - List of equipment that shall be used during construction

<table>
<thead>
<tr>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Double Cabin Car</td>
</tr>
<tr>
<td>Double Cabin Car 4*4</td>
</tr>
<tr>
<td>Pick Up</td>
</tr>
<tr>
<td>Bus (26 Persons)</td>
</tr>
<tr>
<td>Puller</td>
</tr>
</tbody>
</table>
2.3.1 Right of Way Activities
GASCO will manage its access for the Right of Way (R.O.W) through governmental permits from the relevant ministries/organizations. Annex 3 presents a copy of some of the local permits obtained so far. The contractor will then implement the R.O.W activities to clear any obstacles that may interrupt the excavation activities. The contractor will be keen to avoid unnecessary damage to crops or neighbor buildings during R.O.W, and he will be responsible for compensating any damages. The contractor shall also use warning signs in the work area to protect persons, automotive vehicles…etc. No impacts are anticipated after the pipeline is constructed and is under operation. Although some restrictions are normally applied on the land uses of the RoW (2*2 m in urban areas and 6*2 meters in rural areas from the center of the pipeline).

2.3.2 Ditching
Before any excavation activities, the contractor shall coordinate with the different authorities to determine the existing infrastructure in the project’s area (e.g. water lines, sewage lines, electrical cables and telecommunication lines) so as to avoid any undue

<table>
<thead>
<tr>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generator 200-250 K.V</td>
</tr>
<tr>
<td>Crane 50 Ton.</td>
</tr>
<tr>
<td>Side Boom D8</td>
</tr>
<tr>
<td>Pipe welder</td>
</tr>
<tr>
<td>Pipe Carrier</td>
</tr>
<tr>
<td>Welding Machine</td>
</tr>
<tr>
<td>Low Bed</td>
</tr>
<tr>
<td>Water Tank Car</td>
</tr>
<tr>
<td>Solar Tank Car</td>
</tr>
<tr>
<td>Agriculture Excavator</td>
</tr>
<tr>
<td>Truck</td>
</tr>
<tr>
<td>Excavator</td>
</tr>
<tr>
<td>Loader</td>
</tr>
<tr>
<td>Bulldozer D8</td>
</tr>
<tr>
<td>Trailer</td>
</tr>
<tr>
<td>Compressor</td>
</tr>
<tr>
<td>Sand Plaster</td>
</tr>
<tr>
<td>Cement Mixer</td>
</tr>
<tr>
<td>Boom Excavator</td>
</tr>
<tr>
<td>Ambulance</td>
</tr>
<tr>
<td>Equipment carrier</td>
</tr>
</tbody>
</table>
damage. In case of lacking sufficient information on the available infrastructure, the contractor will carefully excavate a trial pit.

In case of the asphalt roads, an excavator will be used to remove the asphalt layers. The contractor shall excavate the trench in which the pipeline is to be laid with the following dimensions with a possibility of having 10% excess where required by works in some areas:

- **Depth to the pipe top elevation below the general ground level**
  - 1 m for all land types other than rocky lands
  - 0.7 m for rocky lands.

- **Width of trench**
  - Pipe outside diameter “with coating” + 0.4 m

- **Angle of trench**
  - Rocky area - vertically cut
  - Compacted soil - 40° to vertical
  - Running soil - 70° to vertical

The following figure illustrates how to dig trenches for various types of soils. The ditch bottom shall be uniformly and carefully graded and be free from coarse rocks solid objects which could negatively affect the pipeline coating. Due to its criticality, quality control checks will be applied from GASCO and the contractor for this issue.
Figure 2-6 - Ditching in various types of soils
At locations with irregular ground elevations, additional excavation may be applied to avoid undue bending of the pipe. In addition, and in case of having crossing with other underground infrastructure lines/cables, the trench shall be deepened so that the pipeline be installed below or above the existing lines/cables in accordance with the following figures.
Figure 2-7 - Excavation required in case of having other infrastructure line/cable above the proposed NG pipeline
Figure 2-8 - Excavation required in case of having other infrastructure line/cable below the proposed NG pipeline
2.3.3 Pipe Laying and Trench Backfilling

After ditching, the pipes can be laid in the trench. The pipes “originally coated with polyethylene” are generally stored and stacked in a devoted area in a way that ensures their protection from any effects that may damage the pipes or their coatings. In addition, the contractor will set quality control procedures during the transportation and handling of pipes for the same reason. The pipes are welded together, and a quality control test using X-rays will be applied to ensure the welding effectiveness. In addition, the uncoated parts of the pipes (at the end parts to be welded) are coated on site, and the coating layer is tested using a “holiday test” before starting the pipeline laying. Such tests will be implemented by the contractor and re-checked by GASCO.

As discussed above, the bottom of the trench is cleaned of any rocks or solid objects which may damage the pipeline. In addition, the trench shall be laid on a fine sieved sand layer of a minimum depth of 20 cm. Wide nonabrasive belts will be used while lowering the pipeline to the trench, and the contractor will carefully remove the belts from around the coated pipes. In case of any damage caused to the pipes’ coating during the lowering operation, the contractor will repair such damage before laying the pipe in the ditch. The pipeline lowering shall be undertaken in the presence of GASCO representatives.

The trench shall be backfilled within 48 hours after lowering the pipeline. As was the case with the layer below the pipeline, the initial backfill will be to a minimum height 20 cm. of fine sieved sand to protect the pipeline. The backfill will be then compacted by wet sand layers of 15 cm thickness, so that the total height is not less than 20 cm above the adjacent ground level.

On the other hand, and in case of the trenches being dug in roads, backfilling shall be carried out immediately after the pipeline has been laid in the same technique shown above. The main difference is that the finished backfilling level will be the same as the road level. After that, the contractor will work on restoring the road surface to its original status. In all cases, cathodic protection system will be applied to the pipeline and valves. Appropriate signage and community safety measures will be in place in addition to covering or safeguarding any open trenches that are not promptly filled.

2.3.4 Hydrostatic Testing

To ensure that the pipeline can withstand pressures high than the operating natural gas pipeline, the natural gas flow will not be started before applying the hydrostatic pressure test. The test is conducted by introducing pressurized water into the pipeline (150% of operating pressure) for 24 hours and checking whether there are any pressure losses. This will be detected by the pressure recording instrument connected to the pipeline during the test.

The water used in the test shall be clean fresh water and free from any substance which may be harmful to pipe material (including high levels of salinity). The water to be used in the hydrostatic test of this project will be sourced from water trucks. A filter of sufficient capacity shall be
accordingly installed between the water source and the suction side of the pump side of the pump. Hydrostatic testing must be followed by dewatering and gauging.

Before introducing the water, a 'bi-directional pig' is placed in the beginning of the pipeline. Then the pipeline is filled with fresh clean water, where the 'bi-directional pig' will be moving in the entering water direction, and comes out from the other side guaranteeing that there are no air pockets inside the pipeline. After raising the water’s pressure, and ensuring the test’s success, another 'bi-directional pig' is introduced to discharge the water as shown in the following section.

2.3.5 Dewatering

The 'bi-directional pig' used will be based on foam or rubber. Pigs will continue operation until there is no evidence of having water in the pipeline as determined by the tests. Such tests shall include either the calculation of the gain in weight of the pig or measuring of the dew point of the compressed air entering and exiting the pipeline.

2.3.6 Magnetic Cleaning and Geometric Pigging

To ensure that the pipeline is free of any solid materials which may cause erosion to the pipeline, pipeline cleaning should be conducted using 'pigging' technique. A series of magnetic cleaning pigs will be run until the pipeline is judged by the company to be free of magnetic debris. After that, the contractor will run a geometric pig. After a successful run by the geometric pig, the pipeline will be left with positive pressure of at least 2 bar using either dry air or dry nitrogen as determined by the company so as to discharge any metallic components still present. The resulting solid waste from the pigging operation will be disposed by applying GASCO’s specific solid waste management procedure.

2.3.7 Purging and Commissioning

Before starting the flow of Natural gas, the pipeline will be purged by flushing with dry nitrogen at ambient temperature to ensure that no operational problems arise from air or water left in the pipeline. The pressure of Nitrogen is gradually increased till it reaches the operating pressure, and then the operation starts by replacing the Nitrogen with Natural gas.

2.3.8 Pipeline Crossings

To install a natural gas pipeline beneath the ground level, this can either be done by digging a trench or using trenchless technologies. Trenchless technologies can be further classified as guided methods and non-guided methods. In this analysis, the most famous technology in each category (which are generally employed by GASCO) will be considered; namely, horizontal directional drilling (HDD) representing the guided trenchless technology, auger boring representing the non-guided trenchless technology, and the open-cut representing the trench technology.

The open cut method is usually used in small internal roads, where normal excavation takes place. It can be also applied in case of having long agricultural or desert roads where auger boring and HDD are not possible. This is a simple technique which usually takes between 1 and 2 days, and require
road narrowing or diverting. For bigger branched roads, auger boring excavation technique is usually applied. This technique requires more excavation depths (about 5-6 meters). This is a bit more complex technique compared to the open-cut technology; however, it also takes between 1 and 2 days, and may require road narrowing or diverting. On the other hand, where the pipelines cross main roads, or huge water bodies, HDD is usually applied. HDD is a trenchless methodology that use high excavation depths (about 30-40 meters) and can be used for high pipeline length. HDD provides a number of benefits compared to the other traditional technologies.

These benefits include having very little disruption to traffic as road narrowing or diverting are not required, in addition to the smaller work area requirements. However, HDD suffer from two main disadvantages which are the long time required (about 2 weeks), and the high cost compared to the conventional technologies. HDD pipeline installations have been widely used in the previous period in GASCO projects, and it is considered the fastest growing trenchless construction method today.

The following sub-sections present a technical background about the auger boring and HDD technologies.

2.3.8.1  Auger Boring
The horizontal auger boring trenchless technique involves equipment like auger boring machine, auger, and cutting head. This technique also requires the excavation of a drilling pit and a receiving pit. The process starts by lowering the auger boring machine into the drilling pit, and then the augers installed inside the casing pipe are lowered into the pit and connected to the auger boring machine. The boring operation then starts by rotating the augers and the cutting head, and pushing the casing pipe gradually forward. This process continues till the casing pipe emerges from the receiving pit side. The boring process results in cuttings (spoil) which is carried through the augers and extracted from the entry side of the boring machine.

The process is mainly unguided, and accordingly operator skill is critical. The degree of controlling the horizontal alignment is usually low. Enough working space is required both in the drilling and receiving pits for the equipment and the crew movement. The technique is suitable for wide range of solids; however, non-cohesive soils and boulders cause some difficulties.
2.3.8.2 **Horizontal Directional Drilling**

As shown in Figure 2-10, Figure 2-11, and Figure 2-12, the HDD technique can be classified to three stages as follows:

**Stage 1: Pilot hole drilling**

**Stage 2: Pre-Reaming**

**Stage 3: Pipeline Pullback**

Before starting the drilling activities, a topographic survey is conducted to the proposed excavation site. This survey aims to determine the soil conditions at the different depths, and accordingly determine a drill path including the entry and exit points. After that, the first stage starts by drilling a pilot hole through the studied drill path centerline. The drilling machine usually sets on the surface, and the drill string enters the ground at an angle between 5 and 20 degrees. The bore path is usually adjusted to be of gradual curvature to match with the allowable bend radius of the pipeline and minimize friction. The bore path is monitored by devices mounted to the drill string. Signals are directed to the operators on the surface so as to direct the drill path accordingly. Usually, a drilling slurry is pumped in the bore path so as to lubricate, clean and cool the cutting heads, transport the cuttings to the surface, and stabilize the hole against collapse. The slurries are usually bentonite...
based, and the slurry associated with cuttings is pumped to a settling pit where the slurry is separated from the cuttings and recycled.

After the plot hole drilling step, a back-reamer attached to the end of the drill string is pulled back through the path to enlarge the hole. This step can be repeated more than once till the hole diameter becomes about 50% larger than the required pipeline diameter to minimize friction or bending of the pipeline. As the reamer goes back and forth, this is called “pre-reaming. After that, the pipeline is connected to the back-reamer and pulled back through the drill path.

![Figure 2-10 - Pilot hole drilling stage in HDD technique](image)

![Figure 2-11 - Pre-Reaming stage in HDD technique](image)
2.3.9 Construction work in the valve room
The construction of the valve room includes some structural work (reinforced concrete installation) in addition to the electromechanical components and the commissioning activities.

2.4 Activities of Operational Phase

Such kinds of projects do not include much operational activities while the natural gas flows through the pipeline. The following table presents the general natural gas composition of the national network. The main activities are the monitoring of the pipeline and the routine checking for the occurrence of gas leaks. The following sub-sections present more details about these activities.

Table 2-2 - General natural gas composition of the national network

<table>
<thead>
<tr>
<th>Component/Properties</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>0.6183</td>
<td>0.6653</td>
<td>Mole%</td>
</tr>
<tr>
<td>Methane</td>
<td>79.8207</td>
<td>88.0622</td>
<td>Mole%</td>
</tr>
<tr>
<td>Carbon Dioxide</td>
<td>5.8996</td>
<td>5.4793</td>
<td>Mole%</td>
</tr>
<tr>
<td>Ethane</td>
<td>8.5755</td>
<td>4.9468</td>
<td>Mole%</td>
</tr>
<tr>
<td>Propane</td>
<td>3.4219</td>
<td>0.6918</td>
<td>Mole%</td>
</tr>
<tr>
<td>Iso Butane</td>
<td>0.5244</td>
<td>0.0602</td>
<td>Mole%</td>
</tr>
</tbody>
</table>
2.4.1 Pipeline Patrolling
Pipeline patrolling is carried out in order to identify activities (e.g. construction activities nearby) or actions (e.g. trespass) that could damage the pipeline, and accordingly cause safety problems that may reach to explosion. Patrolling also identifies areas of concern such as land slippage etc. in the general area of the pipeline that could cause subsequent problems. Written reports showing the results of the pipeline patrolling is reported to the sector office. The pipeline class of this line is class 4. Generally, the frequency of the patrol varies for differing areas according to the location class as shown in the following table. The number of buildings is usually accounted in a zone of 200 meters wide on either side of the pipeline route, and in section of 1 km lengthwise. As the location class increases, the patrolling frequency increases as well.

<table>
<thead>
<tr>
<th>Component/Properties</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-Butane</td>
<td>0.7855</td>
<td>0.0758</td>
<td>Mole%</td>
</tr>
<tr>
<td>Neo Pentane</td>
<td>0</td>
<td>0</td>
<td>Mole%</td>
</tr>
<tr>
<td>Iso Pentane</td>
<td>0.144</td>
<td>0.0086</td>
<td>Mole%</td>
</tr>
<tr>
<td>N-Pentane</td>
<td>0.1138</td>
<td>0.0061</td>
<td>Mole%</td>
</tr>
<tr>
<td>Hexanes and Heavier</td>
<td>0.0963</td>
<td>0.0039</td>
<td>Mole%</td>
</tr>
<tr>
<td>Gross Heating Value</td>
<td>1101.6298</td>
<td>999.5827</td>
<td>Btu/ft³</td>
</tr>
</tbody>
</table>

At 60 F and 1 atm

<table>
<thead>
<tr>
<th>Location Class</th>
<th>Number of buildings intended for Human Occupancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location Class 1</td>
<td>10 or fewer</td>
</tr>
<tr>
<td>Location Class 2</td>
<td>More than 10 but fewer than 46</td>
</tr>
<tr>
<td>Location Class 3</td>
<td>More than 46</td>
</tr>
<tr>
<td>Location Class 4</td>
<td>More than 46 and including multistorey buildings and where there may be many other utilities</td>
</tr>
</tbody>
</table>
2.4.2 Leakage Survey

Leakage Survey is conducted to protect the population against the effects of escaping natural gas and to early detect any damage to the pipeline or the components of the valve room. The Cathodic protection system is also inspected weekly to ensure its effectiveness. Written reports showing the results of the leakage survey are reported to the sector office, and in case of detecting any leakage, the maintenance department quickly perform the required procedures to fix the leakage source. The staff undertaking patrolling and leakage surveys must be fully trained before carrying out such duties.

2.4.3 SCADA (Supervisory Control and Data Acquisition System)

GASCO company is working with SCADA system, which is a highly sophisticated integrated system used to control the national natural gas pipeline network. The SCADA system performs remote controlling of the valve rooms to adjust the operating pressure, and if necessary change the flow of natural gas by bypassing the main route. The SCADA system can also detect natural gas leakage if a pressure drop was observed in certain pipeline. The SCADA system is connected with the fiber optics system installed in the pipelines.

2.5 Resources Consumption

2.5.1 During Construction Phase

i) Water

Water is mainly used during the construction phase in the hydrostatic testing in addition to the domestic uses by the workers and engineers. The water for construction and hydrostatic testing will be sourced from trucks. Drinking water will be bottled. The expected amount of water to be used during the construction phase of this project is:

- Domestic uses by the workers and engineers: 5 m$^3$/day
- Construction activities: 250 m$^3$
- Hydrostatic testing: 2000 m$^3$

ii) Fuel

Diesel fuel will be mainly used for diesel generators that supplies electricity to the difficult construction activities including welding. In addition, diesel will be the fuel used by the trucks and excavators. The expected amount of diesel fuel to be used in the construction phase of this project is 30,000 liters (approximately 100 liters/day). The fuel will be delivered to the construction site via trucks when needed.

2.5.2 During Operation Phase

i) Electricity
The electricity consumption in the operation phase is expected to be sourced from the valve room. The electricity consumption during the operation phase is expected to be minimal which will be mainly consumed at the control room.

2.6 Waste Generation

2.6.1 During Construction Phase
Solid waste during construction phase will comprise domestic waste, construction waste and some hazardous wastes from the project activities. The waste is expected to include the following waste streams:

Hazardous wastes:
- Used oil waste
- Asphalt
- Miscellaneous containers, paint cans, solvent containers, aerosol cans, adhesive, and lubricant containers

Non-hazardous wastes:
- Soil (excavated or surplus)
- Packaging materials
- Damaged products (pipes, etc.);
- Packing timber;
- Paving materials;
- Electrical cable off-cuts;
- Concrete;

2.6.2 During Operation Phase
The pipeline operation is not expected to dispose any type of solid waste during the operation phase.

2.7 The Expected Timeline of the Project Execution

- Engineering Work: 15 months
- Procurement work: 15 months
- Construction work: 10 months

Duration expected for the whole project is 19 months. For activity durations and overlapping refer to annex4
3 Legislative and Regulatory Framework

3.1 Preface
The World Bank has defined 10 environmental and social safeguard policies that must be considered to its financed projects. Applicability of such policies to this project is overviewed and discussed in subsequent sections.

Egyptian legislation provides environmental compliance procedures and emission limits which are at least comparable with WB/international requirements, if not more stringent. GASCO is bound by internal policies which obligate them to comply with national legal requirements. In the case that national requirements are non-existent for specific issues or pollutants, WB requirements will be adopted.

3.2 National Administrative and Legal Framework
The following is a brief description of the different national authorities and institutions of relevance with respect environmental assessments including Environmental and Social Impact Assessments (ESIAs).

The main legal instrument dealing with environmental issues in Egypt is Law 4/1994, amended by Law 9/2009 and law 5/2015 and its Executive Regulations amended by decree 1095/2011, then 710/2012 and 964/2015, commonly known as the Law on Protection of the Environment. The law deals mostly with the protection of the environment against pollution. Prime Ministerial Decree 631 of 1982 established the EEAA as the competent body for environmental matters in Egypt. Law 4 also stipulates the role of the EEAA as the main regulatory agency for environmental matters.

According to Article 1 of Law 4, the legal entity responsible for a given project is required to carry out an assessment of the project's potential impacts on the natural and socio-cultural environment before implementing that project. The findings of the assessment are submitted to the EEAA for review and approval before other relevant governmental authorities can issue their permits for implementing the project.

An ESIA is required to be viewed as an integrated part of the project planning process, according to EEAA requirements. The ESIA will help to ensure that environmental concerns are taken into account along with technical and economic considerations.

The Egyptian Environmental Affairs Agency (EEAA) is an authorized state body regulating environmental management issues. Egyptian laws identify three main roles of the EEAA:

- It has a regulatory and coordinating role in most activities, as well as an executive role restricted to the management of natural protectorates and pilot projects.
- The agency is responsible for formulating the environmental management (EM) policy, setting the required action plans to protect the environment. Following-up their execution in coordination with Competent Administrative Authorities (CAAs).
In specific to this project, EEAA is responsible for review and approve of the environmental impact assessment studies.

EMU (Environmental Management Unit at Governorate and District level) is responsible for the environmental performance of all projects/facilities within the governorates premises. The governorate has established environmental management units at both the governorate and city/district level. The EMU is responsible for the protection of the environment within the governorate boundaries and are mandated to undertake both environmental planning and operation-oriented activities. The environmental management unit is mandated to:

- Follow-up on the environmental performance of the projects within the governorate during both construction and operation phases to ensure that the project abides by laws and regulations as well as mitigation measures included in its ESIA approval.
- Investigate any environmental complaint filed against projects within the governorate.
- The EMU are affiliated administratively to the governorate, yet are technically affiliated to EEAA.
- The governorate has a solid waste management unit at the governorate and district level. The units are responsible for the supervision of solid waste management contracts.

The CAAs are the entities responsible for issuing licenses for projects construction and operation. The ESIA is considered one of the requirements of licensing. The CAAs are thus responsible for receiving the ESIA forms of studies, check the information included in the documents concerning the location, suitability of the location to the project activity and ensure that the activity does not contradict with the surrounding activities and that the location does not contradict with the ministerial decrees related to the activity. The CAA forwards the documents to EEAA for review. They are the main interface with the project proponents in the ESIA system. The CAA is mandated to:

- Provide technical assistance to Project Proponents
- Ensure the approval of the Project Site
- Receive ESIA Documents and forward it to EEAA
- Follow-up the implementation of the ESIA requirements during post construction field investigation (before the operation license)

After submission of an ESIA for review, the EEAA may request revisions in the ESIA report within 30 days, including additional mitigation measures, before issuing the approval of the report. GASCO will have the right to issue an appeal within 30 days from its receipt of the EEAA’s decision. It should be noted that once the ESIA has been approved, the ESMP as will be presented in the report, will be considered an integral part of the project; and the GASCO will be legally responsible for the implementation of that plan, depending on their involvement in construction or operation. It is therefore worth mentioning that the GASCO must ensure that all mitigation measures and
environmental requirements described in the ESMP have been clearly referred to in the tender documents for the construction works, the construction contracts, and have been respected. GASCO will follow-up on the construction contractor to ensure that the ESMP is adequately implemented in the construction phase.

According to the guidelines of the ESIA preparation issued by the EEAA, projects are classified into three categories according to the severity of possible environmental impacts and location of the establishment and its proximity to residential settlements: Category (A): projects with minimum environmental impacts, Category (B): projects with potential adverse environmental impacts yet less than category C, and Category (C): Projects which have highly adverse impacts. These are required to prepare a full EIA study.

Based on these categories, the proposed Natural Gas lines project is classified as “C” under the Egyptian requirements. Class C projects require full ESIAs including public consultation sessions (2 sessions were held: a scoping session and a public consultation session).

3.3 Applicable Environmental and Social Legislations in Egypt

The Egyptian environmental law covers many aspects, such as air quality, water quality, noise, solid waste management and occupational health and safety. Each of these aspects will be discussed in details and the allowable limits for the different aspects included according to applicability to the project.

Mitigation measures are mentioned in Chapter 7 of the study to ensure compliance with these legislations.


3.3.1.1 Regulations for the Protection of Air Environment from Pollution

According to the provisions of Articles 34 through 40, 42, 43, and 47 bis in Law 4/1994 amended by Law 9/2009, and Article 42, annex 5,6 in the Executive Regulations, the project developer must ensure the following:

1. The site of the project must be selected properly to suit the project activity in order to ensure that the total pollution emitted by the proposed project during the construction and operation phases will not exceed the maximum permissible limits for the pollutants in the ambient air as listed below:
Table 3-1 - Maximum Limits of Outdoor Air Pollutants (Annex 5 of the Executive Regulations amended in 2012)

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Location Area</th>
<th>Maximum Limit [µg/m³]</th>
<th>1hour</th>
<th>8hours</th>
<th>24hours</th>
<th>1Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulphur Dioxide</td>
<td>Urban Industrial</td>
<td>300</td>
<td>350</td>
<td></td>
<td>125</td>
<td>150</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>Urban Industrial</td>
<td>30 mg/m³</td>
<td>10 mg/m³</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrogen Dioxide</td>
<td>Urban Industrial</td>
<td>300</td>
<td>300</td>
<td></td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Ozone</td>
<td>Urban Industrial</td>
<td>180</td>
<td>180</td>
<td>120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Suspended Particles (TSP)</td>
<td>Urban Industrial</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>230</td>
<td>230</td>
</tr>
<tr>
<td>Particulate Matter less than 10 µm (PM₁₀)</td>
<td>Urban Industrial</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Particulate Matter less than 25 µm (PM₂.₅)</td>
<td>Urban Industrial</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Suspended Particles Measured as Black Smokes</td>
<td>Urban Industrial</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Lead</td>
<td>Urban Industrial</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH₃)</td>
<td>Urban Industrial</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>120</td>
<td>120</td>
</tr>
</tbody>
</table>

Other limits include the allowable limits for pollutants emissions in air from the different sources which are detailed in annex 6 of the Executive regulations amended by decree 1095/2011, 710/2012 and 964/2015. The limits relevant to the current project scope are the pollution limit from asphalt mixing units which will be utilized to return the roads to their original state after the project completion, and the limits of emissions from vehicles which are shown in the following tables.

It should be noted that as per the Annex 6 of the executive regulations; the actual pollutant concentration from the stack is calculated at standard conditions using the following equation;
Concentration at Standard Conditions

\[
\text{Measured Concentration} \times \frac{(21 - \text{Reference Oxygen } \%) \times \frac{1}{(21 - \text{measured Oxygen }\%) \times \text{measured atmospheric pressure}}}{\frac{(273 + \text{measured Tempertature})}{273}}
\]

Table 3-2 - Allowable Emission levels from Asphalt mixing units (Table 12 of Annex 6 of the Executive Regulations amended in 2012)

<table>
<thead>
<tr>
<th>Total Suspended Solids (TSP)</th>
<th>Carbon Monoxide (CO)</th>
<th>Total Volatile Organic Compounds (VOCs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>500</td>
<td>50</td>
</tr>
</tbody>
</table>

- Reference conditions (at 13% \(O_2\), temperature of 273 Kelvin, and 1 atm pressure).
- The asphalt mixing unit should be placed at a minimum distance of 500 m from the nearest residential area, taking into consideration the prevailing wind direction.

Table 3-3 - Maximum allowable emissions from vehicles that operate using gasoline fuel (Table 23 of Annex 6 of the Executive Regulations amended in 2012)

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>Before the year 2003</th>
<th>From 2003 to 2009</th>
<th>Year 2010 and later</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrocarbons</td>
<td>HC (ppm)</td>
<td>CO%</td>
<td>HC (ppm)</td>
</tr>
<tr>
<td>Maximum allowable Limit</td>
<td>600</td>
<td>4</td>
<td>300</td>
</tr>
</tbody>
</table>

Measurements should be done at the idle speed from 600 to 900 rpm.

Table 3-4 - Maximum allowable emissions from vehicles that operate using diesel fuel (Table 24 of Annex 6 of the Executive Regulations amended in 2012)

<table>
<thead>
<tr>
<th>Manufacturing Year (model)</th>
<th>Before the year 2003</th>
<th>From 2003 and later</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoke density factor K (m(^{-1}))</td>
<td>2.8</td>
<td>2.65</td>
</tr>
</tbody>
</table>

Measurements are done in accordance with the ISO-11614 international standard.

3.3.1.2 Noise

Article 42 of the environmental law states that during the construction and operation phases of the project, the resulting noise levels must not exceed the sound intensity levels given by Table 3 of Annex 7 of the Executive Regulations when carrying out production, service or other activities, particularly when operating machinery and equipment or using sirens and loudspeakers. The table lists the maximum permissible noise level limits according to area type as per the following designation:

- Sensitive areas to noise exposure
- Residential suburbs with low traffic flow
- Commercial and administrative areas in city center
- Residential areas with some workshops, administrative activities, or recreational and entertainment activities overlooking public roads less than 12 meters,
- Areas overlooking public roads more than or equal 12 meters, or industrial areas with light industries
- Industrial Zone with heavy industries

Table 3-5 - Maximum permissible noise level limits for the project area
(from Annex 7 of the Executive Regulations, Table 3)

<table>
<thead>
<tr>
<th>AREA TYPE</th>
<th>MAXIMUM PERMISSIBLE EQUIVALENT NOISE LEVEL [dB(A&lt;sub&gt;eq&lt;/sub&gt;)]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day</td>
</tr>
<tr>
<td>Sensitive areas to noise exposure</td>
<td>50</td>
</tr>
<tr>
<td>Residential suburbs with low traffic flow</td>
<td>55</td>
</tr>
<tr>
<td>Commercial and administrative areas in city center</td>
<td>60</td>
</tr>
<tr>
<td>Residential areas with some workshops, administrative activities, or recreational and entertainment activities overlooking public roads less than 12 meters</td>
<td>65</td>
</tr>
<tr>
<td>Areas overlooking public roads more than or equal 12 meters, or industrial areas with light industries</td>
<td>70</td>
</tr>
<tr>
<td>Industrial Zone with heavy industries</td>
<td>70</td>
</tr>
</tbody>
</table>

3.3.2 Waste Management Regulations

The collection, transportation and safe disposal of solid wastes from houses, public places, commercial and industrial establishments is regulated through the public cleanliness law 38/1967 amended by law 31/1976 and its executive regulations issued by Minister of Housing Decree Number 134 of 1968, as well as the environmental law 14/1994 and its executive regulations.
3.3.2.1 Public Cleanliness Law Number 38/1967
Law 38 for the year 1967 amended by law 31/1976 and its Executive Regulations issued by decree 134/1968 prohibit the dumping of solid wastes in any location other than those designated by the municipal authorities. This includes solid waste treatment and disposal, in addition to the temporary storage in undesignated containers. Article 1 of the Ministry of Housing and Utilities decree 134/1968 defines solid waste as any waste generated by persons, residential units, non-residential constructions such as commercial establishments, camps, animal cages, slaughterhouses, markets, public spaces, parks, and transportation methods.

The Public Cleanliness Law and its Executive Regulations requires the municipal authority responsible for public cleanliness or the contracted entity assigned by it for the collection, transportation, and disposal of solid wastes, to carry out these processes in accordance with the specifications stipulated in the Executive Regulations and any other regulations by the municipal authority.

3.3.2.2 Environmental law 4/1994
In general, the law prohibits the disposal of any solid wastes except in areas designated for this purpose through article 37, and articles 38, 39 and 41 of the executive regulations which require that during excavation, construction or demolition activities, the entity undertaking the work must take the necessary precautions to safely store and transport the resulting wastes in accordance with the set procedure.

Regarding the hazardous wastes, and in accordance with the provisions of articles 29 to 33 of law 4/1994 which is equivalent to law 9/2009 and articles 28, 31 and 33 of the executive regulations, the entity producing hazardous wastes in gaseous, liquid or solid form is committed to collect and transport the generated waste to designated disposal sites which are predetermined by the local authorities, the competent administrative authorities and the Egyptian Environmental Affairs Agency.

The hazardous waste should be collected in specific locations with clear warning signs and oral or written instructions for safety conditions that prevent the occurrence of any damage generally or to people who get exposed to it. Additionally, the workers should be trained on proper handling procedure.

The transportation vehicles used to transport hazardous waste should belong to licensed entities that manage hazardous waste and follows the guidelines included in the executive regulations.

3.3.2.3 Hazardous waste from Petroleum sector
Petroleum and Mineral Resources ministerial decree number 1352/2007 defines the hazardous waste materials generated from the petroleum industry, and prohibits handling of these hazardous waste except by entities authorized by EGPC.
3.3.3 Wastewater Management Regulations

3.3.3.1 Industrial Wastewater disposal Law 93/1962

The industrial wastewater disposal into the drainage systems is regulated by law 93/1962 and its executive regulations amended by decree 44/2000. The law prohibits the disposal of domestic, industrial and commercial wastewater, treated or untreated, in public drainage system without obtaining a prior approval.

Article 14 of the executive regulations set the parameters required regarding the quality of the wastewater discharged to the public sewage network.

**Table 3-6 - standards and specifications of wastewater discharged to public sewage system (Article 14 of the ER of Law 93/1962)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Limit in the disposed wastewater</th>
</tr>
</thead>
<tbody>
<tr>
<td>(pH)</td>
<td>6-9.5</td>
</tr>
<tr>
<td>Temperature</td>
<td>43</td>
</tr>
<tr>
<td>BOD$_5$</td>
<td>600 ppm</td>
</tr>
<tr>
<td>COD</td>
<td>1100 ppm</td>
</tr>
<tr>
<td>Total suspended solids</td>
<td>800/100l</td>
</tr>
<tr>
<td>Dissolved solids</td>
<td>10 ppm</td>
</tr>
<tr>
<td>Oil and grease</td>
<td>100 ppm</td>
</tr>
<tr>
<td>Total nitrogen</td>
<td>100 ppm</td>
</tr>
<tr>
<td>Total phosphorous</td>
<td>25 ppm</td>
</tr>
<tr>
<td>cyanide(CN)</td>
<td>0.02</td>
</tr>
<tr>
<td>phenol</td>
<td>0.05 ppm</td>
</tr>
<tr>
<td>Deposited materials (after 10 minutes)</td>
<td>8 cm$^3$/l</td>
</tr>
<tr>
<td>Deposited materials (after 30 minutes)</td>
<td>15 cm/l</td>
</tr>
<tr>
<td>Total heavy metals</td>
<td>5 mg/l</td>
</tr>
<tr>
<td>Chromium 6</td>
<td>0.5 mg/l</td>
</tr>
<tr>
<td>cadmium (Cd)</td>
<td>0.2 mg/l</td>
</tr>
<tr>
<td>lead(Pb)</td>
<td>1 mg/l</td>
</tr>
<tr>
<td>Mercury(Hg)</td>
<td>0.2 mg/l</td>
</tr>
<tr>
<td>Silver(Ag)</td>
<td>0.5 mg</td>
</tr>
<tr>
<td>Copper(Cu)</td>
<td>1.5 mg</td>
</tr>
<tr>
<td>Nickel(Ni)</td>
<td>1 mg/l</td>
</tr>
<tr>
<td>bioter</td>
<td>2 mg/l</td>
</tr>
<tr>
<td>Arsenic(As)</td>
<td>2 mg/l</td>
</tr>
<tr>
<td>Boron(B)</td>
<td>1 mg/l</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.2</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.1</td>
</tr>
</tbody>
</table>
3.3.4 EEAA ESIA guidelines related to the Public Consultation
Consultation with the community and concerned parties, where all the stakeholders are invited, should clearly provide attendees with the necessary information about the project. Paragraph 6.4.3 of EEAA EIA guidelines provides detailed information about the scope of public consultation, methodology and documentation thereof
- Paragraph 6.4.3.1 Scope of Public Consultation
- Paragraph 6.4.3.2 Methodology of Public Consultation
- Paragraph 6.4.3.3 Documentation of the Consultation Results
- Paragraph 7 Requirement and Scope of the Public Disclosure

3.3.5 Work environment and occupational health and safety
Several laws and decrees tackle occupational health and safety provisions at the workplace, in addition to Articles 43 – 45 of Law 4/1994, which address air quality, noise, heat stress, and the provision of protective measures to workers. These laws and decrees apply to the work crew that will be involved in construction activities.

Law 12/2003 on Labor and Workforce Safety and Book V on Occupational Safety and Health (OSH) and assurance of the adequacy of the working environment. The law also deals with the provision of protective equipment to workers and fire-fighting/emergency response plans. Moreover, the following laws and decrees should be considered:
- Minister of Labor Decree 55/1983.
- Minister of Industry Decree 91/1985

The environmental aspects that have to be taken in consideration for the workplace are noise, ventilation, temperature, and health and safety, which are as follows

3.3.5.1 Noise
Annex 7 of the Executive Regulations amended in 2012 stipulates the permissible limits for sound intensity and safe exposure times that must be observed by the operators for the work areas and places within the proposed project.
Table 3-7 - Permissible noise levels inside sites of productive activities
(Table 1, Annex 7 of the Executive Regulations)

<table>
<thead>
<tr>
<th>No.</th>
<th>TYPE OF PLACE AND ACTIVITY</th>
<th>MAXIMUM PERMISSIBLE EQUIVALENT NOISE LEVEL [dB(A)]</th>
<th>Exposure Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>a) Work places (workshops and industries) with up to 8 hour shifts (licensed before 2014)</td>
<td>90</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>b) Work places (workshops and industries) with up to 8 hour shifts (licensed since 2014)</td>
<td>85</td>
<td>8</td>
</tr>
</tbody>
</table>

For the first item (a, b) the exposure duration shall be decreased by half if the noise level increases by 3 dB (A) combined with using ear plugs. This is to avoid any impacts on the sense of hearing.

The instantaneous noise level shall not exceed 135 dB (A) during working period.

The noise level is measured inside working areas and closed areas in $L_{Aeq}$ according to the international guidelines (Parts 1&2) ISO 9612/ ISO 1996 or the Egyptian specifications No. 2836 part 1 & 2 and No. 5525 concerning this matter.

Equivalent noise level $L_{Aeq}$ is the average acoustic pressure at the level of measurement (A) during a specific time period, and expressed in dB.

Table 3-8 - Maximum Permissible Exposure to Heavy Hammers (Table 2, Annex 7 of Executive Regulations)

<table>
<thead>
<tr>
<th>Peak Noise Intensity Level [dB(A)] $L_{cPeak}$</th>
<th>135</th>
<th>130</th>
<th>125</th>
<th>120</th>
<th>115</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Allowable Strikes during Working Hours</td>
<td>300</td>
<td>1000</td>
<td>3000</td>
<td>10000</td>
<td>30000</td>
</tr>
</tbody>
</table>

The intermittent noise exposure depends on the noise level intensity presented in the previous table (number of strikes per shift).

The hammer strikes are considered intermittent if the duration between strikes 1 second or more. If the duration is less than 1 second, the strikes are considered continuous and the noise level shall comply with Table 1 of Annex 7 of the executive regulations.

3.3.6 Petroleum pipelines Law 4/1988

The petroleum pipelines law 4/1988 states that the owner of a property should allow the passing of pipelines transporting liquid or gaseous hydrocarbons beneath the ground surface in accordance with the procedure mentioned in the executive regulations (Decree 292/1988).
Article 2 of the law specifies that no buildings or trees, other than agricultural land trees, should be constructed or planted at a distance less than 2 m on each side of the pipeline inside urban and 6 m on each side of the pipeline outside the urban areas. If it is necessary to place the pipelines at a closer distance than what is specified in the law, it is allowed through a decision from the chairman of Egyptian General Petroleum Corporation (EGPC); taking into consideration the necessary safety precautions.

The law also specifies that if the activities done in accordance to the law will result in damage to the property, the owner has the right to a fair compensation to be decided by a committee formed by a decision from the Minister of Petroleum, and the executive regulations include the guidelines for compensation estimation.

3.3.7 Traffic Related Laws
The applicable laws regarding the traffic and work done in relation to roads is governed by Traffic law 66/1973 amended by law 121/2008. The law is concerned with traffic planning during the construction of projects. Law 140/1956 is also concerned with the utilization and blockage of public roads, and Law 84/1968 is also concerned with public roads, including Highways, main roads and regional roads.

The governing laws require that no works that could affect the traffic flow be undertaken without prior permission, and specifies that the competent administrative authority could utilize public ways for a fee. The executive regulations of law 140/1956 outlines the specifications for the management of construction and demolition debris, and in general prohibits vehicle drivers to cause any road pollution by dumping wastes, or construction wastes, or any other material.

3.3.8 Relevant international treaties to which Egypt is a signatory
Egypt has signed and ratified a number of international conventions that commit the country to conservation of environmental resources.

- International Plant Protection Convention (Rome 1951)
- African convention on the conservation of nature and natural resources (Algeria 1968)
- UNESCO Convention for the protection of the world cultural and natural heritage (Paris, 16 November 1972)
- International tropical timber (Geneva 1983)
• Convention on biological diversity (Rio de Janeiro 1992), which covers the conservation of habitats, animal and plant species, and intraspecific diversity.
• Convention for the protection of the ozone layer (Vienna 1985)
• Convention for the prevention and control of occupational hazards caused by carcinogenic substances and agents (Geneva 1974)
• Convention for the protection of workers against occupational hazards in the working environment due to air pollution, noise and vibration (Geneva 1977)
• International Labor Organization: core labor standards are to be followed during the project implementation. Egypt has been a member state of the ILO since 1936, and has ratified 64 conventions which regulate the labor standards and work conditions. In 1988, Egypt ratified the Occupational Safety and Health Convention of 1979 (No 152).
• Cultural Heritage: respecting cultural heritage and not financing projects which threaten the integrity of sites that have a high level of protection for reasons of cultural heritage, e.g. UNESCO World Heritage sites
• Consultation, Participation and Public Disclosure: The Aarhus Regulation promotes transparency of environmental information and the inclusion of stakeholders in projects. Consultation serves to identify and manage public concern at an early stage. The regulations include provisions for the public disclosure of key project information such as the Non-Technical Summary and the ESIA.

3.4 World Bank Safeguard Policies

International funding agencies, such as the WB require that the projects they finance to be in compliance with both the country’s national standards as well as their own environmental and social policies. Therefore, in addition to the national regulations, the project aims at complying with the WB safeguard policies and guidelines. The policies help to ensure the environmental and social soundness and sustainability of investment projects. They also support integration of environmental and social aspects of projects into the decision-making process. In addition, the policies promote environmentally sustainable development by supporting the protection, conservation, maintenance, and rehabilitation of natural habitats.

The World Bank (WB) has identified 10 environmental and social safeguard policies that should be considered in its financed projects. The proposed project is classified as Category A according to the World Bank. This mandates a full Environmental and Social Impact Assessment (ESIA).

<table>
<thead>
<tr>
<th>Safeguard Policy</th>
<th>Triggered</th>
<th>Justifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Habitats (OP/BP 4.04)</td>
<td>No</td>
<td>Location and alignment of project components is mainly along (or close to) previously paved paths.</td>
</tr>
<tr>
<td>Environmental Assessment (OP/BP 4.01)</td>
<td>Yes</td>
<td>The project is classified as Category A which requires full environmental assessment.</td>
</tr>
</tbody>
</table>
Forests (OP/BP 4.36)
No Proposed project areas contain No forests.

Pest Management (OP 4.09)
No The proposed project will not involve purchasing or using Pesticides or herbicides.

Physical Cultural Resources (OP/BP 4.11)
No No proposed activities will pass through archeological sites and no cultural resources will be impacted.

Indigenous Peoples (OP/BP 4.10)
No No indigenous people are identified in Egypt.

Involuntary Resettlement (OP/BP 4.12)
No No need for involuntary resettlement. Land needed for the valve rooms has been allocated (public property), land needed during excavation is public property.

Safety of Dams (OP/BP 4.37)
No Not relevant to the proposed project

Projects on International Waterways (OP/BP 7.50)
No Not relevant to the proposed project. The pipeline will pass beneath the waterways. It will not cross any water way.

Projects in Disputed Areas (OP/BP 7.60)
No Not relevant to the proposed project

3.4.1 OP 4.01 – Environmental Assessment
According to the World Bank Operational Policy OP 4.01, the Natural Gas Connection Project is classified among Category A projects. Projects under this Category are likely to have significant adverse environmental impacts that are sensitive¹, diverse, or unprecedented. Likely environmental impacts of the project shall be analyzed and mitigation measures proposed for expected negative impacts, along with an Environmental Management and Monitoring Plan.

3.4.2 OP 4.09 Pest Management
The proposed project will not involve purchasing or using any pesticides or herbicides during the project activities including the right of way maintenance.

3.4.3 OP 4.11 – Physical Cultural Resources
Project areas do not include sites, buildings and monuments that fall under the definition of Physical Cultural Resources². Thus this policy has not been triggered.

3.4.4 OP 4.12 – Involuntary Resettlement
According to the WB’s safeguard policy on Involuntary Resettlement, physical and economic displacement resulting from WB funded developmental projects or sub-projects should be avoided or minimized as much as possible. Unavoidable displacement should involve the preparation and implementation of a Resettlement Action Plan (RAP) or a Resettlement Policy Framework (RPF), to

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¹ A potential impact is considered “sensitive” if it may be irreversible (e.g., lead to loss of a major natural habitat) or raise issues covered by OP 4.10, Indigenous People; OP 4.04, Natural Habitats; OP 4.11, Physical Cultural Resources; or OP 4.12, Involuntary Resettlement.

² Physical Cultural Resources are defined as movable or immovable objects, sites, structures, groups of structures, and natural features, and landscapes that have archeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance.
address the direct economic and social impacts resulting from the project or sub-project’s activities causing involuntary resettlement.

*It is envisaged that the project on hand will not result in any physical or economic dislocation of people.*

### 3.4.5 World Bank Environmental, Health, and Safety Guidelines

The general World Bank Environmental, Health, and Safety Guidelines in addition to the World Bank Onshore Oil and Gas Development EHS guidelines will be followed to ensure that the project complies with the Environmental Health and Safety standards and requirements of the WB during the different phases of the project.

### 3.5 Gap analysis for key Egyptian and WB environmental issues

This section outlines the key requirements of both the Egyptian Legislations and the World Bank policies and the gaps between the requirements of the two entities.

#### 3.5.1 Air Quality

<table>
<thead>
<tr>
<th>Exposure Period</th>
<th>Requirements of Egyptian Legislation</th>
<th>Requirements of World Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Outdoor Air Pollutants</strong> (in urban and industrial areas) as per Article 34 of law 4/1994 amended by law 9/2009 and Annex 5 of the Executive Regulations amended by Decree 710/2012.</td>
<td><strong>Ambient Air Quality</strong> as per OP 4.01 IFC General EHS Guidelines (Table 1.1.1[^3])</td>
</tr>
<tr>
<td><strong>Carbon monoxide (µg/m³)</strong></td>
<td>30 (urban and indus.) 10 (urban and indus.) N/A N/A N/A N/A N/A</td>
<td>1 hr 8 hr 24 hr 1 year 1 hr 8 hr 24 hr 1 year</td>
</tr>
<tr>
<td><strong>Sulphur dioxide SO₂ (µg/m³)</strong></td>
<td>300 (urban) 350 (indus.) N/A 125 (urban) 150 (indus.) 50 (urban) 60 (indus.) N/A N/A 125 (IT-1) 50 (IT-2) 20 (guideline) N/A</td>
<td>1 hr 8 hr 24 hr 1 year 1 hr 8 hr 24 hr 1 year</td>
</tr>
<tr>
<td><strong>Nitrogen Oxides NOx (µg/m³)</strong></td>
<td>300 (urban) 300 (indus.) N/A 150 (urban) 150 (indus.) 60 (urban) 80 (indus.) 200 (guideline) N/A N/A 40 (guideline)</td>
<td>1 hr 8 hr 24 hr 1 year 1 hr 8 hr 24 hr 1 year</td>
</tr>
</tbody>
</table>


[^4]: IT stands for Interim Target, which are the increment values that should be targeted by an organization during the implementation of a project leading to the recommended guideline values.
Table 3-11 - Egyptian legislations and WB standards concerning Water Quality

<table>
<thead>
<tr>
<th>Requirements of Egyptian Legislations</th>
<th>Requirements of World Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Requirements</td>
<td>Requirements</td>
</tr>
<tr>
<td>Executive Regulations</td>
<td>States the standards an</td>
</tr>
<tr>
<td>180 (urban)</td>
<td>160 (IT-1)</td>
</tr>
<tr>
<td>180 (indus.)</td>
<td>100 (IT-1)</td>
</tr>
<tr>
<td>120 (urban)</td>
<td>50 (IT-1)</td>
</tr>
<tr>
<td>120 (indus.)</td>
<td>70 (IT-1)</td>
</tr>
<tr>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

In case of any discrepancy between the requirements of Egyptian legislations and the requirements of the World Bank, the requirements of the World Bank will be applied; since it’s the funding entity. However, the Egyptian limits will be applied for the following cases, since there are no corresponding limits in the World Bank standards to these parameters:

- Carbon monoxide limits
- Sulfur dioxide limits for 1 hour, and 1 year
- Nitrogen oxide limits for 24 hours
- Total suspended particulates limits
- Ozone limits for 1 hour
issued by decree 92/2013 of Law 48/1982 (Article 49) specifications of fresh waterways quality to which industrial water can be discharged IFC General EHS Guidelines: Environmental potential to generate process wastewater, sanitary (domestic) sewage, or stormwater should incorporate the necessary precautions to avoid, minimize, and control adverse impacts to human health, safety, or the environment.

Ministerial Decree No. 44/2000 of law 93/1962 Includes the quality of industrial wastewater discharged to the sewage network. The decree also states the entity should acquire the wastewater discharge licenses from the concerned authorities during the construction and operation phase OP 4.01 IFC General EHS Guidelines: Environmental Includes in Table 1.3.1 the indicative values for treated sanitary sewage discharges

<table>
<thead>
<tr>
<th>Parameter/Pollutant</th>
<th>Effluent threshold (ER 44/2000 of law 93/1962)</th>
<th>Effluent threshold (WB requirements)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6-9.5</td>
<td>6-9</td>
</tr>
<tr>
<td>BOD (mg/l)</td>
<td>600</td>
<td>30</td>
</tr>
<tr>
<td>COD (mg/l)</td>
<td>1100</td>
<td>125</td>
</tr>
<tr>
<td>Total nitrogen (mg/l)</td>
<td>100</td>
<td>10</td>
</tr>
<tr>
<td>Total Phosphorous (mg/l)</td>
<td>25</td>
<td>2</td>
</tr>
<tr>
<td>Oil and grease (mg/l)</td>
<td>100</td>
<td>10</td>
</tr>
<tr>
<td>Total suspended solids (mg/l)</td>
<td>800</td>
<td>50</td>
</tr>
<tr>
<td>Total Coliform Bacteria (Most Probable Number/100 ml)</td>
<td>N/A</td>
<td>400</td>
</tr>
</tbody>
</table>

In case of any discrepancy between the requirements of Egyptian legislations and the requirements of the World Bank, the requirements of the World Bank will be applied.
3.5.3 Noise

Table 3-13 - Egyptian legislations and WB standards concerning Ambient Noise

<table>
<thead>
<tr>
<th>Requirements of Egyptian Legislations</th>
<th>Requirements of World Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td><strong>Law 4/1994 amended by law 9/2009 and its ERs amended by decree 1095/2011 and 710/2012</strong></td>
<td><strong>General Occupational Health and Safety Table 2.3.1</strong></td>
</tr>
<tr>
<td><strong>Law 4/1994 amended by law 9/2009 and its ERs amended by decree 1095/2011 and 710/2012</strong></td>
<td><strong>Limit of noise beyond the property boundary of the facilities.</strong></td>
</tr>
</tbody>
</table>

Table 3-14 - Limits for ambient noise as per Egyptian and WB requirements

<table>
<thead>
<tr>
<th>Area type</th>
<th>Egyptian Law Permissible noise level</th>
<th>WB Permissible noise levels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum permissible equivalent noise level [dB(A_{eq})]</td>
<td>Receptor</td>
</tr>
<tr>
<td></td>
<td>Day 7 AM – 10 PM</td>
<td>Night 10 PM – 7 AM</td>
</tr>
<tr>
<td>Sensitive areas to noise exposure</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>Residential suburbs with low traffic flow</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>Commercial and administrative areas in city center</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>Residential areas with some workshops, administrative activities, or recreational and entertainment activities overlooking public roads less than 12 meters</td>
<td>65</td>
<td>55</td>
</tr>
<tr>
<td>Areas overlooking public roads more than or equal 12 meters</td>
<td>70</td>
<td>60</td>
</tr>
<tr>
<td>Area type</td>
<td>Maximum permissible equivalent noise level [dB(A)]</td>
<td>Receptor</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>or industrial areas with light industries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial Zone with heavy industries</td>
<td>70</td>
<td></td>
</tr>
</tbody>
</table>

Table 3-15 - Limits noise exposure in Work environments as per Egyptian and WB requirements

<table>
<thead>
<tr>
<th>Type of place and activity</th>
<th>Maximum permissible noise level [dB(A)]</th>
<th>Exposure duration</th>
<th>Location/activity</th>
<th>Equivalent Level, $L_{Aeq}$, 8 hrs</th>
<th>Maximum L$_{Amax}$, fast</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Work places (workshops and industries) with up to 8 hour shifts (licensed before 2014)</td>
<td>90</td>
<td>8</td>
<td>Heavy Industry (no demand for oral communication)</td>
<td>85 dB(A)</td>
<td>110 dB(A)</td>
</tr>
<tr>
<td>b) Work places (workshops and industries) with up to 8 hour shifts (licensed since 2014)</td>
<td>85</td>
<td>8</td>
<td>Light industry (decreasing demand for oral communication)</td>
<td>50-65 dB(A)</td>
<td>110 dB(A)</td>
</tr>
<tr>
<td>Closed wedding and celebration halls (provided that this limit does not exceed the hall boundaries)</td>
<td>95</td>
<td>4</td>
<td>Open offices, control rooms, service counters or similar</td>
<td>45-50 dB(A)</td>
<td>N/A</td>
</tr>
<tr>
<td>Type of place and activity</td>
<td>Maximum permissible equivalent noise level [dB(A)]</td>
<td>Exposure duration</td>
<td>Location/activity</td>
<td>Equivalent Level, $L_{Aeq}$ 8 hrs</td>
<td>Maximum $L_{Amax}$, fast</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------------------------------------------------</td>
<td>-------------------</td>
<td>------------------</td>
<td>-----------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Work rooms for computers, typewriters or similar equipment</td>
<td>65</td>
<td>-</td>
<td>Individual offices (no disturbing noise)</td>
<td>40-45 dB(A)</td>
<td>N/A</td>
</tr>
<tr>
<td>Work rooms for activities requiring routine mental concentration – Bank lobbies, control rooms for industrial activities, restaurants and cafeterias</td>
<td>60</td>
<td>-</td>
<td>Classroom, lecture halls</td>
<td>35-40 dB(A)</td>
<td>-</td>
</tr>
<tr>
<td>Hospitals, clinics, public libraries, museums, post offices, courts, mosques and worships places.</td>
<td>45</td>
<td>-</td>
<td>Hospitals</td>
<td>30-35 dB(A)</td>
<td>40 dB(A)</td>
</tr>
<tr>
<td>Universities, schools, institutions, nursery, …etc. (inside classrooms)</td>
<td>40</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Universities, schools, institutions, nursery, …etc. (building yards and gardens)</td>
<td>55</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential buildings, hotels, …etc. (living rooms)</td>
<td>50</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential buildings, hotels, …etc. (bedrooms)</td>
<td>35</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In case of any discrepancy between the requirements of Egyptian legislations and the requirements of the World Bank, the requirements of the World Bank will be applied.
4 Baseline Environmental and Social Conditions

4.1 Description of the Environment

4.1.1 Project Area
Giza governorate is located on the west side of the Nile River. This pipeline lies in Abu Rawash in 6th of October city, Giza. It extends for less than 1 km (0.4 km) besides a residential and industrial area. The project location is located less than 20 km away from Qalyubiya governorate. The area is mostly a desert and no agriculture exists therein. Not far away from the pipeline path, there are various car maintenance centers in addition to one of the biggest shopping centers in Egypt.

4.1.2 Location and Land Use

![Route of the pipeline](image)

Figure 4-1 – Route of the pipeline in relation of Greater Cairo areas
6th of October is a newly developed area established in order to reduce the overcrowded population in Greater Cairo. It is a city under the administration of Giza governorate. 6th of October is located 35 km from Cairo. It is bordered by Giza and Menofiya Governorates form its north, Fayoum Governorate from the south, the administrative boundaries of Giza Governorate and River Nile form the east and the administrative boundaries of Matrouh and Beheira Governorates from the west. 6th of October area is distributed into 12 districts (Hai), the total population is about 1.6 million persons. The majority of the population is residential.

It is considered one of the most successful industrial cities in Egypt. Industrial activities are concentrated two industrial zones; 1st zone exists in Sixth of October city, one of the biggest industrial cities in Egypt; 2nd zone in Abu Rawash. The master plan of the city was designed to separate the industrial areas from the populated area, with the industrial zone located in the southwest of the city.

6th of October city is home to several important activities, it includes two of the largest private universities as well as several healthcare institutions including public and private companies. Six October has more than 30 higher institutes and a number of commercial and entertainment centers, in addition to the Media Production City.
4.1.3 Social Land Use of the route
The gas pipeline project will cover the area located in 6th of October and Abu Rawash (6th of October Power Plant). The project will extend along 400 m, along with Abu Rawash road. Therefore, it passes only through desert area parallel to the Abu Rawash road. The team has observed very limited impacts on socio-economic aspects are expected.

4.1.4 Climate
The climate has its primary role in affecting ecological systems in any region, whether it’s agricultural, urban or aquatic, in addition to its direct effect on humans.

Wind speed over the area varies from one month to another on the range of 6.7 to 9.7 km/h. The direction of prevailing wind varies for the different seasons along the year. For example, during winter the wind is original from the Northeast while over the spring the area is subjected to the Southeast winds to change again over the summer, having winds mainly coming from the Southeast, and finally, over the fall season winds are found to come from the Southwest (EMA, 1996). The mean monthly values of relative humidity are relatively similar along the year and relatively high during the summer period. The annual mean of daily relative humidity is 58% (46-69%).

4.1.4.1 Temperature
The mean monthly values for temperature are more or less in the same range all over the area which reflects regional identity. The maximum values of temperature are generally recorded in July being 37°C and the minimum in January being about 7°C. The monthly mean temperatures during the whole year are presented in Table 4-1.

Table 4-1 - Monthly temperatures in 6th of October
(Source: Meteoblue, www.meteoblue.com)
### Month

<table>
<thead>
<tr>
<th>Month</th>
<th>Maximum temperature (°C)</th>
<th>Minimum temperature(°C)</th>
<th>Daily average (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>20</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>February</td>
<td>21</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>March</td>
<td>25</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>April</td>
<td>30</td>
<td>11</td>
<td>20</td>
</tr>
<tr>
<td>May</td>
<td>34</td>
<td>14</td>
<td>24</td>
</tr>
<tr>
<td>June</td>
<td>36</td>
<td>17</td>
<td>27</td>
</tr>
<tr>
<td>July</td>
<td>37</td>
<td>19</td>
<td>28</td>
</tr>
<tr>
<td>August</td>
<td>37</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td>September</td>
<td>35</td>
<td>18</td>
<td>26</td>
</tr>
<tr>
<td>October</td>
<td>31</td>
<td>16</td>
<td>23</td>
</tr>
<tr>
<td>November</td>
<td>26</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>December</td>
<td>21</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>Yearly average</td>
<td>28.5</td>
<td>13.8</td>
<td>21</td>
</tr>
</tbody>
</table>

4.1.4.2 Relative Humidity

As shown in Table 4-2, the relative humidity Increases in the late fall and winter months as a result of the low temperatures, where it reaches maximum of 66%, 68% and 69% in November, December and January, while less than 50% in Spring months (April, May, June). in general the average annual relative humidity is 58%.

**Table 4-2 - Monthly averages of relative humidity**

<table>
<thead>
<tr>
<th>Month</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>66</td>
</tr>
<tr>
<td>February</td>
<td>59</td>
</tr>
</tbody>
</table>
4.1.4.3 Rainfall
The monthly rain amounts and the annual precipitation is very low in this region, December, January and February are considered the peak months of rain precipitation. This small amount of precipitation cannot be considered reliable for agricultural purposes. This is shown in Table 4-3.

**Table 4-3 - Monthly averages rainfall (mm) in Giza Governorate**

<table>
<thead>
<tr>
<th>Month</th>
<th>Average Rainfall (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>3.5</td>
</tr>
<tr>
<td>February</td>
<td>3.5</td>
</tr>
<tr>
<td>March</td>
<td>2.4</td>
</tr>
<tr>
<td>April</td>
<td>0.9</td>
</tr>
<tr>
<td>May</td>
<td>1.3</td>
</tr>
</tbody>
</table>
### Monthly Rainfall

<table>
<thead>
<tr>
<th>Month</th>
<th>Average Rainfall (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>June</td>
<td>0</td>
</tr>
<tr>
<td>July</td>
<td>0</td>
</tr>
<tr>
<td>August</td>
<td>0</td>
</tr>
<tr>
<td>September</td>
<td>0</td>
</tr>
<tr>
<td>October</td>
<td>2.5</td>
</tr>
<tr>
<td>November</td>
<td>3.2</td>
</tr>
<tr>
<td>December</td>
<td>4.9</td>
</tr>
<tr>
<td>Total</td>
<td>22.2</td>
</tr>
</tbody>
</table>

#### Wind

North wind is generally moderate and mild and it is the prevailing winds throughout the year. Wind speeds are generally light to moderate with annual average of 4.6 knots. Table 4-4 provides the average of wind speed (in knots). Figure 4-4 shows the wind rose distribution and prevailing directions in the region.

**Table 4-4 - Monthly averages of wind speed (knots) in Giza Governorate**

<table>
<thead>
<tr>
<th>Month</th>
<th>Knot</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>3.9</td>
</tr>
<tr>
<td>February</td>
<td>4.7</td>
</tr>
<tr>
<td>March</td>
<td>5.1</td>
</tr>
<tr>
<td>April</td>
<td>5.3</td>
</tr>
<tr>
<td>May</td>
<td>5.4</td>
</tr>
<tr>
<td>June</td>
<td>5.4</td>
</tr>
<tr>
<td>July</td>
<td>5</td>
</tr>
</tbody>
</table>
Figure 4-4 - The annual average wind directions in Giza Governorate
4.1.5 Ambient Air Quality
The overall objectives of studying ambient air quality are to:

- Establish air quality baseline which will assist in the estimation of the project impact on the local physical, biological and social environment;
- Verify compliance with the local and world bank regulatory limits for the ambient air quality;
- Check the conditions of operation and the adequacy of controls on discharges from the nearby suspected sources, provide a warning of unusual or unforeseen conditions and, where appropriate, trigger a special environmental monitoring program.

4.1.5.1 Site Specific Air Quality Assessment
Air quality measurements have been carried out as part of the baseline description, where one point in Giza governorate has been selected.

The baseline air quality measurements were conducted on a basis of 8 hours with one-hour intervals for carbon monoxide (CO), nitrogen dioxide (NO₂), sulphur dioxide (SO₂), Total Suspended Particulates (T.S.P) and particulate matter (PM10) at the specified location. The air quality was found to comply with the national guidelines for all the analyzed parameters. Standard ambient air quality monitoring instruments were used under the supervision of experienced specialists.

Air quality measurement specifications are shown in Annex 5.

4.1.5.2 Sampling strategy
The selection of the active air measurement location is based on the nature of the surrounding activities, the location of the nearest sensitive receptors with respect to the project plots, prevailing wind direction; site topography, and the future layout of the proposed project components. Moreover, the selection is based on the guidelines stated in the American Society for Testing Materials (ASTM) reference method.

The GPS coordinates of the selected Ambient Air monitoring locations:

<table>
<thead>
<tr>
<th>Location</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Abo Rawash</td>
<td>30° 3'19.30&quot;N</td>
<td>31° 3'2.30&quot;E</td>
</tr>
</tbody>
</table>
The measurement location was chosen on the basis that it’s at a residential area close to the pipeline route.

4.1.5.3 Analysis Results
The air quality at the sampling locations is exhibiting acceptable levels of classic air pollutants in comparison with the Egyptian limits and the world bank limits. The analysis results are presented in Table 4-6.

Table 4-6 - One hour average results (μg/m3)

<table>
<thead>
<tr>
<th>Time</th>
<th>NO</th>
<th>NO2</th>
<th>NOx</th>
<th>SO2</th>
<th>CO</th>
<th>PM10</th>
<th>T.S.P</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00</td>
<td>10.3</td>
<td>19.5</td>
<td>29.8</td>
<td>12.2</td>
<td>1.5</td>
<td>92.2</td>
<td>121.1</td>
</tr>
<tr>
<td>11:00</td>
<td>6.6</td>
<td>17.3</td>
<td>23.9</td>
<td>11.8</td>
<td>1.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:00</td>
<td>15.1</td>
<td>21.4</td>
<td>36.5</td>
<td>11.2</td>
<td>1.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13:00</td>
<td>4.9</td>
<td>20.3</td>
<td>25.2</td>
<td>10.5</td>
<td>1.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14:00</td>
<td>10.3</td>
<td>21.9</td>
<td>32.2</td>
<td>9.9</td>
<td>1.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15:00</td>
<td>15.5</td>
<td>11.1</td>
<td>26.6</td>
<td>9.9</td>
<td>1.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16:00</td>
<td>4.1</td>
<td>10.6</td>
<td>14.7</td>
<td>10.5</td>
<td>1.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
All the recorded data showed compliance with the national and international guidelines for ambient air quality.

4.1.6 Noise
Noise measurements methodology and measurement method are discussed in Annex 5. The main results are shown in the following tables.

According to the areas’ classification in the Egyptian regulations, the selected sampling location can be best defined as: Residential areas with some workshops, administrative activities, or recreational and entertainment activities overlooking public roads less than 12 meters. On the other hand, and since the world bank regulations only classify areas as residential or industrial, the first sample location will be defined as “Residential”. The following tables present the results of the noise measurements.

<table>
<thead>
<tr>
<th>Time</th>
<th>NO</th>
<th>NO₂</th>
<th>NOₓ</th>
<th>SO₂</th>
<th>CO</th>
<th>PM10</th>
<th>T.S.P</th>
</tr>
</thead>
<tbody>
<tr>
<td>17:00</td>
<td>4.3</td>
<td>12.2</td>
<td>16.7</td>
<td>10.3</td>
<td>1.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>8.9</td>
<td>16.8</td>
<td>25.7</td>
<td>10.8</td>
<td>1.6</td>
<td>92.2</td>
<td>121.1</td>
</tr>
<tr>
<td>Egyptian Limits</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>125</td>
<td>10mg/m³</td>
<td>150</td>
<td>230</td>
</tr>
<tr>
<td>World Bank Limits</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>125 (It-1)*</td>
<td>N/A</td>
<td>150 (It-1)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

* IT stands for Interim Target, which are the increment values that should be targeted by an organization during the implementation of a project leading to the recommended guideline values.

By substituting in the noise level equation (found in Annex 4), the equivalent sound level = 55.7dBA

<table>
<thead>
<tr>
<th>Time</th>
<th>Sound &amp;PercentileRecordings in dBAfor8 Hours</th>
<th>Equivalent Level LAeq(dBA)</th>
<th>Permissible Limits L\text{Aeq}(dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L\text{Aeq}</td>
<td>LA10</td>
<td>LA50</td>
</tr>
<tr>
<td>10:00</td>
<td>53.82</td>
<td>50.52</td>
<td>46.05</td>
</tr>
<tr>
<td>11:00</td>
<td>57.96</td>
<td>49.06</td>
<td>34.62</td>
</tr>
<tr>
<td>12:00</td>
<td>53.12</td>
<td>56.87</td>
<td>47.47</td>
</tr>
<tr>
<td>13:00</td>
<td>54.5</td>
<td>57.38</td>
<td>49</td>
</tr>
<tr>
<td>14:00</td>
<td>57.9</td>
<td>52.54</td>
<td>41.9</td>
</tr>
<tr>
<td>15:00</td>
<td>51.12</td>
<td>54.52</td>
<td>42.65</td>
</tr>
<tr>
<td>16:00</td>
<td>57.89</td>
<td>60.94</td>
<td>53.44</td>
</tr>
<tr>
<td>17:00</td>
<td>54.5</td>
<td>58.67</td>
<td>49.75</td>
</tr>
</tbody>
</table>
Table 4-8 - Ambient Noise Levels Readings at night

<table>
<thead>
<tr>
<th>Time</th>
<th>LAeq</th>
<th>LA10</th>
<th>LA50</th>
<th>LA90</th>
<th>LA95</th>
<th>LCpeak</th>
<th>Permissible Limits LAeq(dBA)</th>
<th>National</th>
<th>World Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>19:00</td>
<td>44.53</td>
<td>50.52</td>
<td>46.05</td>
<td>39.93</td>
<td>37.27</td>
<td>116.97</td>
<td></td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>20:00</td>
<td>46.82</td>
<td>49.06</td>
<td>34.62</td>
<td>28.4</td>
<td>27.83</td>
<td>121.52</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21:00</td>
<td>43.22</td>
<td>56.87</td>
<td>47.47</td>
<td>39.7</td>
<td>37.8</td>
<td>104.96</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22:00</td>
<td>42.55</td>
<td>57.38</td>
<td>49</td>
<td>41.11</td>
<td>39.06</td>
<td>105.77</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23:00</td>
<td>48.34</td>
<td>52.54</td>
<td>41.9</td>
<td>36.13</td>
<td>34.77</td>
<td>93.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00:00</td>
<td>46.77</td>
<td>54.52</td>
<td>42.65</td>
<td>35.86</td>
<td>34.17</td>
<td>105.57</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>01:00</td>
<td>47.57</td>
<td>60.94</td>
<td>53.44</td>
<td>45.95</td>
<td>43.89</td>
<td>104.93</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02:00</td>
<td>44.89</td>
<td>58.67</td>
<td>49.75</td>
<td>38.61</td>
<td>36.17</td>
<td>99.24</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

By substituting in the noise level equation (found in Annex 4), the equivalent sound level = 46dBA

The previous analysis results show that the noise level at the specified location complies with the Egyptian but slightly exceed World Bank regulations in the daytime, and in the night time.

4.1.7 Geological characteristics

This section provides the general geological characteristics of Giza governorate. The exact geological characteristics of the project area will be surveyed by the main project contractor in the beginning of the construction phase after the contractual agreement with GASCO.

Giza is located in a central location in the heart of the Arab Republic of Egypt, linking the Nile Delta and Upper Egypt, the Nile River crosses the borders of the governorate dividing it into two parts:

- Eastern part containing the Eastern Desert environment which is known for its natural, distinctive characteristics.
- Western section containing the Western Desert which is known for its natural distinctive characteristics and contains Bahariya Oasis.

The beginning of the fork of the River Nile to Damietta and Rosetta branches is located inside the borders of the governorate in the northern part. All of the aforementioned features gave Giza governorate a variety of natural properties and geological characteristics.

The geological situation of the governorate defines the quality of the rocks and sediments that make up the governorate and their geological age, which is divided as follows:

1. Quaternary deposits:
• **Holocene deposits**

Holocene sediments on the surface of the Nile Valley extend for more than 15 meters. There are agriculture areas and a network of canals and drains inside the area of these deposits. Some sand dunes appear on the surface of the ground on the top of the compositional Western plateaus that belong to the Holocene age.

• **Pleistocene deposits**

This sediment is located below the Holocene sediments in the Nile Valley, which is made up of dark mud containing fine sand lenses. The thickness of these deposits reaches more than 200 meters. The Pleistocene deposits appear on the surface of the ground in different parts of the governate comprising sand, sand gravel and clay. The thickness of these deposits ranges between 16 meters to 20 meters.

• **Lower Miocene deposits**

These deposits appear on the surface of the ground at the north and the west of the governate, and it is composed of sand, sand-stone, and some remains of fossilized trees. These deposits are known as Wood Mountain formation and their thicknesses range between 60 to 70 meters.

• **Oligocene deposits**

They appear on the surface of the ground near the Nile Valley in the northern zone of the governate, in addition to the central western zone of the governate. They are made of a thick sequence of sandstone with some shale interference, which is known as the Tarry Mountain formation and its thickness ranges between 170 to 200 meters.

• **Eocene deposits**

This sediment is usually located below the Pliocene sediments in the Nile Valley and in the vicinity of Bahariya Oasis which is located in the southern region of the governate. The Eocene deposits consist of limestone, marl and limestone sand. The thickness of this layer ranges from 200 meters to over 500 meters.

2. **Tertiary deposits**

• **Paleocene deposits**

These deposits usually appear in the far southern part of the governate, which includes the formation Tarawan chalk and Esnashale sediments. The thickness of Tarawan chalk ranges between 20 to 50 meters, while the thickness of Esna shale ranges between 100 to 120 meters.

• **Upper cretaceous deposits**

Upper Cretaceous rocks usually exist in Abu Rawash area and the Bahariya Oasis. These rocks consist of limestone and Cretaceous limestone; with thickness ranging between 100 to 150 meters. The deposits of this age also exist beneath the seabed of Bahariya Oasis, which is composed of
sandstone and shale, with some iron deposits, which give these deposits a red color. The thickness of these deposits varies between 750 to 1,100 meters and is known as Bahariya formation.  

Specific soil investigation study for the pipeline route will be conducted before the commencement of the construction activities after the contractual agreement with the construction contractor.

4.1.8 Terrain (topographic)
Due to the great area of Giza governorate, there is extreme diversity in the characteristics of its surface; divided into many sections as follows:

- **Young alluvial plains**
  These occur on both sides of the River Nile. Beneath these plains exists sediments of silt, mud, and a fine sand belonging to the Holocene age. In general, the ground level height of these plains varies between about 23 meters above sea level at the southern part of the governorate to 16 meters above sea level in the northern part of the governorate.

- **Old alluvial plains**
  They are located south-west of the Nile Valley, between modern alluvial plains and the Western Structural plateau. Beneath these plains exists some sediments belonging to Pleistocene era; consisting of coarse sand and gravel with some clay lenses.

- **Structural plateau (Plains)**
  They are located in north-west and in south-east of the governorate; ranging in height from 100 meters to 300 meters above sea level. Beneath these plains exists sediments of the Triathlonera, which consist of sand, gravel, sandstone, and some shale, and interrupted by rocks of basalt in some places in the northern part of the governorate near the Nile Valley.

- **Structural plateau (Hills)**
  The Nile River sculpts its course through the low tectonic; separating the structural limestone plateau into two plateaus; one located at the eastern side of the Nile and the other located at the western side of the Nile. The altitude of the Western plateaus (known as Al Ahram Plateau) range between 100 to 200 meters. Beneath this plateau exists rocks consisting of limestone, marl and sandstone belonging to the Eocene era. There are also structural plateaus in southwestern part of the governorate; with heights ranging between 200 meters to 400 meters above the sea level. Beneath this plateau, there are rocks ranging in age between the Cretaceous and the upper Eocene ages. These rocks consist of limestone, marl, sandstone, dolomitic limestone and Cretaceous limestone.

- **Bahariya oasis depression**

---

5Environmental characterization of the Giza Governorate, 2007
This occurs in the southwestern part of the governorate; taking an elliptical shape longitudinally between the plateaus surrounding it. Its heights ranges between 100 to 150 meters above sea level and sandstone rocks and shale exist beneath it.

4.1.9 Water: Availability and Quality
The pipeline path will not intersect with any waterways. In addition, the water demand required during the construction phase will be met through water trucks.

4.1.10 Ecology and Biodiversity

![Figure 4-7 - Site Location](image)

As seen in Figure 4-7&Figure 4-8, the valve room is the starting point for this pipeline. The line will start from the valve room and end at the 6th of October power plant (shown in Figure 4-10). To the east of the pipeline, there is a large area of desert with patches of vegetation and to the west of the pipeline, a small farm can be found (see Figure 4-9).
Figure 4-8 - Location 1 (Valve Room)

Figure 4-9 - Small farm next to valve room
4.1.10.1 Overview
The 6th October pipeline falls under the Giza governorate, which is considered to cover a vast land area with a wide range of environments such as wetlands, desert oasis environments and freshwater environments. The pipeline is located in a desert environment that is surrounded by urban areas and no water environments will be discussed in this section. The pipeline is located in the Western Desert, where vegetation is considered sparse, with no more than 5% plant cover. Due to the lack of water in the area, most of the species are drought tolerant. An ecological survey was conducted in the area of study along with desktop research and it is safe to say that flora and fauna in this area are poor. Furthermore, no endemic or endangered species listed in the IUCN list (found in section 4.1.10.2) were recorded on site.

4.1.10.2 IUCN Red List
The International Union for the Conservation of Nature (IUCN) Red List of Threatened Species evaluates the conservation status of plant and animal species and is widely recognized as a comprehensive global approach. The IUCN Red List highlights plant and animal species that are facing a higher risk of global extinction by listing them as Critically Endangered, Endangered and Vulnerable, Table 4-9 shows the Red List of Egypt's terrestrial species, without taking into consideration extinct species, extinct in the wild or of least concern. As mentioned earlier, no endemic or endangered species are located in or around the project sites.
Table 4-9: Red List Species of Egypt

<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
<th>Population Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Fauna</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acanthodactylus pardalis (Leopard Fringe-fingered Lizard)</td>
<td>Vulnerable</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Acinonyx jubatus (Cheetah)</td>
<td>Vulnerable</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Addax nasomaculatus (Addax)</td>
<td>Critically Endangered</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Allactaga tetradactyla (Four-toed Jerboa)</td>
<td>Vulnerable</td>
<td>Unknown</td>
</tr>
<tr>
<td>Ammotragus lervia (Aoudad)</td>
<td>Vulnerable</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Aquila clanga (Greater Spotted Eagle)</td>
<td>Vulnerable</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Aquila heliaca (Eastern Imperial Eagle)</td>
<td>Vulnerable</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Capra nubiana (Nubian Ibex)</td>
<td>Vulnerable</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Caretta caretta (Loggerhead)</td>
<td>Endangered</td>
<td>(needs updating)</td>
</tr>
<tr>
<td>Chelonia mydas (Green Turtle)</td>
<td>Endangered</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Chersophilus duponti (Dupont's Lark)</td>
<td>Near Threatened</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Chlamydotis undulata (Houbara Bustard)</td>
<td>Vulnerable</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Circus macrourus (Pallid Harrier)</td>
<td>Near Threatened</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Coracias garrulus (European Roller)</td>
<td>Near Threatened</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Crocidura floweri (Flower's Shrew)</td>
<td>Data Deficient</td>
<td>Unknown</td>
</tr>
<tr>
<td>Crocidura religiosa (Egyptian Pygmy Shrew)</td>
<td>Data Deficient</td>
<td>Unknown</td>
</tr>
<tr>
<td>Emberiza cimeracea (Cinereous Bunting)</td>
<td>Near Threatened</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Eretmochelys imbricata (Hawksbill Turtle)</td>
<td>Critically Endangered</td>
<td>(not given)</td>
</tr>
<tr>
<td>Falco cherrug (Saker Falcon)</td>
<td>Endangered</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Falco concolor (Sooty Falcon)</td>
<td>Near Threatened</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Falco naumanni (Lesser Kestrel)</td>
<td>Vulnerable</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Falco vespertinus (Red-footed Falcon)</td>
<td>Near Threatened</td>
<td>(not given)</td>
</tr>
<tr>
<td>Felis margarita (Sand Cat)</td>
<td>Near Threatened</td>
<td>Unknown</td>
</tr>
<tr>
<td>Ficedula semitorquata (Semi-collared Flycatcher)</td>
<td>Near Threatened</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Gazella dorcas (Dorcas Gazelle)</td>
<td>Vulnerable</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Species</td>
<td>Status</td>
<td>Population Trend</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>-----------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Gazellagazella (Mountain Gazelle)</td>
<td>Vulnerable</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Gazellaleptoceros (Slender-horned Gazelle)</td>
<td>Endangered</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Geochelonesulcata (African Spurred Tortoise)</td>
<td>Vulnerable</td>
<td>(needs updating)</td>
</tr>
<tr>
<td>Geronticuseremita (Northern Bald Ibis)</td>
<td>Critically Endangered</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Hippopotamus amphibius (Common Hippopotamus)</td>
<td>Vulnerable</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Hyaenahyaena (Striped Hyaena)</td>
<td>Near Threatened</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Merionessacramenti (Buxton's Jird)</td>
<td>Vulnerable</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Milvus milvus (Red Kite)</td>
<td>Near Threatened</td>
<td>(not given)</td>
</tr>
<tr>
<td>Monachusmonachus (Mediterranean Monk Seal)</td>
<td>Critically Endangered</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Neophronpercornopterus (Egyptian Vulture)</td>
<td>Endangered</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Numeniusarquata (Eurasian Curlew)</td>
<td>Near Threatened</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Oryx leucoryx (Arabian Oryx)</td>
<td>Endangered</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Pantheraleo (Lion)</td>
<td>Vulnerable</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Pantherapardus (Leopard)</td>
<td>Near Threatened</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Paragomphussinaticus</td>
<td>Vulnerable</td>
<td>Unknown</td>
</tr>
<tr>
<td>Pelecanuscrispus (Dalmatian Pelican)</td>
<td>Vulnerable</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Philochortuzolii</td>
<td>Critically Endangered</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Pipistrellusariel (Desert Pipistrelle)</td>
<td>Data Deficient</td>
<td>Unknown</td>
</tr>
<tr>
<td>Plecotuschristii</td>
<td>Data Deficient</td>
<td>Unknown</td>
</tr>
<tr>
<td>Rhinolophusmehelyi (Mehely's Horseshoe Bat)</td>
<td>Vulnerable</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Serinussyriacus (Syrian Serin)</td>
<td>Vulnerable</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Spalaxehrenbergi (Middle East Blind Mole Rat)</td>
<td>Data Deficient</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Telescopushoogstraali</td>
<td>Endangered</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Testudo graeca (Spur-thighed Tortoise)</td>
<td>Vulnerable</td>
<td>(needs updating)</td>
</tr>
<tr>
<td>Testudo kleinmani (Kleinmann's Tortoise)</td>
<td>Critically Endangered</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Testudo werneri (Negev Tortoise)</td>
<td>Critically Endangered</td>
<td>Decreasing</td>
</tr>
<tr>
<td>Torgostracheliotos (Lappet-faced Vulture)</td>
<td>Vulnerable</td>
<td>Decreasing</td>
</tr>
</tbody>
</table>
4.1.10.3 Important Bird Areas and Bird Species

The project site does not pass through any important bird areas as seen in Figure 4-12. A common species of desert bird which is documented near the study area is the Oenanthe deserti (Figure 4-11), which resides in desert plains and semi desert environments. Other species documented in the area include Turdus philomelos (Figure 4-11), Athene noctua, and Coracias garrulus. Table 4-10 shows some of the main resident species that were found in the study area and other inland habitats area across several ecosystems in Egypt.

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motacillaflavapygmaea</td>
<td>Egyptian Wagtail</td>
</tr>
<tr>
<td>Anthus pratensis</td>
<td>Meadow Pipit</td>
</tr>
<tr>
<td>Columba livida</td>
<td>Rock Dove</td>
</tr>
<tr>
<td>Upupa epops</td>
<td>Hoopoe</td>
</tr>
<tr>
<td>Corvus ruficollis</td>
<td>Desert raven</td>
</tr>
<tr>
<td>Bubo buboascalaptus</td>
<td>Pharaoh owl</td>
</tr>
<tr>
<td>Ardeacinerecinerea</td>
<td>Grey heron</td>
</tr>
</tbody>
</table>

Table 4-10 - Common bird species in study area
Due to the harsh conditions of the desert environment and the lack of vegetation cover in the area, fauna is more likely to appear during the night time. The most common species of reptiles
documented near the site include Mesalinarubropuncata (Red spotted lizard), Cerastuscerastes (Toresh horned viper). Other common reptile species documented in the Giza governorate and in other habitats across Egypt can be found in Table 4-11.

**Table 4-11 - Common reptile species**

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acanthodactyluspardalis</td>
<td>Egyptian leopard lizard</td>
</tr>
<tr>
<td>ColbuberFlorulentus</td>
<td>Flowered snake</td>
</tr>
<tr>
<td>Buthacusleptochelys</td>
<td>Scorpion</td>
</tr>
<tr>
<td>Hemidactylusturcicusturcicus</td>
<td>Turkish gecko</td>
</tr>
<tr>
<td>Chamaeleochamaeleon</td>
<td>Common chameleon</td>
</tr>
<tr>
<td>Scincusscincus</td>
<td>Sandfish skink</td>
</tr>
</tbody>
</table>

No mammals were spotted during the field survey of the site, but rodents are known to form the largest mammalian group in the area. The most common rodent species documented in the area include Arvicanthisniloticus (Field rats), Rattusrattus (Black Rats) and Acomyscahirinus (Bicolored spiny mouse). Other Mammal species in the area include vulpesvulpesaegyptiaca (Red fox) and Vulpesruupelli (Sand Fox).

![Figure 4-13 - Left: Arvicanthisniloticus, Right: Mesalinarubropuncata](image-url)
4.1.10.5 Flora
As mentioned earlier, the project site is considered to be located in the western desert which is known to have scarce rainfall and soils with high salt content and high porosity. Some of the most common floral species documented in the area include:

- Zilla spinose
- Seneciodesfontainei
- Fagonia indica
- Neuradaprocumbens
- Tamarix tetragyna
- Haloxylon salicornicum
- Seneciodesfontainei
- Kochia indica
- Echinopsspinosus

Roadside vegetation (Figure 4-14) was also prevalent near the project site with the two most common species being Gramineae (Phragmites australis) and Leguminosae (Alhagigraecorum).

![Roadside Vegetation onsite](image-url)

Figure 4-14 - Roadside Vegetation onsite

Finally, species such as Casuarina cunninghamiana (Figure 4-15) were found to surround a small farm in the project and they are known to act as a wind break.
4.1.10.6 Protectorates

El Hassana Dome National Park is the main protectorate in close proximity to the project site as seen in Figure 4-16 and Figure 4-17. It is located approximately 3 km east of the area of interest and was declared as a protected site in 1989 under declaration No. 946 due to its geological significance. The convex height of the Dome is a distinguishing geological phenomenon that took place at the end of the Cretaceous age.

No impact is expected to occur on El Hassana Dome from the project activities.
Figure 4-16 - Protected areas of Egypt
Figure 4-17 – Proximity of Protectorate to Pipeline
5 Environmental and Social Impacts

The environmental and social advantages of upgrading the Egyptian Natural Gas Network are diverse. Natural Gas provides improved safety, reduced financial burden on the national budget, and secure supply to the power plants. On the national level, it promotes the utilization of Egyptian natural resources and reduces the subsidy and import burden. Even on the global level, the project involves cleaner fuel with reduced carbon footprint.

A thorough analysis of environmental and social impacts is important to detail an effective management and monitoring plan which will minimize negative impacts and maximize positives.

All the potential impacts will be analyzed and discussed in the sections below. Afterwards, a rating matrix method will be applied to identify the significance of the impacts based on the frequency and severity of each impact. This evaluation method is used to determine the most significant impacts, and the suitable mitigation measures that will be applied to eliminate or reduce the adverse effect of such impacts on the environment and surrounding community as much as possible.

The assessment of impacts distinguishes between the construction phase and the operations phase.

5.1 Positive Impacts

5.1.1 During the construction phase

5.1.1.1 Provide direct job opportunities to skilled and semi-skilled laborers
The project is expected to result in the creation of job opportunities, both directly and indirectly. Based on similar projects implemented recently by GASCO, the daily average number of workers during the peak time will be about 10 temporary workers for 6 months (total of 1200 workers days). The local community could theoretically provide a proportion of this temporary labour force dependent on skills needed and the strategies of the individual contractors in sourcing their workforce.

In order to maximize employment opportunities in the local communities it is anticipated that training will be required for currently unskilled workers. On-the-job training will also supplement opportunities for the local workforce for both temporary construction roles also for long-term operations phase position, where these are available.

5.1.1.2 Create indirect opportunities
Increased economic activity in project through the following supply chain:
- Implementation of works and provision of supplies related to construction, operation and closure of the site and ancillary facilities;
- Provision of transportation, freight and storage services to the Project;
- Drivers and mini-bus owners will benefit from the transportation of the workers;
• Provision of food supplies, catering, and cleaning services;
• Provision of building and auxiliary materials and accessories, engineering, installation and maintenance;
• Provision of white goods, electronic appliances, communications and measurement equipment;
• Security personnel;
• Retail services;
• Provision of fuel;
• Workers and engineers may need accommodation facilities;
• National pipes and scaffold factories will be flourished.

5.1.2 During the operation phase

5.1.2.1 Economic Impacts
The expansion of the National Natural Gas Grid has several positive economic impacts:

• Support the expansion of power generation projects. The current gas connection lines will mainly provide energy source for the new “Siemens Power Stations”. The expansion in power generation will dramatically enhance the national electricity grid;
• Expanding the natural gas network will positively provide an energy source to local industries which will indirectly create job opportunities;
• Variation of the energy mix in order to reduce the dependency on imported fuel;

5.2 Negative Impacts

5.2.1 Potential Negative Impacts during Construction - Environmental Impacts

5.2.1.1 Air Quality
• Dust Emissions are expected to occur during the construction phase due to the on-site activities such as land preparation, excavation and refilling activities, also in addition to the movement of the construction vehicles can generate some fugitive dust. The generation of dust can cause negative health effect on the respiratory system of the workers, and the surrounding community in the close vicinity of the construction works.
• Minor gaseous emissions can be expected to occur from the construction activities such as welding of pipe connections, and coating these connections with the polyethylene sheets. Additionally, gaseous emissions are expected to occur during the construction phase as a result of the exhaust gases from vehicles and equipment (excavator, loader, bulldozer, trailer,…) in addition to gaseous emissions from diesel generators.
• However, these emissions are expected to be in small amounts and temporary.
- Minimal odor emissions are expected to occur during the construction phase from chemicals, oils and paints used during the construction phase.

Due to the continuity of the construction activities, the impact level from dust emission is expected to be **High**.

5.2.1.2 Aquatic Environment

There are no water bodies close to or crossing the project path, therefore no impact is expected from the project on the aquatic environment. However, in case the contractor improperly disposed construction wastes or debris in a waterway, there will be adverse impact on the aquatic environment there. Also the improper disposal of the wastewater resulting from the hydrostatic testing of the pipeline can cause changes in the characteristics if the waterways used for such disposal.

Usually the generated wastewater, as well as water resulting from the dewatering activities during excavation, will be disposed of in the sewage networks, and in the case that the water will be disposed back to the water bodies, full coordination with the Ministry of water and irrigation and with the Holding Company for Water and Wastewater will take place, and proper testing will be carried out to ensure that the disposed water quality is within the limits required by the law.

During construction, without good practices or improper disposal, the impact on aquatic environment is expected to be **High**.

5.2.1.3 Noise and Vibration

The main sources of noise and vibration during the construction phase are the operation of the construction equipment and machinery such as diggers, cranes, loaders and transportation trucks. Increased road traffic as a result of the excavation activities will also increase the noise intensity level. The negative impact will be mainly affecting the operators working on the site In case the operators don’t use their PPE, they may be subject to hearing loss. In addition, nearby residents will be affected by the increased noise levels during the construction phase.

The construction activities are expected to be carried out throughout the day time, and the noise and vibration impacts are expected to be **High**.

5.2.1.4 Flora and Fauna

The pipeline route is located in an unused area with very limited flora within the surrounding regions of the route. Therefore, minimal impact is expected on the flora and fauna of the project area and the impact is considered as insignificant.

As there are no significant flora and fauna in the project area, the impact is expected to be **Low**.
5.2.1.5  **Land use, landscape and visual Impact**  
There are no current land uses for the route area as it is located in an empty area beside an existing road, which is not expected to be affected due to the project activities.

**Thus, the impact level of this aspect is considered to be Insignificant.**

5.2.1.6  **Soils, Geology and Hydrogeology**  
The excavation activities will result in disturbance of the soil and geological characteristics. This will be more pronounced in the trench’s area (around 1 meter depth) where excavation, pipeline laying, and soil compaction as a result of heavy equipment take place. Soil disturbance at higher depths will also take place in case of applying auger boring or HDD technologies in main crossings. In addition, potential soil contamination may take place as a result of spillage or leaks of oils.

**However, since there is no current land use for the project area, the negative impacts on the soil is Insignificant.**

5.2.1.7  **Traffic**  
An increased number of trucks and heavy equipment will be necessary to transport the construction materials and equipment to the project site during the construction phase. It is important to note that the pipeline path will not cross any roads main or secondary; therefore there is no expected impact from this activity.

**The construction trucks movement can be considered to be a continuous process, with a Medium impact.**

5.2.1.8  **Archaeological, Historic and Cultural Heritage**  
There are no archaeological concerns encounters the pipeline route, however, if any archeological sites are discovered during the construction activities, the proper actions will be taken to report the site and construction will be stopped.

**Thus, the impact level of this aspect is considered to be Insignificant.**

5.2.1.9  **Natural Disaster Risk**  
Earthquake and floods may disturb the construction activities. This has the potential to negatively impact the time schedule of the construction activities and may cause injuries or fatalities to the workers.

**However as natural disasters are not considered common in the project area, therefore the impact is expected to be short-termed, however of medium impact.**
5.2.1.10 Major Accidents and Hazards
The construction activities may include leaks of the oil equipment and machinery which may affect the land in the project site.

As most of the maintenance activities will be carried off site in areas specialized in such activities, the effect of this impact is expected to be **Medium and for a short-term**.

5.2.1.11 Solid Waste Management
Solid waste will comprise domestic waste, construction waste and some hazardous wastes from the project activities. The waste is expected to include the following waste streams:

**Hazardous wastes:**
- Welding belts
- Used oil waste
- Asphalt
- Miscellaneous containers, paint cans, solvent containers, aerosol cans, adhesive, and lubricant containers

**Non-hazardous wastes:**
- Soil (excavated or surplus)
- Packaging materials
- Damaged products (pipes, etc.);
- Packing timber;
- Geotextiles;
- Paving materials;
- Electrical cable off-cuts;
- Concrete;

**Domestic Wastes:**
- From the labor use on-site.

Adverse impacts on the environment from the possible improper disposal of the solid wastes in addition to the increased demand for landfill space. Furthermore, adverse impacts from increased traffic load when transporting waste to designated landfills and/or disposal sites are expected. Accordingly, the impact of improper solid waste handling is expected to be **High**.

5.2.1.12 Public Health
The dust and noise resulting from the construction activities may affect the health of the residents in populated areas along the pipeline route. Care will be taken to reduce the effect of these impacts as much as reasonably practicable in populated area; also the duration of the construction activities in each location is expected to be short.
The selected plot for the workers camp for 6th of October pipeline project will be near the populated area or the main roads. The location of the workers camp will be decided upon before the commencement of the construction activities.

Moreover, it is not expected that there will be a spread of infectious diseases among workers such as HIV/AIDS since they are not commonly spread among the community. Additionally, the provisions of occupational health and safety laws at the workplace will be applied.

Thus, the impact level of this aspect is considered to be **Low**.

5.2.1.13 **Occupational Health and Safety**
The workers will be subjected to health and safety hazards during the construction phase from the on-site construction activities.

Thus, the impact level of this aspect is considered to be **Medium**.

5.2.1.14 **Existing Infrastructure**
The construction phase may lead to breaking any of the underground infrastructure pipelines (water, sewerage or telecommunication) which will result in negative impacts on the water supply or the telecommunication service for the surrounding areas and in case of breaking a sewerage line, adverse environmental impacts may take place since the sewage may flood to the main road/agricultural land, and infiltrate to the ground water and also residents of the affected area will face water shortage.

The effect of this impact is expected to be **Medium** and for a short period of time.

5.2.1.15 **Energy Use**
There will be an increase in the energy consumption during the construction phase as a result of the transportation of equipment & construction materials to the project site as well as the equipment used for on-site preparation (front loaders, trucks, etc).

However, this increase in energy use is **not significant** and does not affect other users of energy.

5.2.1.16 **Land Requirements**
*Permanent land acquisition:* Permanent acquisition of land for the establishment of the valve rooms.
For the current line the 2 valve rooms exist, only extension for the rooms is required. One of the existing rooms is inside of 6 October Power Station. No impact.
**Temporary land acquisition:** The line extends for 0.4 km, hence the land requirements for construction can be estimated by about 8 km$^2$. The line passes mainly at desert areas hence temporary land disruption will not impact in economic or physical displacement. Limited impact.

Since the route of the pipeline is quite short and is located at a desert area and it is a short as well as this impact is considered **limited temporary, very limited impact** is considered about temporary land acquisition.

5.2.17 Labor conditions and occupational health and safety
Throughout this phase there will be many occupational health and safety risks to workers on the sites. These are generic risks associated with construction sites and include slips and falls; moving lorries and machinery; exposure to chemicals and other hazardous materials; exposure to electric shock and burns; weather related impacts (dehydration; heat stroke). This is short term (6-12 months) but because of the large number of unskilled workers who are reluctant to use health and safety tools.

Impact related to Occupational health and safety during the construction phase is **Major**

### 5.2.2 Potential Negative Impacts during Operation

#### 5.2.2.1 Air Quality
No gaseous emissions are expected to occur during the operation phase except for the potential natural gas leak or in case of accidents and during maintenance activities. In addition, the gaseous emissions generated by natural gas combustion for power generation are much lower than those associated with heavy fuel oil (mazout) or coal, which is a positive impact. Additionally, no dust or odor emissions are expected to occur during the operation phase of the project.

Thus, the impact level of this aspect is considered to be **insignificant**.

#### 5.2.2.2 Aquatic Environment
The project operation will not have any effect on the aquatic environment.

Thus, the impact level of this aspect is considered to be **insignificant**.

#### 5.2.2.3 Noise and vibration
Minimal noise will be generated from the operation of the valve room and pressure reduction station.

6 The calculation was based on the length of the line that will cross desert land multiplied by a width of 20 m for excavation (10 m from each side)
Thus, the impact level of this aspect is considered to be **low**.

5.2.2.4 **Ecology (Flora and Fauna)**  
The project operation will not affect the flora and fauna since the pipeline is laid underground with minimal maintenance activities.  

Thus, the impact level of this aspect is considered to be **insignificant**.

5.2.2.5 **Land use, Landscape and Visual Impact**  
Since the pipeline is laid underground, the land in which the pipeline passes through will regain its usage and no visual impacts will occur.

Thus, the impact level of this aspect is considered to be **insignificant**.

5.2.2.6 **Soil, Geology and Hydrogeology**  
The operation of the pipeline will not affect the soil, geology or hydrology of the land.

Thus, the impact level of this aspect is considered to be **insignificant**.

5.2.2.7 **Traffic**  
The operation of the pipeline does not include any trucks’ movement or materials’ transportation.

Thus, the impact level of this aspect is considered to be **insignificant**.

5.2.2.8 **Natural Disaster Risk**  
Natural disasters such as earthquakes may lead to pipeline breakage. Fire or explosion may take place in the affected areas which may lead to severe injuries or death to the nearby human beings. This may also lead to the temporary cut-off of natural gas supply to the nearby area.

Due to the potential harm of the surrounding residents and environment, the impact level of this aspect is considered to be **high**.

5.2.2.9 **Major Accidents and Emergencies**  
Accidents and emergencies such as release of significant amounts of natural gas due to any failure in the pipeline, maintenance activities or as a result of accidents may take place during the operation of the proposed project. This may also take place as a result of sabotage or trespass.

Such accidents may result in fires in the affected areas which may lead to severe injuries or death to the nearby human beings. This may also lead to the temporary cut-off of natural gas supply to the nearby area. A quantitative risk assessment (QRA) was conducted by GASCO to determine the level of threat to the public in case of an accident or emergency. The results of the QRA are annexed to the ESIA.
Due to the potential harm of the surrounding residents and environment, the impact level of this aspect is considered to be **high**.

5.2.2.10 **Solid and Hazardous Waste Management**
The pipeline operation will not dispose any type of solid waste and the project will not have a negative impact in that regards.

Thus, the impact level of this aspect is considered to be **insignificant**.

5.2.2.11 **Public Health**
Apart from the big accidents that may take place due to the release of significant natural gas amounts, nothing may cause adverse impacts on the public health and the project activity will not have a negative impact in that regards.

Thus, the impact level of this aspect is considered to be **insignificant**.

5.2.2.12 **Occupational Health and Safety**
The pipeline operation will not affect the occupational health and safety as there will be a small number of workers during the inspection and maintenance activities and the project activity will not have a negative impact in that regards.

Thus, the impact level of this aspect is considered to be **insignificant**.

5.2.2.13 **Existing Infrastructure**
The project operation will not affect the existing infrastructure and no significant impact concerning the existing infrastructure.

Thus, the impact level of this aspect is considered to be **insignificant**.

5.2.2.14 **Energy use**
This environmental aspect is considered a potential positive impact since the proposed project will support Egypt’s strategy by supplying the region with natural gas for electricity generation in addition to supplying natural gas to the residential areas. This will eventually lead to economic growth as the project implementation will attract economic investments to the region.

Furthermore, the proposed project will facilitate the use of a less carbon intensive fuel (natural gas) in 6th of October Power Plant, with a CO2 emission factor less than that of the grid, since the emission factor of the grid takes into account the use of more carbon intensive fuels in power generation (Heavy fuel oil, Light fuel oil and Coal). Thus, the project will result in net reduction in the CO2 emissions that would otherwise be generated using more carbon intensive fuels. Details of the calculations are mentioned in Annex 13.
Thus, the impact level of this aspect is considered to be high.

5.2.2.15 Community health and safety.
In addition to a full array of safety and emergency precautions taken by GASCO and the implementing entities, user safety is prioritized by stating emergency precautions on the land use over the pipeline and by setting up emergency response centers. Impacts on user health and safety may occur through improper handling of accidents.

User safety impacts could be permanent and highly severe.
5.2.3 Summary of the expected environmental impacts during the construction and operation phases of the project

<table>
<thead>
<tr>
<th>Activity</th>
<th>Air Quality</th>
<th>Aquatic Environment</th>
<th>Noise</th>
<th>Ecology</th>
<th>Land Use</th>
<th>Soil</th>
<th>Traffic</th>
<th>Cultural Heritage</th>
<th>Natural Disasters</th>
<th>Hazards and Accidents</th>
<th>Waste Disposal</th>
<th>Public Health</th>
<th>Occupational Health and Safety</th>
<th>Existing Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction Phase</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Site Preparation</td>
<td>Temporary, High</td>
<td>Temporary, High</td>
<td>Temporary, High</td>
<td>Not Applicable</td>
<td>Temporary, Low</td>
<td>Temporar y, Low</td>
<td>Not Applicable</td>
<td>Temporary, Medium</td>
<td>Temporary, Low</td>
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5.3 Impacts Significance Ranking

5.3.1 Ranking Methodology
Rating matrix method was applied to identify the significance of the impacts presented above for both the construction and operation phases. Each impact will be given a rank for severity (S) and frequency of occurrence (F). Ranks are given on a scale from 1 to 5, as shown in Table 5-1.

<table>
<thead>
<tr>
<th>Scale used in Severity and Frequency Ranking of Impacts</th>
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<tbody>
<tr>
<td>very low</td>
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</table>

An impact is considered significant if its severity is ranked 4 or higher, or if the product of the severity and frequency ratings is equal to 12 or higher.

To determine the severity rank, four parameters are considered, as follows:

1. Scale: How far can the impact spread? To exemplify, considerations can include the size of an area affected by land pollution impacts, number of people affected by health impacts, etc.
2. Possibility of reducing the impact: How difficult will it be to reverse or mitigate the impact? Considerations can include, for instance, availability of technology to change impact, level of complexity of available technology, capacity to apply the available technology, existence of constraints to change impact, etc.
3. Cost of changing the impact: How much will it cost to change the impact?, cost in relation to the means of change considered in the above parameter
4. Effect on public image: To what degree does the impact affect the public image of the enterprise (positively for positive impacts and negatively for negative impacts)?

As for the frequency rank, two parameters are considered:

1. Probability: What is the probability of occurrence of the impact?
2. Duration: How long will the impact last?

**Equation 1- Formula used to Determine Aspect Significance Ranking:**

\[
S = \text{AVERAGE}(R_{\text{scale}}, R_{\text{reducing possibility}}, R_{\text{cost}}, R_{\text{image}})
\]

\[
F = \text{AVERAGE}(R_{\text{probability}}, R_{\text{duration}})
\]

\[
R = S \times F = \text{significant if } (S \times F) \geq 12 \text{ OR } S \geq 4
\]

This analysis is conducted for both the construction and operation phases of the project.
5.3.2 Determination of Significant Impacts during the Project Construction

The rating system discussed above is applied to the environmental impacts resulting from the various aspects of the project construction stage, and the detailed assessment table is presented in Table 1, Annex 11.

As seen in Table 1, Annex 11, applying the impact ranking method discussed in the beginning of this section yields several significant negative impacts for the following aspects of the project construction stage:

1. Dust emissions during the construction phase due to the on-site activities (site preparation, excavation, etc)
2. The aquatic environment can be impacted in case of improper disposal of construction wastes or debris in the waterways, and in case of improper disposal of water resulting from hydrostatic testing.
3. Increase in noise level resulting from the construction equipment, and other excavation and construction works.
4. The possibility of affecting the existing infrastructure such as water and wastewater networks pipes, telephone connections, etc. during the construction activities.
5. Management of the different types of waste including domestic, hazardous and construction waste, such as Soil, Concrete, Welding belts, used oils, starting from their storage onsite until the final disposal.
6. Occupational Health and Safety aspects
7. Natural disasters that might lead to delays in the work schedule
8. Traffic impacts due to the increase in the number of trucks transporting construction materials and equipment to the site.

Mitigation measures for these significant impacts are discussed in the following subsection.

5.3.3 Determination of Major Impacts during Project Operation

The rating system discussed earlier is applied to the environmental impacts resulting from the various aspects of the project operation stage. The detailed assessment table is presented in Table 2, in annex 11.

For the project operation stage, there are two significant negative impacts appear which appear in:

1. In case of pipeline failure due to maintenance activities, accidents, sabotage or trespass, this may lead to the release of a significant amount of natural gas will cause major risks and to the surrounding communities and the environment.
2. Natural disasters might lead to pipeline failure and accordingly the release of natural gas, which will major risks to the surrounding communities and the environment.

The project implementation will yield one significant positive impact which is:
1. Supplying the region with natural gas for the electricity generation which will enrich the national electricity grid.
6 Alternatives

This chapter discusses the different possible alternatives in four main topics: alternative construction methods and technologies (especially in crossing roads, railways and waterways), alternative route options, alternative energy sources other than natural gas, in addition to the “No action” alternative.

6.1 The “No Action” Alternative

The main target of the proposed project is to increase the natural gas supply to 6 of October Power Plant, in order to help meet the growing national demand. In case of having “No Action”, the power plant will run on liquid fuel (Mazout or diesel) despite that there will be more polluting air emissions in case of transporting it through vehicles, and even during its burning. In the past years, Egypt has suffered from several blackouts which led to social problems which have even caused some political unrest. This was attributed to the shortage in fossil fuels; especially natural gas and mazout. Due to some recent natural gas discoveries, and after implementing the country’s strategy of switching the cement plants towards using coal instead of natural gas, the latter returns again to be the best alternative to power plants especially that mazout is mainly imported. The option of employing renewable energy to drive the 6 of October plant is not technically or economically viable since the power plant is already constructed and not using it is considered waste of resources. In the current time, it is not technically or economically feasible to fully depend on renewable energy projects to supply the continuously increasing national demand. However, installing renewable energy projects is part of the country’s strategy which targets to have 20% of its power generation using renewables by 2022, and this project is not interrupting the country’s plans in this issue.

6.2 Pipeline Installation Technology Alternatives

To install a natural gas pipeline beneath the ground level, this can either be done by digging a trench or using trenchless technologies. Trenchless technologies can be further classified as guided methods and non-guided methods. In this analysis, the most famous technology in each category will be considered; namely, horizontal directional drilling representing the guided trenchless technology, auger boring representing the non-guided trenchless technology, and the open-cut representing the trench technology.

6.2.1 Trenchless Technologies

Section 2 presents the description of HDD and auger boring technologies. HDD has some advantages compared to auger boring and open-cut technique as follows:

- Compared to the open-cut technology, it doesn’t cause interruption to traffic flow.
- Compared to the open-cut technology, it causes less disturbance to the surface and sub-surface soil layers.
- Compared to the auger boring technology, it can be used for larger distances and wider range of pipeline diameters.
• Compared to the auger boring technology, it is a surface-launched process which doesn’t require drive pits.
• Compared to the auger boring technology, it is a guided method, and accordingly can achieve high accuracy for the pipeline path.
• Can be employed for high depths, and accordingly can avoid any breakage accidents to the existing infrastructure lines/cables.

On the other hand, HDD suffers from some disadvantages including:

• Like any other trenchless technology, and according to the geologic condition, soil collapse may take place during the installation.
• In case of having existing infrastructure lines/cables, there will be less flexibility in choosing the pipeline depth, the fact which may necessitate drilling through soil layers which may be of insufficient strength to withstand the slurry’s pressure.
• Not favorable with soils containing gravels and cobbles.

6.2.2 Open-Cut Method

This is the traditional method for pipeline installation. It is very simple technology which just depends on excavating the soil, laying the pipeline, and backfilling. However, it is technically not possible to be used in crossings with major waterways. It can be used in crossings with major roads and railways; however, this will cause huge interruption to traffic as this will necessitate either rerouting or reducing the number of lanes. This will lead to reduction in the average speed of the vehicles on the road, and may affect the areas devoted for parking. This may also increase the probability of having car accidents, in addition to negative socio-economic impacts as a result of interrupting the flow of people and goods. Open-cut method may be the only possible solution in case of having long pipeline distances such as in agricultural lands or desert areas.

In conclusion, since the pipeline route does not cross any main road or railway, open-cut method is recommended to be used since this will not negatively affect the environment, and it will be a cheap and safe option.

6.3 Routing Alternatives

From the environmental and social point of view, the best pipeline route is the one which minimizes the change in the land use, the interruption of the ecological nature, the intersection with residential areas and areas with special nature such as religious buildings and historical areas. This point of view intersects with GASCO’s strategy which aims to choose a route away from the residential areas, and in locations already containing other infrastructure pipelines/cables to minimize disturbance in new areas. GASCO has an unwritten strategy that avoids passing through any construction buildings including: houses, religious buildings and historical areas.
As shown in Figure 2-1, the chosen pipeline route starts at a valves room at Abu Rawash Power station which is established on Tanash/Dahshor 20” pipeline and it extends 350 meters to the south towards 6 of October power plant. The pipeline route has a specified start point and end point, and due to the small length of this particular pipeline, there are no much routing alternatives available. In addition, this pipeline will pass beside an existing natural gas pipeline that serves 6 of October power station. The chosen pipeline route achieves the environmental and social targets, and at the same time aligns with GASCO’s strategy which aims at choosing routes already containing existing infrastructure pipelines to minimize disturbance in new areas. Moreover, the chosen route will also facilitate the implementation of the construction and maintenance activities of the pipeline.

GASCO conducted a site survey, and analyzed all the alternatives given the start point (existing valve room) and end point of the route; it was found that this is the only possible route for this pipeline.
7 Mitigation Measures

Based on the ranking system applied in the section 5 for identifying the significant impacts resulting from the project construction and operation phases, the construction activities will cause eight negative impacts in the fields of dust emissions, impacts on the aquatic environment, noise emissions, affecting existing infrastructure, occupational health and safety, natural disasters, traffic and generation of construction waste. Also, during the operation phase, it is expected that any natural gas release due to natural disasters or failure in the pipeline or during the maintenance activities will cause major accidents and hazards to the surrounding environment.

GASCO will implement the following mitigation measures during the construction and operation phases of the project to eliminate or reduce the probability of occurrence of the negative impacts.

The controls proposed to mitigate or enhance the negative or positive impacts, successively are elaborated in the following sub-sections.

7.1 Mitigation Measures for Impacts during Construction Phase

7.1.1 Proposed Mitigation Measures for Dust Emissions

During the construction phase, dust emissions are expected from on-site activities (preparation, excavation, etc.), in addition to the various construction equipment and vehicles that will be used on site. An assigned supervisor will ensure the implementation of good site construction practices as follows:

- Appropriate setting and covering of stockpiles of friable materials with adequate cover in addition to regular water spraying so as to minimize dust blow.
- Minimizing drop heights for material transfer activities such as unloading of friable materials.
- Transportation of construction waste by a licensed contractor.
- Sheeting of Lorries transporting friable construction materials.

7.1.2 Proposed Mitigation Measures for Gaseous Emissions

- Maintaining and operating construction equipment and vehicles properly during the construction phase and ensure the compliance of the exhaust emissions from diesel engines with the limits of the environmental law.
- Ensuring that vehicles and equipment will not be left running unnecessarily to reduce gaseous and exhaust emissions from diesel engines.
- Using paved routes to access the site wherever possible.
7.1.3 Proposed Mitigation Measures for Solid, Construction and Hazardous Waste Generation

- The existing solid waste management procedures of GASCO will be adopted. The existing management system includes sections on waste reduction, material reuse and recycling, waste segregation with the objective of minimizing the quantity of waste that requires offsite disposal.
- The contractor will obtain official permits from the local authorities for the disposal of wastes (construction wastes landfills, hazardous wastes landfills,…etc) prior to the commencement of construction activities.
- Wastes will be segregated and safely temporarily stored in the allocated areas for waste storage on the premises of the construction site in a way that doesn’t cause further traffic disruption.
- Wastes will be covered to avoid the pollution of the ambient air by dust dispersion.
- Adequate trucks will be used for wastes transportation and the trucks will not be overloaded with wastes volumes.
- Consignments for waste disposal will be recorded.

7.1.3.1 Non-Hazardous Waste Generation

- The non-hazardous wastes (paper, garbage, wood, plastics,…) will be segregated and transported to the local disposal sites by the mean of the approved contractor.
- The non-hazardous wastes will be transported off-site for recycling or final disposal by a licensed contractor and GASCO will supervise the disposal procedure and the conditions of the trucks.

7.1.3.2 Hazardous Waste Generation

- The asphalt waste resulting at the end of the construction phase will be disposed with the construction waste, since asphalt recycling is not a common practice in Egypt.
- Activities that involve fueling, lubricating or adding chemicals will not take place on-site unless it is necessary to avoid soil pollution and generation of additional hazardous wastes. If such actions will necessarily take place on-site, they will be conducted over impervious surfaces and a spill kit will be made available on-site.
- Containers of used chemicals and oil will be collected and disposed in an approved hazardous wastes facility in coordination with the local authorities.
- The hazardous liquid waste will be collected in specific drums and transferred to authorized petroleum companies (Misr Petroleum &Petrotrade companies) to be recycled.
- According to Article 33 of Law 4/1994, the contractor is required to keep up records and manifests in a register for the methods of waste disposal and the agencies contracted to receive such wastes.
7.1.3.3 Construction Waste Generation

- The construction waste generated has to be disposed in safe locations assigned by the contractor and the local authorities before starting the construction phase. Two landfills can be used for the disposal of construction wastes; one located at Shabramant in Abu Elnomros District, Giza and the other in Sadat City in Menoufeya. However, the contractor will coordinate with the local authorities before the commencement of construction activities the exact landfill to be used.
- A temporary storage location near the pipeline in the construction process has to be assigned. These storage areas should be far away from the traffic congested areas.
- Waste collection should occur daily and it should be transported to the approved and safe disposal locations via adequately equipped trucks. The supervisor has to make sure that this process occurs without any hazards or problems.
- Excavated soil will be reused in the backfilling of the pipeline. The excess excavated soil volumes will be sent to the construction wastes landfill.

7.1.4 Damage to Existing Infrastructure

There is a high risk of damaging the infrastructure lines that have been established a long time ago without having a proper and accurate mapping or documentation that shows the depths and the routes of these lines (ex. Water, sewage and telecommunication lines...etc). The following mitigation measures will be applied to the proposed project:

- The contractor will gather the most accurate area maps for infrastructure routes before commencing excavation.
- The contractor will performs exploratory excavations manually in the area of the project in order to avoid any damage to the existing infrastructure.
- If a line break occurs, the site manager has to quickly notify the nearest police department and the correspondent authority (according to the type of broken pipe). The authority shall repair the damaged line as soon as possible and the contractor will pay the repairing costs.
- In case an infrastructure line is damaged, a documentation report for infrastructure pipe damage shall be prepared for the any accident, containing the following aspects:
  a. Time and location of accident
  b. Name of contractor/subcontractor causing the accident.
  c. Type of damaged infrastructure line
  d. Description of accident circumstances and causes in addition to the extension of damage.
  e. Actions taken and responses of different parties, such as correspondent authority
  f. Duration of fixing the damage
7.1.5 Noise
Construction activities will cause increase in the ambient noise levels that resulting from the vehicles and machines used for excavation and construction purposes. However, this impact is temporary and will diminish by the end of the construction phase. The following mitigation measures will applied to reduce the noise impact during the construction phase:

- Noise exposure periods should be minimized for workers so as not to exceed the safe limits mentioned in the environmental laws in addition to the occupational health and safety standards.
- Workers operating in areas or activities of high noise level intensities should be supplied with earmuffs.
- Contractors should train all the workers before the commencement of construction activities about this hazard and how to avoid it.
- If the construction is done in a populated area, construction activities must be minimized during night so as not to disturb the surroundings.
- Avoid construction activities during peak hours of heavy traffic whenever possible; especially when the project site is in proximity of a sensitive receptor.
- Restrictions on lorry movements to prevent noise nuisance in the early morning/late evening.
- All machine and vehicles should be shut-off when not used.

7.1.6 Management of Traffic Disruptions

- Informational signs should be posted at the construction zones before the commencement of any construction activities to inform drivers and ensure the safety of the roads.
- According to the Egyptian Road Code of Practice (Ministry of Housing, 1998), markings, in the form of lane lines and directional arrows, will be posted to direct drivers to the proper lane changes and turnings during the construction phase.
- The contractors and the site supervisor should choose a location for temporary storage of construction materials, equipment, tools, wastes and machinery before construction so as not to cause further traffic disruptions due to routes blockages. In case lateral excavations will take place, alternative routes should be decided upon and facilitated for the use of drivers. The time period of using such alternative roads should be minimized.
- Pedestrian crossings can be provided if necessary.
- Construction work should be avoided at the traffic peak times whenever possible.
- Upon using the open-cut method in agricultural lands, alternative roads should be developed to facilitate the entrance to the farms and an agreement should be held with the owner of these farms beforehand.
- Uncontrolled off road driving will be prohibited.
7.1.7 Mitigation Measures for the Impacts of Water Use/Wastewater generation

- In case groundwater occurs in the construction site, all the necessary permits from the local sewage or irrigation authority for dewatering should be obtained and the drainage of dewatering water should be pre-planned.
- If the groundwater is contaminated or contains hydrocarbons that could be observed or smelled, it should be collected in separate barrels and transported to a specialized wastewater treatment facility after coordinating with MWRI.
- All liquid waste generated such as chemicals and sewage should be collected in suitable tanks to prevent their drainage over land.
- The water resulting from the hydrostatic test of the pipeline should be tested before being discharged in a water body or be transported directly to the nearest waste water treatment plant after coordinating with the wastewater company and MWRI.

7.1.8 Occupational Health and Safety

- Ensure the adequate implementation of occupational health and safety provisions on-site such as providing the personal protective equipment (PPE) to the workers.
- The site should be provided by all the protective and safety requirements stipulated by labor laws and occupational health.

7.1.9 Land Use

- Restoring the land to its original condition at the end of the construction phase.
- Hazardous liquids have to be handled carefully in order to avoid the spilling or leaks to the ground.

7.1.10 Mitigation Measures for Hazards and Accidents

GASCO holds the responsibility to implement all the plausible precautions to safeguard the pipeline construction activities and protect the surroundings. An emergency preparedness response plan, which is already prepared by GASCO, will be in place to give instructions about the identification of the potential occurrence of accidents and emergency situations that may occur during the pipeline construction and how to respond to them to reduce the risks and impacts that may be associated with these emergency situations.

7.1.11 Management of Community health and safety

In addition to all the environmental and social management and monitoring measures in this section which aim for health and safety, awareness-raising actions and signs should be provided to workers and community members to promote safety and health while safety supervisors hired by the
implementing company to oversee work sites and will be largely responsible for children and their safety around the construction site. Trenching activities can cause impacts on safety of the local community or the workers, in case the contractor does not comply with the safety requirements. It is important to include necessary safety measures that the contractor should apply in the contracts and these measures to be monitored as part of the monitoring activities.

7.1.12 Management of grievances (Environmental and Social Grievance Redress Mechanisms)

Grievance system is also important to ensure that complaints are properly handled without delay that may negatively affect the project. Moreover, to ensure that information is shared transparently and that they are accountable to the hosting communities. A functioning GRM is considered to be a good feedback mechanism from the project affected persons and one tool of the citizen engagement.

GASCO operates a comprehensive GRM procedure: Leaflets, posters and brochures are prepared and distributed to the beneficiaries, NGOs, local governmental units, mosques and churches. Thus, sufficient and appropriate information about the GRM will be shared with the communities prior to the construction phase.

Additionally, the World Bank’s Grievance Redress Service (GRS) provides an additional, accessible way for individuals and communities to complain directly to the World Bank if they believe that a World Bank-financed project had or is likely to have adverse effects on them or their community. The GRS enhances the World Bank’s responsiveness and accountability by ensuring that grievances are promptly reviewed and responded to, and problems and solutions are identified by working together. The GRS ensures that complaints are being promptly reviewed and addressed by the responsible units in the World Bank.

The objective of the Grievance Redress Service is to make the Bank more accessible for project-affected communities and to help ensure faster and better resolution of project-related complaints through the following link (http://www.worldbank.org/grs) and e-mail (grievances@worldbank.org).

The following procedures will be applied in order to have a clear grievance’s activities:

7.1.12.1 Institutional Responsibility for Grievances

GASCO Compensation Committee and Social Development Officer (SDO) in cooperation with the local government units, governorates, agriculture associations, and the project manager will address all grievances raised by community people, particularly the ones related to resettlement activities.

The main tasks of the Social Development Officer are:

1- Raise awareness about the grievances mechanisms among the PAPs
2- Collect the grievances received from different channel
3- Document received grievances
4. Direct the grievance to the responsible department to address the grievance
5. Follow up on the resolution
6. Document, report and disseminate outcomes of the grievances
7. Monitoring of grievances activities

7.1.12.2 Grievances Tiers

The proposed mechanism is built on two tiers of grievances:


The Project Manager for each site / SDO is responsible to ensure that the GRM system is widely advertised and well explained on the local level. Moreover, s/he will follow up on the complaint until a resolution is reached. The turnaround time for the response/resolution should be 10 days and The SDO should inform the complainant of the outcome of the grievance.

It is worth noting that most of the previous experience of GASCO is suggesting that complaints are usually handled efficiently and resolved on the local level. In case the PAP is not satisfied with the resolution, the complainant shall submit the grievance to the second level of grievance.

Second tier of Grievances: On the level of GASCO headquarter (Mediation Committee)

If the aggrieved person is not satisfied with the decision of the first tier, he can raise the complaint to the Mediation Committee at GASCO headquarter. The Mediation committee should ensure a resolution is made within 15 days.

1. The above mentioned tiers are consistent with the World Bank’s policy OP 4.12. Providing multi-levels of tiers will result in amicable implementation of the project. It is a function of the project, to provide aggrieved people with an avenue for amicable settlement without necessarily pursuing a court case. The absence of first tier mechanism denies project affected groups the direct channel for grievance and delays resolution of disputes against the interest of both the PAP and the project.

7.1.12.3 Grievance channels

Due to the diversity of the context in different Governorates and the socioeconomic characteristics of the beneficiaries, the communication channels to receive grievances were locally tailored to address all petitioners concerns and complaints. The following are the main channels through which grievances will be received:

1. Project Manager (on Site) acts as the main channel for receiving complaints. He is available on the location. Most of the complaints raised to him/her are raised verbal. He should document all received grievances in written form, giving each grievance a serial number.
2. Hotline: 149 is the hotline in GASCO
3. Community leaders and NGOs/CDAs are an appropriate channel, particularly, in rural areas.
4. Regular meetings with community members including influential stakeholders
5. GASCO Website for literate persons who have access to the internet
6. GASCO Compensation Committee, Mediation Committee and Government Relations Committee

7.1.12.4 Response to grievances
Response to grievance will be through the following channels
1. The same channel the complaint was submitted.
2. Response to grievances should be handled in timely manner (according the duration indicated for each tier), thereby conveying a genuine interest in and understanding of the worries put forward by the community.
3. GASCO should keep a record of complaints and results.

7.1.12.5 Monitoring of grievances
1. All grievance activities should be monitored in order to verify the process. The following indicators should guide the monitoring process:
   1. Number of received grievances per month (Channel, gender, age, basic economic status of the complainants should be included)
   2. Type of grievance received (according to the topic of the complaint)
   3. Number of grievances solved
   4. Level of satisfaction with grievance resolutions
   5. Documentation efficiency
   6. Dissemination activities done
   7. Efficiency of response to grievance provided (efficiency in time and action taken)

A Grievance Monitoring Report should be developed on a quarterly basis in order to keep track of all grievances developed. The report should be developed by the SDO in the GASCO headquarter

All grievances received shall be documented in a grievance register. The following table represents the main contents of such form:

<table>
<thead>
<tr>
<th>Box 1: Grievance form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial Number:</td>
</tr>
<tr>
<td>Markaz:</td>
</tr>
<tr>
<td>Date:</td>
</tr>
<tr>
<td>Gender of the aggrieved person</td>
</tr>
</tbody>
</table>
7.2 Mitigation Measures for Impacts during Operation Phase

7.2.1 Mitigation Measures for Hazards and Accidents

- GASCO holds the responsibility to implement all the plausible precautions to safeguard the pipeline during its operation and protect the surroundings. A full description of the technical design measures used to mitigate the risk of any operational failures is provided in the QRA report prepared by GASCO.

- Regarding the possibility of the release of significant amount of natural gas during the pipeline operation, regular inspection and preventive maintenance activities will be conducted by GASCO to check the pipeline connection and the welding efficiency. The inspection will additionally include checking any construction activities in the vicinity of the pipeline to prevent any failure that may lead to breakage or threaten the safe operation of the pipeline.

- The pipeline is monitored by centralized SCADA systems monitored by GASCO to observe the operating parameters of the pipelines. If any failure occurred such as corrosions or leaks, valves supplying the pipeline will be shut down and the maintenance team will implement the appropriate maintenance actions. In addition to that, signs with a number for emergency will be placed on the pipeline route to be used in case of any emergency. Also, signs indicating the presence of the high pressure pipeline underneath will be posted.

- Advanced fire and gas detection systems as well as shutdown and isolation systems will be installed all over the pipeline.

- Pipeline patrolling will be conducted to ensure there are no encroachments on the pipeline, and the frequency of patrolling will vary according to area class as follows:

<table>
<thead>
<tr>
<th>Pipeline Location</th>
<th>Vehicular</th>
<th>Walking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location Class 1</td>
<td>6 months</td>
<td>No survey</td>
</tr>
<tr>
<td>Location Class 2</td>
<td>1 month vehicular accessible areas in canal and river crossings</td>
<td>6 months Arable land, AGIs, valve rooms,</td>
</tr>
<tr>
<td>Location Class</td>
<td>Action</td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2 weeks survey all areas</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2 weeks survey all areas</td>
<td></td>
</tr>
</tbody>
</table>

- All necessary permits will be obtained from landowners, farmers, railways, etc. prior to starting work. The patrol will ensure that he holds a valid identity card or letter of authorization.
- Leakage surveying will be conducted to protect the surrounding population and workers against the effects of gas leakage from the pipeline in case any damage to the pipeline is detected. The survey will be conducted in areas where the pipeline runs close to buildings and workers.

**Emergency Response Plan**

An emergency preparedness response plan, which is already prepared by GASCO, will be in place to give instructions about the identification of the potential occurrence of accidents and emergency situations that may occur during the pipeline operation and how to respond to them to reduce the risks and impacts that may be associated with these emergency situations. Workers will be provided with adequate emergency preparedness and response training and simulations.

The Emergency Preparedness and Response Procedures include the following aspects:

- Overview of emergency management
- Emergencies classes brief description
- Key personnel responsibilities
- Typical site emergency procedure
- Emergency communication plan

GASCO HSE General Manager coordinates with all GASCO sites to review and update the emergency plan at least once a year, and all GASCO sites are provided with sufficient and suitable tools and capabilities needed for emergency situations. These facilities may be some or all of the following:

- Fire-fighting equipment
- Fire-fighting systems & automatic safety control systems
- Personal protective equipment (PPE)

The emergency response plan includes also a hotline for the local community to report any emergencies. The number is “149” and it is advertised along the signs added to locate the pipeline.
Moreover, in planning the emergency preparedness response, GASCO takes into account the needs of relevant interested parties, e.g. emergency services and neighbors; where arrangements with the neighboring communities are agreed and considered to integrate them in emergency preparedness plan to overcome any possible accidents. Trial emergency experiments also take place periodically according to contingency plan requirements; involving relevant interested parties as appropriate. The full details of the HSE plan during the operation are attached in Annex 6.

7.2.2 Energy Use
This environmental aspect is considered a potential positive impact since the proposed project will support Egypt’s strategy by supplying the region with natural gas for electricity generation in addition to supplying natural gas to the residential areas. This will eventually lead to economic growth as the project implementation will attract economic investments to the region.

7.2.3 Community health and safety
Several measures are suggested to overcome obstacles to full understanding and adoption of safety measures by the clients in the social management plan. Examples include using drawings instead of written instructions to improve communication with illiterate customers, coordinating with women of local NGOs to explain safety precautions to women in the households to be connected, and constantly monitoring the performance of emergency response units.

GASCO must perform regular inspections and maintain awareness campaigns to ensure that NG pipelines are not subject to encroachments as well as explain the components of the NG passing through the lines and measures to be taken in case of any accidents such as calling the hotline.
8 Environmental and Social Management and Monitoring Plan (ESMMP)

8.1 Objectives of the ESM&MP
The objective of the Environmental and Social Management and Monitoring Plan (ESMMP), is to outline actions for minimizing or eliminating potential negative impacts and for monitoring the application and performance of mitigation measures. The ESMMP identifies roles and responsibilities for different stakeholders for implementation and monitoring of mitigations. This section also presents an assessment of the institutional capacity for implementing the ESMMP.

Wherever applicable, the ESMMP is designed to accommodate alternative context-specific mitigations and monitoring measures.

8.2 Institutional Framework for Implementation
The project shall be implemented by the Egyptian Natural Gas Company (GASCO), an affiliate of the Egyptian Natural Gas Holding Company (EGAS), which owns a majority share.

The following project management chart (Figure 8-1–Site Project Management Structure in GASCO), of GASCO indicates that the responsibility of each relevant employee in the project’s implementation.
The Environmental Policy of GASCO mentions that the company and its affiliates are committed to:

- Comply with legislation relevant to their nature of activity
- Provide training and awareness for their staff in order to carry out their work safely
- Achieve continual improvement in the fields of safety, health and environment
- Investigate and analyze incidents to prevent its recurrence
- Follow-up companies and contractors compliance and implementation of health, safety and environment rules, regulations and provisions
- Provide necessary information and data on health, safety and environment
- Ensure execution of the policy through setting objectives, targets and an action plan. The policy shall be reviewed whenever needed

Staff members of GASCO carry out audits and, to make sure the ESMMP is being implemented according to set objectives and targets. As part of the ESMMP procedures, GASCO presents monthly and quarterly reports about its environmental performance. GASCO reviews these reports, and makes occasional site inspections to compare these reports with field conditions.
8.2.1 Environmental Management Structure of Implementing Agency

GASCO is also certified for ISO: 14001 and OHSAS: 18001, and has direct involvement in the environmental management and monitoring of the natural gas pipeline. One of the standard tasks of the HSE Department of GASCO, which is followed up by EGAS, is establishing Environmental Registers for facilities, and frequent auditing of this register. The Environmental Register is audited by the Environmental Department head of GASCO. The HSE Department performs audits twice annually on the average, in addition to infrequent and emergency inspections. The routine monitoring activities performed include:

- Visual inspection of solid waste and scrap, and disposal methods
- Visual inspection of existence of liquid waste such as leaked condensate hydrocarbons or chemicals used in the heaters
- Checking that handling of hazardous waste is according to the approved procedures, which are described below
- Use gas analyzers to measure SO$_2$, CO, CH$_4$ and O$_2$ in ambient air, and detect possible leaks
- Noise measurements

GASCO HSE personnel have received training on environmental auditing, environmental impact assessments for industrial establishments, and environmental legislation.

The Environmental Department of GASCO has been less involved on design, planning, tendering and construction procedures of natural gas connection projects. Their role has been more effective in the operational phase according to the described procedures above. However, the Safety Department in GASCO usually reviews designs, and assigns full time staff member to supervise the construction contractor, making sure that adequate safety measures are considered during design and implemented during construction.

The current positions and person-power of the HSE Department of GASCO is shown in Figure 8-2. These positions are divided over three sectors of the HSE Department, namely Environmental Protection, Safety and Fire Fighting, and Technical Consultancy and Inspection. Furthermore, representatives from each sector are present at the Site HSE department, as well as the HSE headquarters. The organizational structure is shown in Figure 8-3.
The ESMMP will suggest mitigation and monitoring responsibilities for the contractor and GASCO’s HSE Department. The assignment of these responsibilities among the various sectors of the department is the decision of GASCO HSE Management.
Figure 8-3 - GASCO OHSE organizational chart
8.2.2 Social Management Structure of Implementing Agency

The analysis conducted during the preparation of the ESIA and the RAP showed clearly that the main impacts that should be carefully mitigated and addressed is the impact related to temporary and permanent land acquisition and the accompanying process of crops valuation and paying compensation. Currently, this process is done by GASCO through the Compensation Department, which participated in the formation of a Compensation Committee for the project.

The ESIA team noted that although this department is fully aware of the acquisition and compensation issues and is adapting an approach which is very close to the Bank's requirements, certain specific considerations related to OP 4.12 are still not very clear for GASCO staff. The ESIA team suggests appointing a "Social Development Officer" who should be working on full time basis during the project construction to ensure the social management plan is sufficiently addressed. The Social Development Officer might be a GASCO staff with relevant background (e.g. a background in social development or social science). It is required that the "Social Officer" be aware of the World Bank safeguard policy on involuntary resettlement and the associated procedures. Training courses on participatory approaches and the aspects of OP 4.12 might be needed in order to build his/her capacity to efficiently follow up the implementation of the social management plan. The Social Development Officer will be working closely with the Consultant who will be preparing the RAP.

GASCO has appointed Eng. Ahmed Galal, a staff member of the Environmental and Social Department as Social Development Officer during the project implementation. His contacts are added in the grievance mechanism.

8.2.2.1 Social Development Officer

The main roles and responsibilities of the Social Development Officer are as follows:

- He/She is the primary person in charge of ensuring that the proposed social management plan is sufficiently considered and applied.
- Develop detailed list of the local stakeholders and the NGOs representatives and maintain communication channels with them and ensure that they are engaged and consulted
- Developing all the required techniques and formats to monitor the implantation of the social management plan
- Report to the WB on the progress related to the ESMP and the safeguard policies including the fair compensation to PAPs
- Assure transparent and timely sharing of information
• Review PAPs grievance and conduct regular feedbacks and meetings as a proactive and early measure to eliminate disputes
• Follow up the progress to respond to the concerns of PAPs
• Work closely with local NGOs and other stakeholders to raise the awareness of local communities on the safety of line and other related issues.

This social management plan involves a monitoring process that will be the main responsibility of the Social Development Officer. The monitoring of the compensation process and the adherence to the safeguard policy OP 4.12 necessitates the development of some forms/templates in order to be able to process the management and monitoring system appropriately. This includes a Registration Form for affected plots, containing specific information to identify the owner and the approximate value of the crops. Also, a grievance form should be used to record any complaints and ensure that action will be taken. Draft model for these forms are provided in Annex 8. It should be noted that these forms should be updated by the Social Development Officer based on the actual needs.

The results of the monitoring and management system should be reported quarterly to the Headquarter of GASCO. The monitoring and management will be implemented by the branches of GASCO in each governorate under the supervision of the Social Development Officer.

In addition to appointing the Social Development Officer other local-based mechanisms are also suggested, mainly the establishment Compensation Committee with main objective of working as a safeguard mechanism to ensure that the interests of the poor and most vulnerable are protected and to ensure that the valuation and compensation process is as transparent as possible.

8.2.2.2 Compensation Committee

The main roles and responsibilities of the Compensation Committee are as follows:

• Supervise the inventory survey for the project affected persons (PAPs)
• Valuate the affected assets
• Estimate the amount of compensations to PAPs based on the collected information (Egyptian legislations and the World Bank safeguard policy OP 4.12)
• Prepare and disseminate lists of PAPs
• Obtaining approvals from GASCO on the planned compensation
• Apply proactive mechanism for grievance redress including transparent sharing of information, carrying out consultative activities with the local communities and ensuring involvement of local leaders in resolving disputes.
• Ensure that grievances are addressed
Normally, this Committee (currently is formed under GASCO projects) is composed of a manager, an accountant and a lawyer. The committee will be composed of the following members:

- A representative from the GASCO (namely the Social Development Officer and the staff of the Compensation Department including the lawyer,
- A representative from the contractor
- A representative from the Agriculture Association

In cases of acceleration of disputes, a Supreme Compensation Committee with the responsibly of settling disputes could involve the same composition above headed by councilor from the Supreme Court. It should be stressed here that all possible mitigation actions and procedures should be considered in order to prevent the in necessity of involving the Supreme Committee.

8.3 Management and Monitoring Activities during the Construction Phase

8.3.1 Management of Air Quality

8.3.1.1 Management of Dust Emissions
Monitoring dust emissions will take place by monitoring activities that generate dust such as (excavation, preparation of site, vehicles and equipment movement..); ensuring that measures for minimizing dust emissions are applied properly while performing such activities.

8.3.1.2 Management of Gaseous Emissions
Monitoring of air emissions will be done by the periodic inspection of vehicle maintenance schedules, and black smoke produced from any machinery should be observed on-site.

8.3.2 Management of Solid, Construction and Hazardous Waste Generation

8.3.2.1 Solid and Construction Waste Generation
To monitor solid and construction waste management practices, observation of solid and construction waste stockpiles should take place to ensure the frequency of their removal from the site. Site observations will also take place to ensure that solid and construction wastes stockpiles do not contain hazardous components and monitor the frequency of their removal from the site.

8.3.2.2 Hazardous Waste Generation
To monitor hazardous waste management practices, observation of hazardous waste stockpiles should take place to ensure the frequency of their removal from the site.

8.3.3 Management of Land Use
- Recording any spills or leakages incidents and periodically analyzing these data.
• Surveying of structural status of buildings and performing soil investigations shall be undertaken under the supervision of a structural consultancy firm if necessary.

• The pipeline route should be revisited and investigated at the end of the construction phase to ensure that the land has been restored to its original conditions before the project. These observations can be performed as part of the pipeline patrolling and leakage surveying, described in Section 7.

8.3.4 Management of Possible Risk on Damaging the Existing Infrastructure
Such risk can be monitored by documenting and analyzing reasons that led to the existence of such type of accidents and updating procedures to prevent their reoccurrence in the future.

8.3.5 Management of Noise Production
Monitoring of noise impacts can be done by periodic observation of the extent of implementation of the mitigation measures mentioned above in section 7.

8.3.6 Management of Traffic Congestion
Implementation of all mitigation measures mentioned in section 7 in coordination with Traffic Departments of the appropriate governorate shall be monitored.

8.3.7 Management for Occupational Health and Safety
Management of Occupational health and safety can be monitored by on-site observations and also by assuring that all health and safety measures mentioned in section 7 are applied adequately on-site during the construction phase. An occupational health and safety plan done by the contractor is available for the construction phase and could be found in annex 12.

8.3.8 Management of Water Use/Wastewater Generation
- Monitoring if any oily appearance or smell is observed on-site. This could indicate whether to classify this water as hazardous waste or not, and determine whether it should be sent to an appropriate treatment plant. Coordination with MWRI is necessary regarding the water generated from the hydrostatic testing.
- Reviewing the hazardous wastes register to track the quantities and types of generated chemicals and oils wastes on-site and assure that the collection and handling of such substances is done by an authorized contractor.

8.3.9 Monitoring Activities Table
The tables below include the proposed mitigation measures for each impact, the implementation direct responsibility and the supervision responsibility, in addition to the proposed monitoring activities and methods, frequency and location of monitoring during the construction phase.

The preliminary cost for the general implementation and supervision for all the proposed mitigation measures was estimated to be approximately 13,000 EGP/month. Additional costs will be stated for some mitigation measures in the following table.
<table>
<thead>
<tr>
<th>Potential Environmental Impact</th>
<th>Proposed Mitigation Measures</th>
<th>Responsibility of Mitigation</th>
<th>Responsibility of direct supervision</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air emissions</td>
<td>• Implementation of regular maintenance schedule for machinery</td>
<td>Contractor</td>
<td>GASCO HSE site supervisor</td>
<td>General Implementation/supervision cost: 13000 EGP/month</td>
</tr>
<tr>
<td></td>
<td>• Ensuring that vehicles and equipment will not be left running unnecessarily to reduce gaseous and exhaust emissions from diesel engines</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dust Emissions</td>
<td>• Water spraying before excavation, filling, loading and unloading</td>
<td>Contractor</td>
<td>GASCOHSE site supervisor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Spraying of stockpiles, storage in covered areas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Using paved routes to access the site wherever possible.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Sheeting of Lorries transporting friable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential Environmental Impact</td>
<td>Proposed Mitigation Measures</td>
<td>Responsibility of Mitigation</td>
<td>Responsibility of direct supervision</td>
<td>Estimated Cost</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------------------------</td>
<td>-----------------------------</td>
<td>-------------------------------------</td>
<td>----------------</td>
</tr>
</tbody>
</table>
| **Risk of damaging existing infrastructure** | • Consult maps before excavation work  
• Use of trial pits  
• Analysis of accidents logs  
• If a line break occurs, the nearest police department and the corresponding authority shall be informed to repair the damaged line | Contractor | GASCOHSE site supervisor | • General Implementation/ supervision cost  
• Cost of infrastructure damage will vary according to the type of damage. The cost will be charged on the contractor. |
<p>| <strong>Solid, Construction and hazardous waste generation</strong> | • Identification and use of approved nearby disposal sites through | Contractor | GASCOHSE site supervisor | • Hazardous Waste Disposal: 3500 EGP/ton + |</p>
<table>
<thead>
<tr>
<th>Potential Environmental Impact</th>
<th>Proposed Mitigation Measures</th>
<th>Responsibility of Mitigation</th>
<th>Responsibility of direct supervision</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>local authority</td>
<td></td>
<td></td>
<td>transportation cost</td>
</tr>
<tr>
<td></td>
<td>• On-site segregation of wastes according to their types</td>
<td></td>
<td></td>
<td>• General Implementation/supervision cost</td>
</tr>
<tr>
<td></td>
<td>• Designation and use of appropriate stockpiling locations on site</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Covering waste stockpiles to avoid ambient air pollution</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Daily hauling of waste to disposal site in covered trucks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Activities involving fueling, lubricating or adding chemicals will not take place on-site (unless it is necessary) to avoid soil pollution and generation of additional hazardous wastes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Containers of used chemicals and oil will be collected and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential Environmental Impact</td>
<td>Proposed Mitigation Measures</td>
<td>Responsibility of Mitigation</td>
<td>Responsibility of direct supervision</td>
<td>Estimated Cost</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------------------------</td>
<td>-----------------------------</td>
<td>-------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Noise</td>
<td>disposed in an approved hazardous wastes facility • The hazardous liquid waste will be collected in specific drums and transferred by authorized companies</td>
<td>Contractor</td>
<td>GASCOHSE site supervisor</td>
<td>General Implementation/supervision cost</td>
</tr>
</tbody>
</table>

- Minimize the time of exposure of workers to noise
- Ensuring the use of ear plugs in the field
- Training all the workers before the commencement of construction activities about this hazard and how to avoid it
- Construction activities will be minimized during night so as not to disturb the
<table>
<thead>
<tr>
<th>Potential Environmental Impact</th>
<th>Proposed Mitigation Measures</th>
<th>Responsibility of Mitigation</th>
<th>Responsibility of direct supervision</th>
<th>Estimated Cost</th>
</tr>
</thead>
</table>
| Traffic Congestion           | • Using signs for drivers before the commencement of any construction activities to inform drivers and ensure the safety of the roads  
  • Planning alternative routes when roads are obstructed  
  • Choosing a location for temporary storage of construction materials, equipment, tools, wastes and machinery before construction so as not to cause further traffic disruptions  
  • Avoiding | Contractor | GASCOHSE site supervisor | General Implementation/supervision cost |
### Potential Environmental Impact

<table>
<thead>
<tr>
<th>Proposed Mitigation Measures</th>
<th>Responsibility of Mitigation</th>
<th>Responsibility of direct supervision</th>
<th>Estimated Cost</th>
</tr>
</thead>
</table>
| construction work at the traffic peak times whenever possible  
• Prohibiting uncontrolled off road driving | Contractor | GASCOHSE site supervisor | • General Implementation/ supervision cost  
• 6500 EGP/sample |

**Water use/Wastewater generation**

- Acquire discharge permits from sewage/irrigation authority  
- Liquid waste generated such as chemicals and sewage should be collected in suitable tanks  
- The water resulting from the hydrostatic test of the pipeline should be tested before being discharged in a water body or be transported directly to the nearest water treatment plant. Prior coordination

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Page 149 of 218
## Potential Environmental Impact

<table>
<thead>
<tr>
<th>Hazard and Accidents</th>
<th>Proposed Measures</th>
<th>Responsibility of Mitigation</th>
<th>Responsibility of direct supervision</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>with the Ministry of Water Resources and Irrigation (MWRI) is necessary</td>
<td>GASCO HSE department</td>
<td>GASCO Headquarters</td>
<td>GASCO management cost (General Implementation/supervision cost)</td>
</tr>
<tr>
<td></td>
<td>An emergency preparedness response plan, which is already prepared by GASCO, will be in place to give instructions about the identification of the potential occurrence of accidents and emergency situations that may occur during the pipeline construction and how to respond to them to reduce the risks and impacts that may be associated with these emergency situations</td>
<td>Contractor</td>
<td>GASCO Headquarters</td>
<td>General Implementation/supervision cost</td>
</tr>
<tr>
<td></td>
<td>Restoring the land to its original condition</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Land Use**

- Restoring the land to its original condition
### Potential Environmental Impact

<table>
<thead>
<tr>
<th>Proposed Mitigation Measures</th>
<th>Responsibility of Mitigation</th>
<th>Responsibility of direct supervision</th>
<th>Estimated Cost</th>
</tr>
</thead>
</table>
| at the end of the construction phase.  
• Hazardous liquids have to be handled carefully in order to avoid the spilling or leaks to the ground | Contractor | GASCO HSE site supervisor |  
• Training Cost: 6000 EGP/training program  
• General Implementation/supervision cost |  

### Occupational Health and Safety

- Ensure the adequate implementation of occupational health and safety provisions on-site such as providing the personal protective equipment (PPE) to the workers.  
- The site should be provided by all the protective and safety requirements stipulated by labor laws and occupational health.
### Table 8-2 - Environmental Monitoring during Construction

<table>
<thead>
<tr>
<th>Impact</th>
<th>Monitoring Indicators</th>
<th>Responsibility for implementation</th>
<th>Supervision</th>
<th>Frequency/Duration</th>
<th>Location</th>
<th>Methods</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air emissions</td>
<td>Inspection of vehicle and machinery maintenance schedule</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Quarterly</td>
<td>Documentation office</td>
<td>Review of schedule</td>
<td>Contractor cost</td>
</tr>
<tr>
<td>Exhaust emissions concentrations from diesel generators</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Once before construction commencement, then quarterly for each vehicle</td>
<td>Vehicle maintenance site</td>
<td>Sampling of exhaust emissions</td>
<td>Contractor cost</td>
<td></td>
</tr>
<tr>
<td>Dust Emissions</td>
<td>Inspection of the construction activities</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Daily</td>
<td>Construction site</td>
<td>Site observation</td>
<td>Contractor cost</td>
</tr>
<tr>
<td>Risk of damaging existing infrastructure</td>
<td>Frequency and location of damage incidents</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Monthly</td>
<td>Documentation office</td>
<td>Documentation in the monthly HSE reports and accidents logs</td>
<td>Contractor cost</td>
</tr>
<tr>
<td>Solid, Construction and hazardous</td>
<td>Use of on-site allocated stockpile</td>
<td>Contractor</td>
<td>GASCO Environmental</td>
<td>Weekly</td>
<td>Construction site</td>
<td>Site observation</td>
<td>Contractor cost</td>
</tr>
<tr>
<td>Impact</td>
<td>Monitoring Indicators</td>
<td>Responsibility for implementation</td>
<td>Supervision</td>
<td>Frequency/Duration</td>
<td>Location</td>
<td>Methods</td>
<td>Estimated Cost</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------------------------------------------------------------------------------</td>
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<td>------------------------------</td>
<td>--------------------</td>
<td>-------------------</td>
<td>---------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>waste generation</td>
<td>locations</td>
<td>Officer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>On-site segregation of hazardous waste components from construction wastes and other non-hazardous wastes</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Daily</td>
<td>Construction site</td>
<td>Site observation</td>
<td>Contractor cost</td>
</tr>
<tr>
<td></td>
<td>Quantities and types of waste generated</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Daily</td>
<td>Construction site</td>
<td>Recording of daily transportation statistics and records from the waste disposal sites</td>
<td>Contractor cost</td>
</tr>
<tr>
<td>Noise</td>
<td>Sound intensity levels and exposure durations</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Quarterly, at least one measurement per contractor /</td>
<td>Construction site</td>
<td>Noise recording, reporting in monthly reports</td>
<td>Contractor cost</td>
</tr>
<tr>
<td>Impact</td>
<td>Monitoring Indicators</td>
<td>Responsibility for implementation</td>
<td>Supervision</td>
<td>Frequency/Duration</td>
<td>Location</td>
<td>Methods</td>
<td>Estimated Cost</td>
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<tr>
<td>Complaints from neighboring residents</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Quarterly</td>
<td>Construction site</td>
<td>Assessment of the filed complaints</td>
<td>Contractor cost</td>
<td></td>
</tr>
<tr>
<td>Use of earmuffs by Construction workers</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Weekly</td>
<td>Construction site</td>
<td>Site observation</td>
<td>Contractor cost</td>
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<tr>
<td>Traffic Congestion</td>
<td>Traffic congestions</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Weekly</td>
<td>Construction site</td>
<td>Obstructed roads observation</td>
<td>Contractor cost</td>
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<tr>
<td>Complaints from neighboring/affected residents</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Weekly</td>
<td>Construction site</td>
<td>Assessment of the filed complaints</td>
<td>Contractor cost</td>
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<tr>
<td>Appropriate implementation of the mitigations measures agreed upon with the contractor</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Monthly</td>
<td>Construction site</td>
<td>Site observation</td>
<td>Contractor cost</td>
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<tr>
<td>Impact</td>
<td>Monitoring Indicators</td>
<td>Responsibility for implementation</td>
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<tr>
<td>Water use/Wastewater generation</td>
<td>Quantity of water used for hydrostatic testing</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Continuous during construction and hydrostatic testing</td>
<td>Construction site</td>
<td>Flow rate measurements</td>
<td>Contractor cost</td>
</tr>
<tr>
<td></td>
<td>Oily appearance or smell of wastewater streams</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Continuous during construction and hydrostatic testing</td>
<td>Construction site</td>
<td>Site observation</td>
<td>Contractor cost</td>
</tr>
<tr>
<td></td>
<td>Wastewater concentrations</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Before discharging the wastewater</td>
<td>Construction site</td>
<td>Chemical analysis</td>
<td>Contractor cost</td>
</tr>
<tr>
<td>Land Use</td>
<td>Recording any spills or leakages incidents and periodically analyzing these data.</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Upon detection of any spillage or leakage incidence</td>
<td>Construction site</td>
<td>Site observation</td>
<td>Contractor cost</td>
</tr>
<tr>
<td></td>
<td>Surveying of structural status of buildings and</td>
<td>Contractor</td>
<td>GASCO Environmental</td>
<td>Yearly, if necessary</td>
<td>Structural consultancy firm for the</td>
<td>Structural consultancy firm</td>
<td>Contractor cost</td>
</tr>
<tr>
<td>Impact</td>
<td>Monitoring Indicators</td>
<td>Responsibility for implementation</td>
<td>Supervision</td>
<td>Frequency/Duration</td>
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<tr>
<td></td>
<td>performing soil investigations</td>
<td>Officer</td>
<td></td>
<td></td>
<td>affected site (if any)</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>The pipeline route should be revisited and investigated at the end of the construction phase to ensure that the land has been restored to its original conditions before the project</td>
<td>Contractor</td>
<td>GASCQ Environmental Officer</td>
<td>After end of construction</td>
<td>Construction site</td>
<td>Site investigation</td>
<td>Contractor cost</td>
</tr>
<tr>
<td>Occupational Health and Safety</td>
<td>Assuring that all health and safety measures are applied adequately on-site during the construction phase.</td>
<td>Contractor</td>
<td>GASCQ Environmental Officer</td>
<td>Daily</td>
<td>Construction site</td>
<td>Observation</td>
<td>GASCQ management cost</td>
</tr>
<tr>
<td>Impact</td>
<td>Monitoring Indicators</td>
<td>Responsibility for implementation</td>
<td>Supervision</td>
<td>Frequency/Duration</td>
<td>Location</td>
<td>Methods</td>
<td>Estimated Cost</td>
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</tr>
<tr>
<td>Hazards and Accidents</td>
<td>Patrolling reports for the pipeline</td>
<td>GASCO inspection Department in the pipeline’s area</td>
<td>GASCO inspection Department in the head office</td>
<td>2 weeks, 1 month or 6 months (According to pipeline Class Table )</td>
<td>Pipeline route</td>
<td>Patrolling schedule</td>
<td>GASCO Management cost</td>
</tr>
<tr>
<td>Regular inspection and maintenance</td>
<td>GASCO inspection Department in the pipeline’s area</td>
<td>GASCO inspection Department in the head office</td>
<td>Quarterly (According to the inspection and maintenance time plan)</td>
<td>Pipeline route</td>
<td>Inspection and maintenance time plan</td>
<td>GASCO Management cost</td>
<td></td>
</tr>
<tr>
<td>Leakage survey and pipeline pressure parameters (through SCADA system)</td>
<td>GASCO inspection department/ GASCO operation department in the pipeline’s area</td>
<td>GASCO inspection Department in the head office</td>
<td>2 weeks, 1 month or 6 months (According to the leakage survey schedule)/ continuous monitoring</td>
<td>Pipeline route and documentation office</td>
<td>Leakage Survey Schedule/ operational log</td>
<td>GASCO Management cost</td>
<td></td>
</tr>
<tr>
<td>Impact</td>
<td>Monitoring Indicators</td>
<td>Supervision</td>
<td>Frequency/Duration</td>
<td>Location</td>
<td>Methods</td>
<td>Estimated Cost</td>
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<tr>
<td>Air emissions</td>
<td>Inspection of vehicle and machinery maintenance schedule</td>
<td>Contractor</td>
<td>Quarterly</td>
<td>Documentation office</td>
<td>Review of schedule</td>
<td>13000 EGP/month for General implementation and supervision cost</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exhaust emissions concentrations from diesel generators</td>
<td>Contractor (via third party)</td>
<td>Once before construction commencement, then quarterly for each vehicle</td>
<td>Vehicle maintenance site</td>
<td>Sampling of exhaust emissions</td>
<td>10000 EGP/sample</td>
<td></td>
</tr>
<tr>
<td>Dust Emissions</td>
<td>Inspection of the construction activities</td>
<td>Contractor</td>
<td>Daily</td>
<td>Construction site</td>
<td>Site observation</td>
<td>General implementation and supervision cost</td>
<td></td>
</tr>
<tr>
<td>Risk of damaging existing infrastructure</td>
<td>Frequency and location of damage incidents</td>
<td>Contractor</td>
<td>Monthly</td>
<td>Documentation office</td>
<td>Documentation in the monthly HSE reports and accidents</td>
<td>• General Implementation/supervision cost</td>
<td></td>
</tr>
<tr>
<td>Impact</td>
<td>Monitoring Indicators</td>
<td>Responsibility for implementation</td>
<td>Supervision</td>
<td>Frequency/Duration</td>
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<tr>
<td>Solid, Construction and hazardous waste generation</td>
<td>Use of on-site allocated stockpile locations</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Weekly</td>
<td>Construction site</td>
<td>Site observation</td>
<td>General implementation / supervision cost</td>
</tr>
<tr>
<td>On-site segregation of hazardous waste components from construction wastes and other non-hazardous</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Daily</td>
<td>Construction site</td>
<td>Site observation</td>
<td>General Implementation / supervision cost</td>
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</tr>
</tbody>
</table>

- Cost of infrastructure damage will vary according to the type of damage. The cost will be charged on the contractor.
<table>
<thead>
<tr>
<th>Impact</th>
<th>Monitoring Indicators</th>
<th>Responsibility for implementation</th>
<th>Supervision</th>
<th>Frequency/Duration</th>
<th>Location</th>
<th>Methods</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>wastes</td>
<td>Quantities and types of waste generated</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Daily</td>
<td>Construction site</td>
<td>Recording of daily transportaton statistics and records from the waste disposal sites</td>
<td>hazardous waste disposal: 3500 EGP/ton +transportation cost</td>
</tr>
<tr>
<td>Noise</td>
<td>Sound intensity levels and exposure durations</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Quarterly, at least one measurement per contractor / subcontractor</td>
<td>Construction site</td>
<td>Noise recording, reporting in monthly reports</td>
<td>• General Implementation / supervision cost</td>
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<td></td>
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<td></td>
<td>• Sampling Cost: 5000 EGP/ sample</td>
</tr>
<tr>
<td>Complaints from</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Quarterly</td>
<td>Construction site</td>
<td></td>
<td>Assessment of the filed</td>
<td>General Implementation / supervision</td>
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<tr>
<td>neighboring</td>
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<td>Impact</td>
<td>Monitoring Indicators</td>
<td>Responsibility for implementation</td>
<td>Supervision</td>
<td>Frequency/Duration</td>
<td>Location</td>
<td>Methods</td>
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<tr>
<td>residents</td>
<td>Officer</td>
<td></td>
<td></td>
<td></td>
<td>complaints</td>
<td>cost</td>
<td></td>
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<tr>
<td>Use of earmuffs by Construction workers</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Weekly</td>
<td>Construction site</td>
<td>Site observation</td>
<td>General Implementation / supervision cost</td>
<td></td>
</tr>
<tr>
<td>Traffic Congestion</td>
<td>Traffic congestions</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Weekly</td>
<td>Construction site</td>
<td>Obstructed roads observation</td>
<td>General Implementation / supervision cost</td>
</tr>
<tr>
<td>Complaints from neighboring/affected residents</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Weekly</td>
<td>Construction site</td>
<td>Assessment of the filed complaints</td>
<td>General Implementation / supervision cost</td>
<td></td>
</tr>
<tr>
<td>Appropriate implementation of the mitigations measures agreed upon with the contractor</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Monthly</td>
<td>Construction site</td>
<td>Site observation</td>
<td>General Implementation / supervision cost</td>
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<tr>
<td>Impact</td>
<td>Monitoring Indicators</td>
<td>Responsibility for implementation</td>
<td>Supervision</td>
<td>Frequency/Duration</td>
<td>Location</td>
<td>Methods</td>
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<tr>
<td>Water use/Wastewater generation</td>
<td>Oily appearance or smell of wastewater streams</td>
<td>Contractor (via third party)</td>
<td>GASCO Environmental Officer</td>
<td>Continuous during construction and hydrostatic testing</td>
<td>Construction site</td>
<td>Site observation and chemical analysis</td>
<td>• 6500 EGP/sample General Implementation / supervision cost</td>
</tr>
<tr>
<td></td>
<td>Samples to test wastewater which will be discharged (pH odour, TSS, COD, BOD, Oil &amp; Grease…etc)</td>
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<tr>
<td></td>
<td>Wastewater analysis after hydrostatic testing</td>
<td>Contractor (via third party)</td>
<td>GASCO Environmental Officer</td>
<td>Before discharging the wastewater</td>
<td>Construction site</td>
<td>Chemical analysis</td>
<td>• 6500 EGP/sample General Implementation / supervision cost</td>
</tr>
<tr>
<td></td>
<td>Samples to test wastewater which will be discharged (pH odour, TSS, COD, BOD, Oil)</td>
<td></td>
<td></td>
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<tr>
<td>Impact</td>
<td>Monitoring Indicators</td>
<td>Responsibility for implementation</td>
<td>Supervision</td>
<td>Frequency/Duration</td>
<td>Location</td>
<td>Methods</td>
<td>Estimated Cost</td>
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<tr>
<td>Land Use</td>
<td>Recording any spills or leakages incidents and periodically analyzing these data.</td>
<td>Contractor</td>
<td>GASCO Environmental Officer</td>
<td>Upon detection of any spillage or leakage incidence</td>
<td>Construction site</td>
<td>Site observation</td>
<td>General Implementation / supervision cost</td>
</tr>
<tr>
<td></td>
<td>Surveying of structural status of buildings and performing soil investigations</td>
<td>Contractor (via third party)</td>
<td>GASCO Environmental Officer</td>
<td>Yearly, if necessary</td>
<td>Structural consultancy firm for the affected site (if any)</td>
<td>Structural consultancy firm</td>
<td>General Implementation / supervision cost</td>
</tr>
<tr>
<td></td>
<td>The pipeline route should be revisited and investigated at the end of the construction phase to ensure that the land has been restored to its original</td>
<td>Contractor (via third party)</td>
<td>GASCO Environmental Officer</td>
<td>After end of construction</td>
<td>Construction site</td>
<td>Site investigation</td>
<td>General Implementation / supervision cost</td>
</tr>
<tr>
<td>Impact</td>
<td>Monitoring Indicators</td>
<td>Responsibility for implementation</td>
<td>Supervision</td>
<td>Frequency/Duration</td>
<td>Location</td>
<td>Methods</td>
<td>Estimated Cost</td>
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</tbody>
</table>
| Occupational Health and Safety     | PPEs, first aid kits, emergency plans, fire-fighting equipment, …etc.                | Contractor                         | GASCO Environmental Officer  | Daily              | Construction site   | Observation              | • General Implementation/ supervision cost  
• Training Cost: 6000 EGP/training program |

conditions before the project
8.4 Management and Monitoring Activities during the Operation Phase

This section describes the monitoring activities that will be undertaken during the operation phase of the project.

8.4.1 Management of Hazards and Accidents
To prevent, as much as reasonably practicable, the hazards that could be expected from the operation of the natural gas pipeline on the surrounding communities and environment, GASCO will implement all the necessary precautions to safeguard the pipelines operation. GASCO will be responsible for monitoring the entire length of the pipeline outside the power stations, and as for the components inside the power station; it will be the responsibility of the electricity authority to monitor these components. In general the monitoring of the pipeline will be done through the following actions.

8.4.1.1 Pipeline Patrolling
Patrolling the pipeline is done by GASCO on regular intervals, according to the pipeline location class as explained in section 7.2.1, to ensure that no activities or actions undertaken in the area can cause damage to the pipeline. The patrolling is done using either a vehicle or walking over the line over a duration of 2 weeks according to the defined line class.

The patrol will be responsible to observe and report any findings to the Sector Office on a daily basis, if any pipeline is at risk, the notification should be carried out as soon as possible. In case of risk, the patrol will obtain an authorization letter from GASCO to directly stop the work or action being carried out immediately. A report will be written by the patrol on a daily basis to record the day’s proceedings.

8.4.1.2 Leakage Survey
Survey for leakages from the pipeline will be done through several monitoring activities, one being onsite leakage survey duty which has a certain frequency set by a qualified engineer with suitable experience in the field of corrosion control for buried ferrous pipes, according to the ASME 31.8. The survey duty frequency will be determined in advance and reviewed annually, and in case it coincides with the patrolling duties, it can be done simultaneously, but reported in different sheets.

An additional measure will be monitoring the pipeline operation pressure, which will be monitored through the centralized SCADA system operated by GASCO personnel. This monitoring system will indicate any significant pressure drop in the pipeline in case of leakages.

Inspection on the status of the cathodic protection should also be conducted on defined intervals, according to the practical experience of the engineering department, in each area to avoid any failure in the pipeline due to corrosion. An inspection and maintenance report will be prepared by the inspection team to report the observations and actions taken during the work performed.
Additional precautions should be taken for the sections of the pipelines marked as vulnerable, or reported as high risk area. Also, the patrolling and leakage survey teams should receive training about the proper method to carry out their tasks.

8.4.1.3 Emergency Response
In case of emergencies, the proper action will be taken according to GASCO’s Emergency Response Procedure. The procedure includes the key personnel responsibilities and communication methods, as well as the emergency classes. Reports will be prepared after the necessary actions are taken to document the cause of the emergency and the remedial actions taken. An emergency response plan done by GASCO is available for the operation phase and could be found in annex 6.

8.4.2 Monitoring Activities Table
The tables below include the proposed mitigation measures for each impact, the implementation direct responsibility and the supervision responsibility, in addition to the proposed monitoring activities and methods, frequency and location of monitoring during the operation phase.
### Table 8-3 - Mitigation measures and their responsibility during operation phase

<table>
<thead>
<tr>
<th>Potential Environmental Impact</th>
<th>Proposed Measures</th>
<th>Mitigation</th>
<th>Responsibility of Mitigation</th>
<th>Responsibility of direct supervision</th>
<th>Estimated Cost</th>
</tr>
</thead>
</table>
| Hazards and Accidents          | • Scheduled patrolling activities, inspection and preventive maintenance activities  
• Inspection will include any activities that could potentially lead to damage in the pipeline  
• In case of emergency, the source of the leak will be isolated until the maintenance team performs the required maintenance  
• Signs will be posted over the pipeline path showing the numbers to be called in case of emergency | HSE department at GASCO (on-site section) | HSE department at GASCO (central unit and administration) | GASCO management cost |
### Table 8-4 - Environmental Monitoring and Management Plan During Operation Phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Monitoring Indicators</th>
<th>Responsibility</th>
<th>Supervision</th>
<th>Frequency/Duration</th>
<th>Location</th>
<th>Methods</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazards and Accidents</td>
<td>Patrolling reports for the pipeline</td>
<td>GASCO inspection Department in the pipeline’s area</td>
<td>GASCO inspection Department in the head office</td>
<td>2 weeks</td>
<td>Pipeline route</td>
<td>Patrolling schedule</td>
<td>GASCO Management cost</td>
</tr>
<tr>
<td></td>
<td>Regular inspection and maintenance</td>
<td>GASCO maintenance Department in the head office</td>
<td>GASCO maintenance Department in the head office</td>
<td>Quarterly (According to the inspection and maintenance time plan)</td>
<td>Pipeline route</td>
<td>Inspection and maintenance time plan</td>
<td>GASCO Management cost</td>
</tr>
<tr>
<td></td>
<td>Leakage survey and pipeline pressure parameters (through SCADA system)</td>
<td>GASCO inspection department/ GASCO operation department in the head office</td>
<td>GASCO inspection department/ GASCO operation department in the head office</td>
<td>2 weeks, 1 month or 6 months (According to the leakage survey schedule)/ continuous monitoring</td>
<td>Pipeline route and documentation office</td>
<td>Leakage Survey Schedule/ operational log</td>
<td>GASCO Management cost</td>
</tr>
</tbody>
</table>
9 Stakeholder Engagement and Public Consultation

The public consultation chapter aims to highlight the key consultation and community engagement activities and their outcomes, in addition to outlining the key aspects to be addressed when holding the consultation activities.

Throughout the various consultation and engagement activities, the work teams experienced and recorded the different reactions of the community and the governmental stakeholders towards the proposed project. The main concern was that the construction of the pipelines does not meet the expectations of the local community to be connected to the natural gas service. Temporary land acquisition is expected as well as impacts on the market value of the land.

Consultation activities (scoping, interviews, focus group discussions, public hearings/consultations) with various stakeholders and community people in the host communities were held for the proposed NG pipeline connections project in compliance with:

- WB policies related to disclosure and public consultation, namely,
  - World Bank Procedure (BP 17.50)
  - World Bank Operational Policy (OP 4.01)
- Egyptian regulations related to the public consultation

Objectives of various consultation activities are summarized as follows:
1- Define potential project stakeholders and suggest their possible project roles
2- Disseminate comprehensive information about the project to enable stakeholders to identify their concerns, needs, and recommendations.
3- Document stakeholder feedback and enhance the ESIA accordingly
4- Identify the most effective outreach channels that support continuous dialogue with the community
5- Discuss potential resettlement plans and impacts of involuntary resettlement

9.1 Defining relevant stakeholders

The following table represents the stakeholders contacted and engaged during the consultation events:
Table 9-1 - Main stakeholders identified for the project

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Role/ concern</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Local Governmental entities</strong></td>
<td></td>
</tr>
<tr>
<td>Governorates</td>
<td>The main role of the governorates is the provision of support to the project through mobilizing people to gain information about the project. Media is known to shed light on activities of the governorate entities</td>
</tr>
</tbody>
</table>
| Local Governmental units (District authorities and village authorities) | - Permissions for the lands needed for valve rooms should be prepared by the governorate and approved by the LGU.  
- Rehabilitation of roads, which is one of the major issues raised by the community, will be performed by the LGU. |
| **Other governmental entities** | |
| Information Centers on the governorate level | Provide NG companies with underground utilities and infrastructure maps. |
| Governmental Authorities | Various authorities in the governorate will support the project through permissions for excavation works, maintenance, health related issues, etc. |
| **Media** | |
| Television and radio representatives | Inform the community about the project and its impacts and support dissemination of ESIA studies |
| Press people | |
| Websites editors | |
| **NGOs working on environmental and social related aspects** | |
| NGOs on the central level | Play an active role in any awareness-raising related to the project |
| NGOs on district level | May provide support during the valuation and compensation process |
| Specific union of NGOs | |
| **Other** | |
| Traders | Provide workers with food and amenities. |
| Contractors | From the project adjacent areas, may be affected. |
| **Community people** | |
| Community leaders | Main cornerstone in mobilizing the communities. |
| Potential beneficiaries | Potentially benefit from the project |
| Potential Project Affected Persons (PAPs) | Farmers whose lands may be traversed by project components. |
| **Natural Gas companies** | |
| GASCO | Implementing agency overseeing activities of the Environmental and Social Management Plan |
| PETROJET | The Company What Will Implement The Construction |

The abovementioned stakeholders were consulted using various tools i.e. Individual interviews, group meetings and public consultation. Most of them have attended the public consultation hearings conducted during March – April 2016. However, some of them were interviewed in their premises in order to enable them to spell out their concerns and worries freely.
9.2 Consultation Methodology and Activities

GASCO has conducted a preliminary public consultation session, as part of the process of updating the existing ESIA of Giza North gas pipelines and in line with the national legislative requirements and The World Bank requirements. This session was held prior to the preparing of the draft ESIA and RAP of the current study. The session was held in Cairo on 12th January 2016 (announcement was published on GASCO website: www.gasco.com.eg).

The following topics were presented and raised during the consultation session were:

- Introduction about GASCO
- The proposed new project and proposed routes
- Project activities
- Scope of the updated ESIA
- Anticipated environmental and social impacts, mitigation measures and monitoring plans
- Resettlement Policy Framework
- Terms of Reference of independent consultant to prepare site/route specific ESIA
- Terms of Reference of independent consultant to prepare site/route specific Resettlement Action Plan (RAP);
- Terms of Reference of independent consultant to prepare due-diligence for associated facilities
- Terms of Reference to prepare Quantitative Risk Assessment

Figure 9-1 - EGAS Assistant Vice President introducing the public consultation session
Later consultation activities held during the current study were conducted on two rounds during the preparation of the site/route specific ESIA and RAP. The consultation process during preparation of the ESIA and RAP was a dynamic and evolving process which adapted with the nature and expectations of the host community. Engaging with the local leadership and the parties involved with agriculture activities such as agricultural cooperatives in order to reach out to various groups of the PAPs.

Throughout the various consultation and engagement activities, the work team came across various prejudices and misconception related to the project. Such perception originated from the unfavorable experience the community had with various previous development projects and other NG pipelines. Additionally, managing community expectations and avoiding over-promising is also a key aspect of efficient stakeholder communication and helps to avoid.

9.3 Scoping consultation event

The scoping session was held in Beni Suef governorate\(^7\) (BeniSuef University Conference hall) on the 21 of March, 2016.

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\(^7\) Scoping session for 6 October pipeline was held as part of the Beni Suef public consultation. Relevant stakeholders were invited to attend the session.

Figure 9-2 - Presenting the routes of the gas pipelines

Figure 9-3 - Newspaper ad for the scoping session
Three consultants from EcoConServ (environmental and social)
Four representatives of GASCO
Governorate representatives
EEAA Regional Office representatives

The list of invitees included EEAA regional branches, environmental offices of the governorates, NGOs, governmental media centers, and various government employees. In cooperation with the Consultant, invitees were informed of the date and location of the Public Consultation at least two weeks ahead. Participants were invited through:
1- Invitations sent by GASCO via mails, Faxes and e-mails.
2- Telephone communication by GASCO and the Consultant.
3- An advertisement was published in Gomhoryia Newspaper.
4- Invitations sent by the consultant to governorate stakeholders

9.3.1.1 Participants profile

Table 9-2 - Distribution of participants by profession

<table>
<thead>
<tr>
<th>Distribution of participants according to Profession</th>
<th>Numbers</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative officials governorate level</td>
<td>4</td>
<td>4.4</td>
</tr>
<tr>
<td>Administrative officials target village councils</td>
<td>6</td>
<td>6.6</td>
</tr>
<tr>
<td>Gas Companies</td>
<td>10</td>
<td>11.1</td>
</tr>
<tr>
<td>NGO’s</td>
<td>19</td>
<td>21.1</td>
</tr>
<tr>
<td>Community members</td>
<td>51</td>
<td>56.6</td>
</tr>
<tr>
<td>Total</td>
<td>90</td>
<td>100</td>
</tr>
</tbody>
</table>

9.3.1.2 Summary of the discussions

Eng. Mostafa Fahim – Vice Chairman for Networks – GASCO, welcomed the participants and pointed to the importance of scoping sessions in order to discuss potential impacts of the project. GASCO is one of the leading firms of the Petroleum Sector and the Ministry of Petroleum. This project is part of the response of the government to meet the growing needs of the energy sector as well as switch to a clean source of energy.

Eng. Farag Mohamed Farag – EEAA Northern Upper Egypt Regional Office Representative, pointed to the importance of the ESIA studies in order to determine the acceptance of the different stakeholders to the project. Community participation is important to national projects in collaboration with the civil society. Scoping sessions
also aim to identify the different positive and negative impacts of the project especially at the local areas where the line will pass.

**Brigadier Tarek Kamel – Head of Environmental Department – BeniSuef Governorate** has welcomed the participants and indicated that the main aim of the scoping session is to discuss the point of view of the civil society towards such a national project. The governorate is willing to support all developmental projects that would revive the local economy. Projects need to take into consideration the environmental aspects.

**Eng. Ibrahim Mahmoud – Head of health and Safety department – GASCO**, has then described the route of the pipeline and the areas it is supposed to pass through. He also explained the aim of the current projects which are providing energy source to Beni Suef power station and the new capital power station. This will also support the expansion of the natural gas grid in Upper Egypt. The new Power stations known as “Siemens stations” represent a new addition to the national power generation grid.

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**Figure 9-4 - The panel of Speakers**

**Figure 9-5 - Presentation of the route of the lines**

**Figure 9-6 - Environmental Expert**

**Figure 9-7 - Participants of the session**
### Table 9-3 - Key comments and concerns raised during the scoping session

<table>
<thead>
<tr>
<th>Issue</th>
<th>Questions and comments</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternatives of Pipeline Route</td>
<td>Why does the pipeline cross from Dahshour to the West of the Nile although the power plant is available east of the Nile? Will the pipeline feed the industrial area?</td>
<td>This pipeline aims mainly to support power generation stations. The remaining capacity will be used to supply natural gas to Upper Egypt. The line has to reach the pressure room to be released again to the Upper Egypt area.</td>
</tr>
<tr>
<td></td>
<td>The pipeline will pass through a populated area at BeniAdi, will the community be connected to the natural gas service?</td>
<td>There is a national plan to expand the natural gas household connections. But to be honest this depends on many other factors including width of the streets and the population density and infrastructure. This is the mandate of another company but in total the national target is to extend natural gas to 6 million households.</td>
</tr>
<tr>
<td></td>
<td>In the map presented there are large desert areas, why did you choose this route which passes in cultivated areas? How will the compensations be handled? Will it be related to the agriculture season? If the road authority refuses the route is it possible to change it?</td>
<td>We have already designed the route to pass along the desert areas between Fayoum and BeniSeuf. But we have finally to cross the cultivated areas to cross the Nile. We cross agricultural areas only as it is the sole option. Farmers will be fully compensated for their crops.</td>
</tr>
</tbody>
</table>
9.4 Second Public consultation event

The second public consultation session was held in Beni Suef™ governorate (Beni Suef University Conference hall) on the 17 of April, 2016. The session was moderated by the following:

- Two consultants from EcoConServ (environmental and social experts)
- GASCO representative
- Two representatives of EEAA (HQ)
- Governorate representative (Department of Environment)

The list of invitees included EEAA regional branches, environmental offices of the governorates, NGOs, and various government employees, in cooperation with the Consultant. Invitees were informed of the date and location of the Public Consultation

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8 Public Consultation session for 6 October pipeline was held as part of the Beni Suef public consultation. Relevant stakeholders were invited to a

Figure 9-10 - Public Consultation Advertisement published in El Gomhoria newspaper
at least two weeks ahead. Participants were invited through:
   1- Invitations sent by GASCO via mails, Faxes and e-mails.
   2- Telephone communication by GASCO and the Consultant.
   3- An advertisement was published in Gomhoryia Newspaper.

9.4.1.1 Participants profiles

The event was conducted on the 17 of April 2016. 56 persons attended the consultation event. They are segregated into 89.2% males and 10.7% females.

<table>
<thead>
<tr>
<th>Distribution of participants according to Profession</th>
<th>Numbers</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative officials governorate level</td>
<td>6</td>
<td>10.7</td>
</tr>
<tr>
<td>Administrative officials target village councils</td>
<td>4</td>
<td>7.1</td>
</tr>
<tr>
<td>Gas Companies</td>
<td>10</td>
<td>17.8</td>
</tr>
<tr>
<td>NGO's</td>
<td>4</td>
<td>7.1</td>
</tr>
<tr>
<td>Community members</td>
<td>32</td>
<td>57.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>56</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
Figure 9-11 - GASCO presentation of the project

Figure 9-12 - Participants of the session

Figure 9-13 - Consultant's presentation

Figure 9-14 - Comments from the participants
9.4.1.2 Summary of discussions

Brigadier Tarek Kamel – Head of Environmental Department – BeniSuef Governorate has welcomed the participants and indicated that the main aim of the public consultation session is to discuss the main findings of the ESIA study with the civil society representatives. The governorate is a strong supportive implementation body for GASCO at all stages of the project.

Eng. Ibrahim Mahmoud – Head of health and Safety department – GASCO, has welcomed the participants in the second public consultation and noted the importance of the session to present the findings of the ESIA study. He gave a brief overview of the project then described the route of the pipeline. He highlighted the importance of the current projects which are providing energy source to BeniSuef power station and the new capital power station. This will also support the expansion of the natural gas grid in Upper Egypt. We welcome any comments that would enrich the ESIA study and add to its results and findings.

Questions and comments:

<table>
<thead>
<tr>
<th>Issue</th>
<th>Questions and comments</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Impacts</td>
<td>We request the compliance with law number 48/1982 for the protection of the River Nile from pollution.</td>
<td>We have previously conducted excavation under the Nile. We use the latest equipment to avoid any negative impacts during excavation. We request from the Ministry of Irrigation the most updated plans for expansion of the Nile. And we pass the Nile at depth lower than these plans. Thus no impact at all on the Nile either the river itself or the marine environment in the Nile.</td>
</tr>
<tr>
<td></td>
<td>What are the methods for monitoring and protection against emissions during excavation?</td>
<td>We use the watering methods to avoid negative impacts from dust.</td>
</tr>
<tr>
<td></td>
<td>This project represents a start towards the sustainable development approaches to reduce emissions and the effects resulting from the climate change.</td>
<td>Noted. The government aims to use another sustainable source of energy.</td>
</tr>
<tr>
<td></td>
<td>What are the measures related to bypass dust? Bypass landfill east of korymat road. How to protect workers during excavation from bypass dust?</td>
<td>This impact has been taken into consideration in the detailed ESIA study. Geotechnical study includes an analysis of the soil to determine what kind of protection is needed for the pipeline.</td>
</tr>
<tr>
<td>Issue</td>
<td>Questions and comments</td>
<td>Responses</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>Route alternatives</strong>&lt;br&gt; <em>Addressed in chapter 6, analysis of alternatives</em></td>
<td>Did the design take into consideration the plans for the Nile River since the line will cross under the river?</td>
<td>Yes the latest plans of the Nile as indicated by Ministry of Irrigation.</td>
</tr>
<tr>
<td><strong>Compensation and land acquisition</strong>&lt;br&gt; <em>Addressed in the RAP study</em></td>
<td>How are compensations of the crops calculated? How do we collect the compensation value?</td>
<td>We pay the amounts of the crops we spoil according to the prices of the agricultural directorate. We also can wait until you harvest your crops if this is possible. Otherwise if we are tight with the time schedule, we then will pay full compensation of the crops.</td>
</tr>
<tr>
<td></td>
<td>What is the size of the area considered for the right of the way (RoW)?</td>
<td>The construction will be 30 meters from the main road according to the approval of the roads authority. We have to follow the requirements of the roads authority.</td>
</tr>
<tr>
<td></td>
<td>We request that excavation is further from the RoW of the road in order not to lose large amounts of our land.</td>
<td>First we have to respect the requirements of the roads authority (20ms). Then the site engineer can discuss that before the implementation and if it is technically possible they will do it. No problem.</td>
</tr>
<tr>
<td></td>
<td>Is the compensation value of the crops fair? How do we make sure the land will return back to its original status after the excavation?</td>
<td>It is based on the prices of the local agriculture directorate and we also consulted with farmers in order to ensure the prices are fair. Yes the land will return to its original status. No problems.</td>
</tr>
<tr>
<td></td>
<td>I own a car service station at the Beni Suef – Wasta road, and I have all official documents. Will there be land acquisition for my shop.</td>
<td>We will coordinate with you on site and probably we will be passing behind your shop. Otherwise we leave an entrance for your shop during excavation to avoid impacts on livelihood. After construction there will be no impacts on your activities. The line will be deep from any impacts that may be caused by the cars activity on top of it.</td>
</tr>
<tr>
<td>Issue</td>
<td>Questions and comments</td>
<td>Responses</td>
</tr>
<tr>
<td>-------</td>
<td>------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td>What papers do I need to prove my rights in the compensation?</td>
<td>During the implementation there will be GASCO camp on site. You need to contact them with your official papers. They will conduct a site visit and an agreement will be signed with you on the details of the route passing through your land.</td>
</tr>
<tr>
<td></td>
<td>Please take into consideration the impacts of the excavation on cultivated areas? We need to protect the agricultural land that is already diminishing significantly.</td>
<td>After completion of the construction there will be restriction on building on the land. This is in a pay preserving the agricultural land.</td>
</tr>
<tr>
<td></td>
<td>Is it possible for GASCO to buy the land? Since after construction of the pipeline we will not be able to build on the land.</td>
<td>We only pay compensation for the crops. We do not need to fully buy the land of the route.</td>
</tr>
</tbody>
</table>

**Safety measures**

**Annex 6 – emergency response plan**

What are the safety measures for the lines especially that the lines will pass in cultivated areas? At what depth will the lines be laid?

- We take all necessary measures to protect our line. It is coated to be protected against water and other elements. It is not put in other cover. We protect it and it is durable enough.

- Stormwater requirements are part of the Ministry of Irrigation. We are not allowed to install the pipeline axial on the stormwater drain route. We can construct the pipeline parallel to the stormwater drain. We also protect the pipeline in this area using different measures to ensure no damage occurs from corrosion factors.

- We ensure all safety measures and we have the existing

Please take all possible safety measures to ensure the safety of the lines and conduct more analysis of the soil. The line may be passing at stormwater path.

<table>
<thead>
<tr>
<th>Community participation and CSR initiatives</th>
<th>What are the CSR initiatives that GASCO is willing to share with the local community?</th>
<th>We have an annual fund for this issue. We provide community service projects. We have an internal committee to select these initiatives.</th>
</tr>
</thead>
</table>

Page 181 of 218
<table>
<thead>
<tr>
<th>Issue</th>
<th>Questions and comments</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is this project only to provide natural gas to power stations or will it also provide natural gas to households?</td>
<td>This project aims mainly to provide natural gas to power station. We have here our colleagues from TaqaWadi el Nile to present the plan for household connections.</td>
<td>The new gas pipeline and station have a large capacity to accommodate the expansion in use of the households. But it needs certain technical procedures to connect villages. The width of the streets and the number of households. Some villages are not possible to be connected.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>But also expanding the natural gas network will mean that butagas cylinders will be available in the markets for other users who are not connected to the natural gas network.</td>
</tr>
<tr>
<td>What job opportunities are offered to the local community?</td>
<td>There are unskilled workers jobs. We also need technical jobs after operation. These are usually very limited opportunities. We prefer of course if it is someone from the local community. But in general the jobs will be in the new power station, operation of the pipeline does not need new jobs.</td>
<td></td>
</tr>
</tbody>
</table>
References

- Giza Governorate environmental baseline characterization by EEAA, 2007
- Environmental characterization of the Giza Governorate, 2007
- Environmental characterization of the Giza Governorate, 2007
- http://www.iucnredlist.org/about/overview
- IFC General Environmental Health and Safety Guidelines (EHS)
- World Bank Operation Policies and
- Environmental, Health, and Safety Guidelines for Gas Distribution Systems, IFC and World Bank, 30 April, 2007
- Guidelines for oil and gas sector, EEAA, January 2005
- Natural Protectorates Map issued by EEAA, 2013
Annexes

Annex 1: Pipeline Route Map
Annex 2: Pressure Reduction Station at 6th of October Power Plant
**Process Description**

Location: 6th of October Power Station.
Fluid: Natural Gas.
Specific Gravity: 0.8
Flow rate total: 167,000 SCM/H
Design Pressure: 80 barg
Station Inlet Pressure
- Max.: 70 Barg.
- Min.: 27 Barg.
Station Outlet Pressure: 25 Barg (after reduction)
Operating Temperature
- Max.: 50° C.
- Min.: -20° C.
Design Temperature: 70° C.

<table>
<thead>
<tr>
<th>No. of filtering streams</th>
<th>: 1 + 1 standby (Each of size 16&quot;/600).</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Water Bath Heaters</td>
<td>: 1+1 standby (Each of size 16&quot;/600).</td>
</tr>
<tr>
<td>No. reducing streams</td>
<td>: Three (2+ 1 standby).</td>
</tr>
<tr>
<td>No. of metering streams</td>
<td>: Three (2+ 1 standby).</td>
</tr>
<tr>
<td>No. of Outlet Lines</td>
<td>: One.</td>
</tr>
<tr>
<td>Land Area</td>
<td>: 55 X 45 meter.</td>
</tr>
</tbody>
</table>

**Operation Philosophy**

- Emergency Shut-Down mode

This mode is used to shut down the inlet valve (MOV) in case of an emergency. This will override all modes and send a close command to inlet valve (MOV) in the PRMS.
ESD can be done locally from the front of the control panel by pressing two push buttons at the same time (these push buttons are protected by glass cover) or remotely by the SCADA. The reset of the ESD can be done only by the reset button on the front of the control panel.

A- Filtering Section

- Filter section is designed in Two lines – One working line and one stand by line.
- Each line can be isolated with inlet and outlet hand operated plug valves.
The separators remove dust and liquids to protect the downstream equipments. It is working in two stages. In the first stage liquids and bigger solid particles will be removed from gas. The second stage separates the smaller solid particles from gas.

Since the filter elements become dirty in operation the differential pressure will increase. This is monitored by the differential pressure transmitters.

The filter elements are designed to withstand a maximum allowable differential pressure of 0.3 bar.

The liquids are collected in a chamber. This chamber is equipped with level indicators and level switches to monitor the liquid level in the chamber.

Level switches send an alarm to the control room and the SCADA in case of high level of condensate.

The level high switch at the separator gives an alarm to the operator in the control room and the SCADA to open the plug valve which keeps the discharge line shut. Because of the higher pressure in the filter section, the liquid in the collecting chamber of the separator will be discharged to the condensate tank. A restriction orifice at the inlet nozzle of the vessel and the connection of vessel to atmosphere prevent a pressure boosting within the condensate tank.

The level in the condensate tank is monitored by a local level indicator.

One level switch creates a signal at half capacity of the vessel. The draining of the condensate tank must be prepared.

The condensate can be discharged by a pump from the tank into mobile disposal equipment.

B- Heating Section

Heating section is designed in two lines – one is working and one is stand-by.

Each Heater can be isolated with inlet and outlet hand operated ball valves.

The water bath heaters will be self supporting and stand alone.

The operating system of the burner will be form the on/off type.

The water bath heaters will be suitable for unattended operation and the heaters will be designed to maintain the gas temperature after regulating of 5 °C under worst case conditions.

The water bath heaters will operate with process gas that will be reduced by an independent fuel gas installation installed at each water bath heater.

C- Pressure Reduction Section
The pressure reduction section is used for reducing the inlet pressure to a fixed pressure (downstream pressure) for the client.

There are three pressure reduction lines (2 working and 1 standby).

In GASCO the pressure reduction stream consists of:
- Inlet ball valve.
- Slam shut off valve.
- Monitor regulator.
- Active regulator.
- Pressure safety valve.
- Outlet ball valve.
- Pressure indicators.

The functionality of each of the above components as per the following:
- Inlet & outlet ball valves: These valves are used to completely isolate the reduction line in case of maintenance or replacement of part of the reduction line.
- Slam-shut valve: This valve will automatically close if the outlet pressure after the pressure regulators has reached the set point of the slam-shut valve.
- Monitor regulator: This pressure regulator is under normal operating conditions always in the fully open position. In case the active regulators fails the monitor regulator automatically takes over.
- Active regulator: This regulator is the working regulator under normal operating conditions and reduces the pressure of the gas to the required outlet pressure.
- A pressure relief valve: a relief valve is mounted in the outlet after the active regulator but before the isolating outlet valve. The pressure relief valve relieves some gas if the outlet pressure has reached the set point of the relief valve (relieve 10% of the line capacity or the header capacity). This situation could occur if pressure regulators fail or in case of thermal expansion if the reducing run has been blocked in.

Normally the active regulator is fail to open and the monitor regulator is fail to close.

The redundancy of pressure reduction section based on (33%), the sequence of operation shall be active of the main line, if failed the active of the stand by line will be in service if failed then the monitor of the main line will be in service, if failed the monitor of the stand by line will be in service.

Protection of the downstream client from high pressure:
Monitor regulator: if failed to achieve the set pressure the monitor regulator is fail to close.
Pressure relief valve: The pressure relief valve relieves some gas if the outlet pressure has reached the set point of the relief valve (10% of the line capacity).
Slam shut off valve: if the above failed to stop the downstream pressure from arising to the set point of the SSV, the SSV will shut off the reduction line.

D- Metering System

The Metering system consists of three streams.
The metering system consists of:
1- Inlet & outlet ball valves: These valves are used to completely isolate the metering line in case of maintenance or replacement of part of the reduction line.
2- Upstream metering tube.
3- Ultrasonic meter.
4- Downstream metering tube.
5- Local cabinet contains: One pressure Transmitter, One temperature transmitter and necessary junction boxes.
6- Three thermowells, one pressure indicator, one temperature indicator.
7- Two multi-stream flow computers.
8- One online Gas Chromatograph complete with all the necessary bottles, sample probes…etc.

Each flow computer is connected to the three Ultrasonic flow meters. Pressure and temperature transmitters communicate with the flow computer. Both flow computers can be used as pay flow computers or one as pay and the other for check flow computer.

The supervisory computers generate reports which are stored on disk. The reports can be manually and/or automatically printed on the report printer. The reports will not be automatically removed and will stay on the hard disk.

A dot matrix printer with is connected to the supervisory computers for printing of alarms. These alarms are also logged and stored in disk in text file format.

The software programs necessary to reprogram the flow computers and the gas chromatographs will be installed on the supervisory computer system. A backup copy of the whole system (disk image) shall be saved on the hard drive and external CD.
Annex 4: Timeline Plan of the project

<table>
<thead>
<tr>
<th>Activity ID</th>
<th>Activity Name</th>
<th>Original Duration</th>
<th>Start</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1000</td>
<td>SURVEY WORK</td>
<td>82</td>
<td>01-Oct-15</td>
<td>31-Oct-15</td>
</tr>
<tr>
<td>A1010</td>
<td>DESIGN AND SPECIFICATION</td>
<td>48</td>
<td>01-Nov-15</td>
<td>28-Feb-17</td>
</tr>
<tr>
<td>A1020</td>
<td>WORK PERMITS &amp; LAND COMPENSATION</td>
<td>517</td>
<td>01-Nov-15</td>
<td>31-Mar-17</td>
</tr>
<tr>
<td>A1030</td>
<td>PROVIDING FUNDING</td>
<td>0</td>
<td>01-Oct-15</td>
<td>01-Oct-15</td>
</tr>
<tr>
<td>A1040</td>
<td>ISSUANCE OF MRQ FOR PIPE &amp; BENDS</td>
<td>51</td>
<td>30-Oct-15</td>
<td>31-Oct-15</td>
</tr>
<tr>
<td>A1050</td>
<td>TEND&amp;P.O FOR PIPE &amp; BENDS</td>
<td>109</td>
<td>30-Nov-15</td>
<td>15-Mar-16</td>
</tr>
<tr>
<td>A1060</td>
<td>ISSUANCE OF MRQ FOR REMAINING MATERIALS</td>
<td>0</td>
<td>30-Nov-15</td>
<td>30-Nov-15</td>
</tr>
<tr>
<td>A1070</td>
<td>TEND&amp;P.O FOR REMAINING MATERIALS</td>
<td>109</td>
<td>30-Nov-15</td>
<td>15-Mar-16</td>
</tr>
<tr>
<td>A1075</td>
<td>PIPES FABRICATION</td>
<td>158</td>
<td>15-Mar-15</td>
<td>03-Aug-16</td>
</tr>
<tr>
<td>A1080</td>
<td>PIPES &amp; BENDS DELIVERY</td>
<td>28</td>
<td>03-Aug-16</td>
<td>31-Aug-16</td>
</tr>
<tr>
<td>A1085</td>
<td>REMAINING MATERIALS FABRICATION</td>
<td>26</td>
<td>16-Mar-15</td>
<td>05-Dec-16</td>
</tr>
<tr>
<td>A1090</td>
<td>REMAINING MATERIALS DELIVERY</td>
<td>26</td>
<td>05-Dec-16</td>
<td>31-Dec-16</td>
</tr>
</tbody>
</table>

Note: The timeline plan shows the progress of activities from October 2015 to December 2016.
## ESIA study for EG-GIZA North Power Project – 6th of October Natural Gas Line

### P/L for Feeding October PSN - 20" - 0.4 km REV7

<table>
<thead>
<tr>
<th>Activity ID</th>
<th>Activity Name</th>
<th>Duration</th>
<th>Start</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1110</td>
<td>PIPE COATING</td>
<td>348</td>
<td>01-Jul-16</td>
<td>15-Jun-17</td>
</tr>
<tr>
<td>A1110</td>
<td>CONSTRUCTION WORK</td>
<td>54</td>
<td>01-Jul-16</td>
<td>24-Aug-16</td>
</tr>
<tr>
<td>A1110</td>
<td>CONSTRUCTION WORK</td>
<td>301</td>
<td>03-Aug-16</td>
<td>31-May-17</td>
</tr>
<tr>
<td>A1110</td>
<td>HYDROTEST</td>
<td>15</td>
<td>31-May-17</td>
<td>15-Jun-17</td>
</tr>
<tr>
<td>A1110</td>
<td>MECHANICAL COMPLETION</td>
<td>0</td>
<td>15-Jun-17</td>
<td></td>
</tr>
<tr>
<td>A1110</td>
<td>COMMISSIONING &amp; GAS START UP</td>
<td>0</td>
<td>15-Jun-17</td>
<td></td>
</tr>
<tr>
<td>FILTERING HEATING METERING &amp; RED</td>
<td>548</td>
<td>15-Oct-15</td>
<td>15-Apr-17</td>
<td></td>
</tr>
</tbody>
</table>
Annex 5: Baseline Measurements
Ambient Air Quality and noise Measurements Report
Gas pipeline in Abo Rwash

Green Plus Environmental Solutions
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1. **INTRODUCTION**

Air quality and noise monitoring has been carried out as part of the baseline description for the Environmental and Social Impact Assessment of the Abo Rowash transformers station project located in Giza governorate.

Air quality monitoring has been undertaken for the pollutants of primary concerns (NO$_2$, SO$_2$, T.S.P and PM$_{10}$) in order to better characterize. The baseline air quality as part of the environmental impact assessment required where a eight hours average with hourly average interval measurements were conducted for carbon monoxide (CO), nitrogen dioxide (NO$_2$), sulphur dioxide (SO$_2$), Total Suspended Particulates (T.S.P) and particulate matter (PM$_{10}$), for one specific location where the air quality complies with the national guidelines for all the analysed parameters. The site-specific air quality measurements were conducted using Standard ambient air quality monitoring instruments under the supervision of experienced specialists. Noise levels were conducted as per the international standard using type 1 precision noise level meter.

1.1 **Objectives**

The overall objectives of this monitoring round are to:

- Assess/confirm compliance of the air quality in the baseline environment with relevant national guidelines;
- identify any non-compliance issues, if any; and
- Provide general conclusions based on analysis results.

1.2 **Scope of Work**

- The scope of work of the present monitoring includes the sampling and analysis of active air and noise in the surrounding area as to distinguish whether air quality is impacted by the project activities or not.
- The measurement will be conducted in four locations within the boundaries of the proposed location.

1.2.1 **Sampling strategy**

The selection of the active air measurement location is based on the prevailing wind direction; site Topography, the future layout of the proposed project components and the location of the nearest sensitive receptors with respect to the project plots. Moreover, the selection is based on the guidelines stated in the American Society for Testing Materials (ASTM) reference method$^1$.

---

$^1$ D1357-95 (Reapproved2000) Standard Practice for Planning the Sampling of the Ambient Air
The following ambient air pollutants were the target parameters to be measured during the monitoring program:

- Total Suspended Particulate (TSP)
- Thoracic particulate (PM$_{10}$)
- Nitrogen dioxide NO$_2$.
- Sulfur dioxide SO$_2$.
- Carbon monoxide CO.

Moreover, location of the measurements is shown in the figure below.

### 1.3 Location

The GPS coordinates of the Ambient Air (AA) measurement location are as follows:

<table>
<thead>
<tr>
<th>Location</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Area</td>
<td>30° 3’18.61&quot;N</td>
<td>31° 3’4.18”E</td>
</tr>
<tr>
<td>Abo Rowash</td>
<td>30° 3’19.30&quot;N</td>
<td>31° 3’2.30”E</td>
</tr>
</tbody>
</table>

![Figure 1-1 location map for Abo Rowash transformers station legislation and regulatory framework](image)
2. NATIONAL AND INTERNATIONAL LEGISLATION

The results of ambient air quality measurements were compared to the national limits set in Annex 5 of the Executive Regulation (D1095/2011) and the guideline values of world health organization (WHO) for the ambient air quality.

Table 2-1 and Table 2-2 lists the corresponding applicable national and international ambient air quality permissible limits.

Table 2-1 Applicable national permissible limits for ambient air quality levels for rural area

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Average Period</th>
<th>Egyptian Standards (µg·m⁻³)</th>
<th>Egyptian Standards (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulphur dioxide (SO₂)</td>
<td>1 hour</td>
<td>350</td>
<td>0.1337</td>
</tr>
<tr>
<td></td>
<td>24 hours</td>
<td>150</td>
<td>0.0573</td>
</tr>
<tr>
<td></td>
<td>Annual</td>
<td>60</td>
<td>0.0229</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>1 hour</td>
<td>30,000</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>8 hours</td>
<td>10,000</td>
<td>9</td>
</tr>
<tr>
<td>Nitrogen dioxide (NO₂)</td>
<td>1 hour</td>
<td>350</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>24 hours</td>
<td>150</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>Annual</td>
<td>60</td>
<td>0.032</td>
</tr>
<tr>
<td>Total suspended particulate T.S.P</td>
<td>24 hours</td>
<td>230</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td>Annual</td>
<td>125</td>
<td>---------</td>
</tr>
<tr>
<td>Thoracic particles (PM₁₀)</td>
<td>24 hours</td>
<td>150</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td>Annual</td>
<td>100</td>
<td>---------</td>
</tr>
<tr>
<td>PM₂.₅</td>
<td>24 hours</td>
<td>100</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td>Annual</td>
<td>70</td>
<td>---------</td>
</tr>
</tbody>
</table>

Table 2-2 WHO Ambient Air Quality Guidelines²,³

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Average Period</th>
<th>Guideline value (µg·m⁻³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulphur dioxide (SO₂)</td>
<td>24 hours</td>
<td>125 (interim target 1)</td>
</tr>
<tr>
<td></td>
<td>10 minutes</td>
<td>50 (Interim target 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 (guideline)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500</td>
</tr>
</tbody>
</table>

³ Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.
<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Average Period</th>
<th>Guideline value ($\mu\text{g.m}^{-3}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen dioxide ($\text{NO}_2$)</td>
<td>1 hour</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>1 year</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>24 hrs.</td>
<td>150 (interim target 1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 (interim target 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>75 (interim target 3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 (guideline)</td>
</tr>
<tr>
<td>Thoracic particles ($\text{PM}_{10}$)</td>
<td>1 year</td>
<td>70 (interim target 1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 (interim target 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 (interim target 3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 (guideline)</td>
</tr>
<tr>
<td>Ozone</td>
<td>8 hours daily maximum</td>
<td>160 (interim target 1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 (guideline)</td>
</tr>
</tbody>
</table>

### 2.1.1 Noise Emissions

Table 2-3 presents the permissible noise levels in different areas, of which the residential areas within the city levels are applicable for the proposed project location.

**Table 2-3** Maximum Permissible Limits in the National Law (Law No. 4/1994 amended by law No. 9/2009) for Noise Intensity in Different Areas

<table>
<thead>
<tr>
<th>TYPE OF AREA</th>
<th>DAY 7 am - 10 pm</th>
<th>NIGHT 10 pm – 7 am</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitive areas</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>Residential suburbs with low traffic</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>Residential areas in the city</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>Residential areas in which can be found some workshops or commercial establishments or which are located on a main road</td>
<td>65</td>
<td>55</td>
</tr>
<tr>
<td>Commercial, administrative and downtown areas</td>
<td>70</td>
<td>60</td>
</tr>
<tr>
<td>Industrial areas (heavy industries)</td>
<td>70</td>
<td>70</td>
</tr>
</tbody>
</table>

### 2.2 International Legislation

#### 2.2.1 IFC Performance Standards

Environmental, Health, and safety (EHS) general guidelines required that noise prevention and mitigation measures should be applied where predicted or measured noise impacts from a project facility or operations exceed the applicable noise level guideline at the most sensitive point of reception. The preferred method for controlling noise from stationary sources is to implement noise control measures at source. Methods for prevention and control of sources of noise emissions depend on the source and proximity of receptors.
The Noise Level should not exceed the levels presented in Table 2-4 which could result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

**Table 2-4 Noise Level Guideline**

<table>
<thead>
<tr>
<th>Receptor</th>
<th>One Hour $L_{eq}$ (dBD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daytime 07:00 – 22:00</td>
</tr>
<tr>
<td>Industrial; commercial</td>
<td>70</td>
</tr>
<tr>
<td>Residential; institutional; educational</td>
<td>55</td>
</tr>
</tbody>
</table>
3. METHODOLOGY

3.1 Ambient air quality

Ambient Air Quality Monitoring equipment is an integrated system of which includes several analyzers with data recording devices. A typical system would include gas analyzers for ambient air analysis, data recording, and signal transmission instrumentation.

![Ambient air quality monitoring system](image)

**Figure 3-1 ambient air quality monitoring system**

**Ambient air pollutants**

The most common gaseous air pollutants (also known as "criteria pollutants") are carbon monoxide, sulfur oxides, and nitrogen oxides. These pollutants can be harmful to health and the environment, and cause property damage. To acquire baseline information on background levels of Thoracic Particulates, the team conducted four one-hour active sampling using a dust sampler. The sampler measures the respirable fraction of airborne dust (of particle size 0.1 to 10 μm) with a measuring range of 0.001 to 400 mg/m3 and an accuracy of ± 5 % of the reading. The levels measured and recorded would serve as baseline values for reference during future monitoring activities.

**Ambient air quality monitoring station specifications**

**General Features**

- Standard methods of measurement which means:


**Ambient Particulate Matter PM₁₀ sampler**

- Approval and Certification: U.S.EPA (USA), UBA/ TUV (Germany), / Sira Certification Service.


- Sampling on filter membranes, which can be used for further Chemical analyses as required by current regulations and standards.

- Active flow Control Flow range: 0-10 LPM.

- Nominal flow: 5LPM Sampler.

- Dimensions: 10” x 12” x 7” Sampler.

- Weight: 9.8LBS (fully configured) Transport Case: 19.75” x 12” x 18”.

- The analyzer should be equipped with batteries in order to avoid possible data losses due to power failures.

- Source: Beta Ray Source with appropriate activity.

- Ranges: 0-500 µg/ m³ (2.3 m³/ h operating flow rate); 0-1,000 µg/ m³ (1 m³/ h operating flow rate).

- Lower Detectable Limit: ≤ 1.5 µg/ m³ (24 hour cycle time, 2.3 m³/ h operating flow rate).

- Precision: ≤ 0.4 µg/ m³ (24 hour cycle time, 2.3 m³/ h operating flow rate).

- Correlation Coefficient R > 0.98.
**Sulfur Dioxide SO$_2$ Analyzer** (Thermo Scientific SO$_2$ Analyzer model 43i-USA)

- Approval and Certification: U.S.EPA (USA), UBA/ TUV (Germany), Sira Certification Service.
- Measuring Method: UV Fluorescence Technology.
- Ranges: Auto ranging feature, Multiple Ranges to cover from 0 to 10 ppm (especially from 0 to 1 ppm).
- Zero Noise: ≤ 0.5 ppb.
- Lower Detectable Limit: ≤ 1 ppb.
- Zero drift (daily): ≤ 1 ppb.
- Span drift (daily): ≤ 1% of full scale.
- Response time: fast, ≤ 100 seconds.
- Precision: ≤ 0.5% of reading.
- Linearity: ≤ ± 1% of full scale.
- Operating temperature: not exceed 40 °C.

**Nitrogen Monoxide, Nitrogen Dioxide and Nitrogen Oxides NO, NO$_2$ & NO$_x$ Analyzer**
(Thermo Scientific NOx Analyzer - Model 42i- USA)

- Approval and Certification: U.S.EPA (USA), UBA/ TUV (Germany), Sira Certification Service.
- Measuring Method: Chemiluminescence Technology.
- Ranges: Auto ranging feature, Multiple Ranges to cover from 0 to 20 ppm (especially from 0 to 1 ppm).
- Zero Noise: ≤ 0.2 ppb.
- Lower Detectable Limit: ≤ 0.4 ppb.
- Zero drift (daily): < 0.5 ppb.
- Span drift (daily): < 0.5% of full scale.
- Response time: fast, ≤ 100 seconds.
- Precision: ≤ 0.5% of reading.
- Linearity: $\leq \pm 1\%$ of full scale.
- Operating temperature: not exceed 40 °C.

**Carbon Monoxide CO Analyzer** (Thermo Scientific Carbon Monoxide CO Analyzer model 48i-USA)

- Approval and Certification: U.S.EPA (USA), UBA/ TUV (Germany), Sira Certification Service.
- Ranges: Auto ranging feature, Multiple Ranges to cover from 0 to 200 ppm (especially from 0 to 50 ppm).
- Zero Noise: $\leq 0.02$ ppm.
- Lower Detectable Limit: $\leq 0.04$ ppm.
- Zero drift (daily): $\leq 0.1$ ppm.
- Span drift (daily): $< 0.5\%$ of reading.
- Response time: fast, $\leq 100$ seconds.
- Precision: $\leq 0.5\%$ of reading.
- Linearity: $\leq \pm 1\%$ of full scale.
- Operating temperature: not exceed 40 °C.

### 3.2 Noise Measurement Methodology

The methodology adopted was to record ambient noise levels for one hour, as per the national and international standards, in one location at the proposed transmission line rout. The following devices were used during the first round of noise level measurements:

- Two B & K 2238 Mediator, Integrating Sound Level Meters, Type I (precision grade), compliant with IEC 1672 Class 1 standard;
- B & K 4198 Outdoor Weatherproof Microphone Kit;
- GPS unit (Garmin MONTANA 650); and
- Digital Camera.

Noise monitoring measurements included recording the following parameters using a Type 1
precision grade hand-held sound-level meters:

- Equivalent continuous noise level (LAeq).
- 95th percentile noise level (LA95).
- 90th percentile noise level (LA90).
- 50th percentile noise level (LA50).
- 10th percentile noise level (LA10).
- Peak sound pressure level (LCpeak).

The following equation\(^4\) is the main equation used to calculate day night equivalent sound pressure level:

\[
L_{den} = 10 \log_\frac{1}{n} \sum_{i=1}^{n} 10^{0.1(L_i-D_i)} \text{ Where } L_{den} = \text{Day Night Equivalent}, \ L_i = \text{The hourly } L_{eq}, \ D_i = \text{the addition for the different periods of the day}, \ n = \text{number of measured hours}.
\]

The sound level meters were calibrated before sound measurements to ensure reliability and precision. GPS coordinates and meteorological conditions were recorded using hand-held kits at all locations prior to the start of noise measurements. It is anticipated that most of these locations would remain the same for the purpose of pre-construction, construction, performance guarantee tests and operation monitoring. Error! Reference source not found. shows the locations of the different noise measurement locations; furthermore, Error! Reference source not found. lists the GPS coordinates of measurement locations, measurement dates, location description and a selection of photos at each location.

---

\(^4\)The equation used to obtain the average noise level of a designated time interval based on weighted readings according to “Long-term Leq errors expected and how long to measure (Uncertainty & Noise Monitoring)”, Dietrich Kuehner, Forum Acusticum 2005 Budapest.
4. RESULTS

The following tables present the results for ambient air quality measurements conducted at all the four monitoring locations.

The objectives of the ambient air quality Monitoring activities conducted at the proposed site are:

- To verify compliance with authorized discharge limits and any other regulatory requirements concerning the impact on the public and the environment due to the normal operation of a practice or a source within a practice;
- To establish air quality baseline which will assist in the estimation of the project impact on the local physical, biological and social environment;
- To check the conditions of operation and the adequacy of controls on discharges from the source and to provide a warning of unusual or unforeseen conditions and, where appropriate, to trigger a special environmental monitoring program.

The air quality at the proposed site of the proposed substation is exhibiting acceptable levels of classic air pollutants in fact the levels are way below the national guidelines. Generation and dispersion of dust from increased vehicle traffic, especially during the construction phase, may reduce visibility, relative to baseline levels, and, together with combustion engine emissions, may affect ambient air quality. Concentration of dust particles, both total suspended particulate and respirable particulate matter and other pollutants from open burning, emissions from equipment and machinery used in construction, concrete batch plant operations and emissions from vehicles used to transport workers contribute to air pollution. These impacts may affect the human environment and, typically, arise during the construction phase and, to a much lesser extent, during the operation phase, requiring monitoring and assessment of the natural and man-made air pollutants.

One hour measurements are shown in Table 4-1 for all the measured parameters.

**Table 4-1 one hours average results (µg/m³)**

<table>
<thead>
<tr>
<th>Time</th>
<th>NO</th>
<th>NO₂</th>
<th>NOₓ</th>
<th>SO₂</th>
<th>CO mg/m³</th>
<th>PM₁₀</th>
<th>T.S.P</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00</td>
<td>10.3</td>
<td>19.5</td>
<td>29.8</td>
<td>12.2</td>
<td>1.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:00</td>
<td>6.6</td>
<td>17.3</td>
<td>23.9</td>
<td>11.8</td>
<td>1.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:00</td>
<td>15.1</td>
<td>21.4</td>
<td>36.5</td>
<td>11.2</td>
<td>1.7</td>
<td>125.82</td>
<td>161.47</td>
</tr>
<tr>
<td>13:00</td>
<td>4.9</td>
<td>20.3</td>
<td>25.2</td>
<td>10.5</td>
<td>1.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14:00</td>
<td>10.3</td>
<td>21.9</td>
<td>32.2</td>
<td>9.9</td>
<td>1.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15:00</td>
<td>15.5</td>
<td>11.1</td>
<td>26.6</td>
<td>9.9</td>
<td>1.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16:00</td>
<td>4.1</td>
<td>10.6</td>
<td>14.7</td>
<td>10.5</td>
<td>1.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17:00</td>
<td>4.3</td>
<td>12.2</td>
<td>16.7</td>
<td>10.3</td>
<td>1.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limits</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>10 mg/m³</td>
<td>150</td>
<td>230</td>
</tr>
</tbody>
</table>
4.1 Analysis of air quality Results

In general, there are two main factors affecting the ambient air concentration of a certain pollutant emitted from a certain source or sources in a selected area:

- The intensity of the emissions (e.g. concentration and flow rate) from the source or sources.
- The uncontrollable atmospheric dispersion conditions, which include but not limited to (wind speed, wind direction, temperature, humidity, rainfall, atmospheric turbulence, solar radiation intensity and atmospheric pressure).

All the recorded rests showed compliance with the national and international guidelines for ambient air quality moreover most of the data recorded were way below the guidelines which indicates that the
ambient air quality in the project areas is one of the best areas in Egypt in terms of ambient air quality which can be attributed to the absence of any major industrial sources.

Moreover, the area is mainly desert with a very scarce source for any pollution other than the nearby highway.
5. **NOISE LEVELS RESULTS**

Table 5-1 and Table 5-2 presents the results of eight hours average with one hour intervals ambient during day time and night time noise measurements and their corresponding national and international permissible limits.

**Table 5-1 Ambient Noise Levels Readings at day**

<table>
<thead>
<tr>
<th>Time</th>
<th>Lpeq</th>
<th>LA10</th>
<th>LA50</th>
<th>LA90</th>
<th>LA95</th>
<th>LCpeak</th>
<th>LAeq (dBA)</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td>39.93</td>
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<td>49.06</td>
<td>34.62</td>
<td>28.4</td>
<td>27.83</td>
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<tr>
<td>12:00</td>
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<td>56.87</td>
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<td>39.7</td>
<td>37.8</td>
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<tr>
<td>13:00</td>
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<td>57.38</td>
<td>49</td>
<td>41.11</td>
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<tr>
<td>14:00</td>
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<tr>
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**Table 5-2 Ambient Noise Levels Readings at night**

<table>
<thead>
<tr>
<th>Time</th>
<th>Lpeq</th>
<th>LA10</th>
<th>LA50</th>
<th>LA90</th>
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<tbody>
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<td>57.38</td>
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The results of ambient noise measurements were compared to the national and international permissible limits.
6. CONCLUSION

Based on the environmental monitoring and measurements performed for the ambient air quality. The results showed compliance with all the national and international guidelines.
7. FUTURE RECOMMENDATION

It is recommended that monitoring should continue for all the regulated parameters, in order to verify/assure compliance.
8. REFERENCES

- EU directive 2008 50 EC - ANNEX I Data quality objectives for ambient air quality assessment
- D1357-95 (Reapproved 2000) Standard Practice for Planning the Sampling of the Ambient Air
Appendix I - Selection of Photos from the Air Quality Monitoring activities
Appendix II - Selection of Photos from the Noise Monitoring activities
Annex 6: Emergency Response Plan
Emergency Preparedness & Response Procedure

The Egyptian Natural Gas Company

Emergency Preparedness And Response Procedure

<table>
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<th>Issue #</th>
<th>Item #</th>
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<th>Reviewed by</th>
<th>Approved by GASCO</th>
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SPONSOR: HSE GENERAL DEPARTMENT
Emergency Preparedness & Response Procedure

1- Purpose:
To identify the potential occurrence of accidents and emergency situations and how to respond for each and to identify preventing and mitigating actions needed for dealing the risks and impacts that may be associated with them.

2- Scope:
This procedure covers all emergency situations at all GASCO’s sites premises

3- Definitions:
HSE: Occupational health, safety and environment.
ECC: Emergency control center

4- Used forms
4-1 Emergency Response Practices Evaluation (GASCO-HSE-F-037)

5- Responsibility:
1- In cooperation with each site, HSE G. Dept. is responsible for prepare the emergency response plan:
   a) To identify the potential for emergency situations;
   b) To respond to such emergency situations.
2- Each site is responsible for preparedness to emergency situations in cooperation with HSE G. Department.
3- Each site HSE crew and other concerned department are responsible for response and manage the emergency cases under ECC supervision in cooperation with the Main ECC in Head Quarter (as in ERP).
4- HSE Site Dept. arrange for emergency training programs and follow-up the repardeness for emergency / accidental situations.

1- الغرض:
1- يهدف هذا الإجراء إلى تحديد الحوادث المحتملة ووقوعها بالشركة وكيفية التدابير معها وتلبية الإجراءات الوقائية والتصحيحية التي يتم اتخاذها للتعامل مع المخاطر المرتبطة بالسلامة والصحة المهنية والتآثرات البيئية المرتبطة بهذه الحوادث.

2- مجال التطبيق:
يشمل هذا الإجراء جميع حالات الطوارئ المحتملة في جميع مواقع شركة جاسكو.

3- ترنيفات:
HSE: السلامة والصحة المهنية وحماية البيئة
ECC: غرفة التحكم في حالات الطوارئ

4- النماذج المستخدمة:
1- تقييم استعدادات حالات الطوارئ نموذج رقم 37

5- المسؤوليات:
1- الإدارة العامة للسلامة والصحة المهنية وحماية البيئة مسؤولة عن إعداد خطة الاستعداد لحالات الطوارئ بالتعاون مع كل موقع من مواقع الشركة و
(أ) تحديد حالات الطوارئ المحتملة و
(ب) تحديد سيناريوهات الاستجابة لمثل هذه الحالات الطارئة.

2- كل منطقة مسؤولة عن تجهيز الاستعدادات لحالات الطوارئ بالتعاون مع الإدارة العامة للسلامة والصحة المهنية وحماية البيئة.

3- يتولى طاقم السلامة والصحة المهنية وحماية البيئة في كل موقع بالتعاون مع الادارات المعنية تحت إشراف غرفة الطوارئ بالمنطقة مسؤولة إعداد وإدارة حالات الطوارئ بالتعاون مع غرفة الطوارئ الرئيسية (طبقاً لمنا ورد في خطة الطوارئ).

4- يقوم قطاع السلامة والبيئة بكل موقع بتنظيم برامج تدريبية خاصة بالاستعداد لحالات الطوارئ ويقوم بمتابعة استعدادات مواجهة الحوادث وحالات الطوارئ.
5- Site HSE Committee review the results of preparedness for emergency / accidental situations follow-up. & the learned lessons of any actual emergency case or mock drill and sent copy of this meeting to HSE general manager.

6- After any emergency case the emergency evaluation committee evaluate the emergency case under site G.Mgr. supervision on the emergency response practices evaluation form (GASCO-HSE-F-037).

7- After any fire drill emergency center team evaluate the drill on the emergency response practices evaluation form (GASCO- HSE- F037)


5 - تتوفر لجنة السلامة والصحة المهنية وحماية البيئة بكل موقع مستقلة مراجعة تنتظر متابعة إعدادات مواجهة الحوادث حالات الطوارئ والدوران المستقلة من حالات الطوارئ الوعية أو الفعالة وترسل نسخة من مضبطية هذا الاجتماع لمدير عام السلامة والصحة المهنية وحماية البيئة.

6 - تجتمع لجنة تقييم حالات الطوارئ تحت إشراف مدير الموقع عقب حدوث أي حالة طوارئ وتقوم بتقييم حالة الطوارئ التي حدثت وتم تسجيل النتائج على نموذج تقييم إعدادات حالات الطوارئ (نموذج رقم 37).

7 - يقوم فريق غرفة الطوارئ بكل موقع بإعداد التدريب الوعي عقب أي تجربة يتم إجرائها وتسليم النتائج على نموذج تقييم إعدادات حالات الطوارئ (نموذج رقم 37).

8 - مسؤوليات مكتشف حالة الطوارئ ومشغل الراديو وفريق الطوارئ ومدير عام الإدارة العامة للشبكات ومدير عام التشغيل وشبكة المناطق ومدير التحكم المركزي ومدير عام الإدارة العامة للنفط وتوزيع الغاز ومدير الإدارة العامة لصيانة وتطوير الشبكات ومدير عام الإدارة العامة للتسجيلات ومدير الإدارة العامة للنشر الإدارية ومدير عام الإدارة العامة للخدمات المساندة ومدير عام الإدارة العامة للمهنية وحماية البيئة ومدير عام الاتصالات ومدير عام الشؤون القانونية وفريق الإعلام ومدير عام الشؤون الطبية ومدير عام الأمن الإداري ومدير المنطقة / المصنع ومدير القطاعات ومدير الأقسام المختلفة بالمناطق / المصانع ومدير السلامة والبيئة بالمناطق / المصانع محددة بالتفصيل في خطة الطوارئ العامة وخطط الطوارئ بالمناطق والمصانع.
**Emergency Preparedness & Response Procedure**

<table>
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<th>ISSUE NO:</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISSUE DATE:</td>
<td>15/11/2008</td>
</tr>
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</table>

**6- General:**

GASCO respond to actual emergencies and prevent or mitigate associated adverse HSE consequences. In planning its emergency response the GASCO take account of the needs of relevant interested parties, e.g. emergency services and neighbors. GASCO also periodically test its ERP’s (mock drills), where practicable, involving relevant interested parties as appropriate.

GASCO periodically review and, where necessary, revise its emergency preparedness and response plans, in particular, after periodical testing and after the occurrence of emergencies as mentioned in Emergency Response Practices Evaluation form # 37

HSE G. Dept. in coordination with site manager & site HSE department are responsible for review the preparedness to emergencies in all sites.

Each GASCO site cooperate with HSE G. Dept. for regarding of emergencies.

**7- Procedure:**

7-1 HSE General Department prepares a **contingency plan** for all GASCO’s sites. Such plan is approved by the HSE G.M. & includes the following subjects:
- Overview of emergency management.
- Emergencies classes brief description.
- Key personnel responsibilities.
- Typical site emergency procedure.
- Emergency communication plan.

A copy of these plans is placed in each site emergency control center and in Head Quarter Main ECC.

**6- عام:**

تتعلق GASCO على الاستجابة لحالات الطوارئ الفعلية ومنع أو تخفيف الآثار السلبية المرتبطة عليها و التي قد تؤثر على السلامة والصحة المهنية والبيئة.

تأخذ GASCO في الاعتبار عند وضع خطة الاستجابة في حالات الطوارئ احتياجاتها لقضايا الأطراف المعنية ذات الصلة بمواقع الشركة، على سبيل المثال خدمات الطوارئ الحكومية كالإسعافات الدفاع المدني أيضا الجيران.

تقوم GASCO بإعداد خطة استجابة لحالات الطوارئ (تجارب وهمية) وحينما يكون مكتنا تشارك فيها الأطراف المعنية ذات الصلة بمواقع الشركة حسبما يقتضي الأمر.

تقوم GASCO دوراً بمراعاة وتنفيذ خطط الطوارئ عندما يقتضي الأمر الضرورة - خاصة بعد التجارب الوهمية الدورية وبعد حالات الطوارئ الفعلية طبقاً لما يقرر عنه نموذج تدريب استعدادات حالات الطوارئ رقم 37.

تتولى الإدارة العامة للسلامة والصحة المهنية وحماية البيئة بالتنسيق مع مدير المواقع وقطاع السلامة والبيئة مسؤولية مراجعة وإعداد استعدادات تجهيزات في جميع مناطق ومواقع الشركة لمواجهة الطوارئ.

كل موقع من مواقع الشركة يتعاون مع الإدارة العامة للسلامة والصحة المهنية وحماية البيئة فيما يتعلق بحالات الطوارئ.

**7- الإجراءات:**

7-1 تقوم الإدارة العامة للسلامة والصحة المهنية وحماية البيئة بإعداد خطة طوارئ لجميع مواقع الشركة، ويعتبر مدير عام إدارة السلامة والصحة المهنية والبيئة هذه الخطة وتنضم الخطة الأATEGORIESية:
- مقدمة وعرض لإعدادات حالات الطوارئ.
- وصف مختصر لأنواع الطوارئ المختلفة.
- مسؤوليات المديرين والрюساء.
- إجراء التعامل مع حالات الطوارئ بالموقع.
- خطة الإتصالات أثناء حالات الطوارئ.

توجد نسخة من خطة الطوارئ لدى غرفة الطوارئ في كل موقع بالإضافة إلى نسخة موجودة في غرفة الطوارئ الرئيسية بالمركز الرئيسي.
7-2 HSE General Manager coordinate with All GASCO’s Sites to review and updated a plan once at least in the year or as per need and All GASCO’s Sites are provided with sufficient and suitable facilities and capabilities needed for emergency situations. These facilities may be some or all of the following:

- Fire fighting equipments
- Fire fighting systems & automatic safety control systems
- Personal protective equipments
- A clinic center or first aid materials.

7-3 Such facilities are checked periodically by HSE site department for adequacy and validity.

7-4 Arrangements with neighbor community working field sites are agreed and considered, under the umbrella of GASCO and EGAS, to integrate emergency preparedness facilities and capabilities to overcome any actual happening accidents.

7-5 Experimental drills, takes place periodically according to contingency plan requirements. A report of each drill results is made by HSE dept. and introduced for debate in the nearest HSE Meeting.

7-6 Training programs are planed and performed for the purpose of raising staff awareness of emergency subjects, right behavior to avoid accidents and correct the response to emergency cases. These training programs are managed according to HSE_MS training procedure.

7-7 تمت إجراء التجارب الوهمية بشكل دوري في الشركة طبقاً لمتطلبات خطة الطوارئ، ويتم إعداد تقرير خاص بكل تجربة وبياناتها ويوافق مطلب التقرير من المحافظة والمñanaة في أقرب إجتماع إدارة السلامة والممانعة والمباشرة. وتدريب المناقشة في أقرب إجتماع إدارة السلامة والممانعة والمباشرة.
Emergency Preparedness & Response Procedure

7-7 Results of any actual accidental situations are reported by HSE dept. and discussed in the nearest HSE general department meeting. Relative documents and procedures should be revised after actual accidental situations to insure its adequacy.

8- Records needed:
Drills reports and emergency cases report (emergency response practices evaluation sheets) are maintained at HSE site department.

8- السجلات:
تقارير تقييم التجارب الوراثية والحوادث يتم الاحتفاظ بها في قطاع السلامة والصحة المهنية وحماية البيئة بالمنطقة.
Emergency Response Practices Evaluation

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**INCIENT DETAILS: (SCENARIO)**

- Time incident reported:
- Time alarm sounded:
- Time fire brigade arrival to the scene:
- Time fire fighting operations started:
- Time arrival of emergency team leaders:
  - Emergency coordinator:
  - Operations:
  - Engineering services:
  - Fire fighting & control:
- Time injuries reported:
- Time required to evacuate injuries:
- First-aid provided:
- Time injuries reported to the clinic:
- Delay in ambulance arrival:
- Cause of delay:
- Is there difficulties in communication:
- Evacuation of personnel made:
- Personnel directed to assembly point:
- Head counting made:

**CONSEQUENCES:**

- Time reported:
- Time fire brigade arrival:
- Time arrival of emergency team leaders:
  - Emergency coordinator:
  - Operations:
  - Engineering services:
  - Fire fighting & control:
- Time injuries reported:
- Time required to evacuate injuries:
- First-aid provided:
- Time injuries reported to the clinic:
- Delay in ambulance arrival:
- Cause of delay:
- Is there difficulties in communication:
- Evacuation of personnel made:
- Personnel directed to assembly point:
- Head counting made:

**RESPONSE ACTION AND CONTROL:**

- Time requested:
- Time arrived:
- Type of equipment provided:
- Manpower:

**MUTUAL AID:**

- Time requested:
- Time arrived:
- Type of equipment provided:
- Manpower:

Signed

HSE Site Manager:
Site General Manager:

Date: / /
### Emergency Response Practices Evaluation

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### EMERGENCY PLAN COMMITTEE

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Site General Manager

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### تقييم حالة الطوارئ

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### التوفيق

مدير السلامة والصحة المهنية وحماية البيئة للمنطقة: 
مدير عام الموقع: 
التاريخ: / / 2006/05/01

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لا راعي الرسمي : إدارة العامة للسلامة والصحة المهنية وحماية البيئة
# تقييم حالة الطوارئ

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**مراجع:** الإدارة العامة للسلامة والصحة المهنية وحماية البيئة
Annex 7: Solid Waste Management Plan
The Egyptian Natural Gas Company

GASCO

Waste Management Procedure

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<th>Issue #</th>
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1- Purpose:
This waste management procedure has been prepared to reduce potential contamination of soil, water, and areas surrounding operational locations in GASCO different sites including project sites / plants and Headquarters. This document shall provide written procedures for production, collecting, handling, transporting, storage and final disposal of SOLID, LIQUID, gases, and energy wastes generated during GASCO different activities.

2- Scope:
This procedure is concerned with the management of all controlled wastes. Wastes covered by this practice include solid and liquid wastes (hazard or non hazard) generated from all GASCO sites, which routinely disposed on or off site, by reuse, recycling, land filling, incineration or other waste treatment and disposal process.

3- Definitions:
- Environment: surroundings in which GASCO operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation

- Pollution: is the introduction of contaminants (in the form of chemical substance or energy) into an environment that cause harm to human health, other living organisms and environment.
• **Pollution Prevention:** use of processes, practices, techniques, products, services or energy to avoid, reduces or control (separately or in combination) the creation, emission or discharge of any type of pollutant or waste, in order to reduce adverse environmental impacts.

**NOTE** Prevention of pollution can include source reduction or elimination, process, product or service changes, efficient use of resources, material and energy substitution, reuse, recovery, recycling, reclamation and treatment.

• **Segregation area:** it is the place where the separation of the entire waste generated in a place, different waste groups according to the specific treatment and disposal requirements.

In GASCO there are 7 segregation areas: 4 Temporary and 3 final segregation area.

The Temporary Segregation areas are:

- El Tebbin Segregation area: for Great Cairo Areas and H.Q.
- Shabshire Segregation area: for Talkha, Shabshire and Damietta areas.
- Suez Segregation area: for Suez, Red Sea and South Sinai areas.
- Portsaid Segregation area: for Portsaid and North Sinai

Merghem Segregation area for East and West Alex Areas and it is also the Segregation area which the other segregation areas send their wastes to before transporting all wastes to EL-Nasseria landfill

The final Segregation areas are:

- Merghem Segregation area for the Temporary segregation area.
- LPG and WDGC Plants Segregation area in their sites before transporting all wastes to EL-Nasseria landfill

**الحذ من التلوث:** ويعني استخدام مجموعة من العمليات / الممارسات / التقنيات / المنتجات / الخدمات / الطاقة (كما على حدة أو مجتمعة) لتجنب أو تقليل أو السيطرة على نشوء / إنبعاث / أو تصريف أي نوع من الملوثات أو المخلفات ، بهدف خفض الآثار البيئية الضارة.

**ملاحظة** منع التلوث يمكن أن يشمل تقليل أو إزالة وتغيير عملية / منتج / خدمة ، وكذلك الاستخدام الفعال للموارد والمواد وإستخدام بازالة الطاقة ، واستخدام تقنيات إعادة الاستخدام ، والإستخلاص ، وإعادة التدوير والإصلاح والمعالجة.

• **منطقة فصل المخلفات:** هي المنطقة التي يتم فصل المخلفات المولدة فيها بما في أماكن متصلة أو مجموعات طبقاً لمتطلبات عملية المعالجة أو التخلص منها.

• يوجد في جاسكو 7 مناطق لفصل المخلفات ( 4 منها مؤقتين و 3 مناطق فصل نهائية).

**مناطق الفصل المؤقتة هي:**

- منطقة فصل التيني: Von نمتظم القاهرة الكبرى والمراكز الرئيسي.
- منطقة الفصل بشّر: مناطق طلخا/ بشّر ودمياط.
- منطقة الفصل السويس: مناطق السويس والبحر الأحمر وجنوب سيناء.
- منطقة الفصل بالقناة: لمنطقتي بورسعيد وشمال سيناء.

تعتبر مرغر منطقة فصل مؤقتة لمنطقتي شرق وغرب الاسكندرية وأيضاً منطقة فصل نهائية لجميع مناطق الشركة حيث أن جميع مناطق الفصل المؤقتة تقوم بنقل المخلفات إلى منطقة مرغر قبل نقلها إلى مدن الناصرية.

**مناطق الفصل النهائية هي:**

- منطقه مرغر: لجميع مناطق الفصل المؤقتة.
- مناطق الفصل بالصناعات (جميع غازات الصهرة العربية و نباتام البئر) حيث يتم فصل المخلفات في المصنعين وتخزينهما قبل نقلهما الى مدن الناصرية.
Landfill: is a site for the disposal of waste materials by burial. Landfills have been the most common methods of organized waste disposal.

Wastes: any substance or object which the holder discards or intends to, wastes are divided to non-hazard wastes and hazard wastes.

Hazard waste: liquid, solid, contained gas, or sludge wastes that contain properties that are dangerous or potentially harmful to human health or the environment.

Solid, Liquid or Gasous wastes are considered hazardous if they possess one or more Hazardous characteristics of the following: (annex1)

- Flammable: Capable of burning or causing fire. (eg: acetone, Toluene, ethyl ether).
- Corrosive: able to corrode steel by chemical reaction as a result of extreme acidic or basic properties and is capable of causing severe damage when in contact with living tissues. (HCl, HNO₃)
- Reactive: undergoes violent reactions with air and/or water. (contains PCl₅)
- Oxidizing: wastes giving rise to highly exothermic reactions when in contact with other substances, particularly flammable substances and may be yielding oxygen cause or contribute to the combustion of other materials. (eg. Peroxides)
- Irritant: non-corrosive wastes which, through immediate, prolonged inflammation or other skin symptoms. (Eg: acetic acid, benzene tetrachloride)
- Toxic: waste containing substances which are poisonous which by inhaled or ingested (swallowed) or penetrates the skin may cause delayed or chronic effects including carcinogenicity or may cause death or serious injury. (eg: Arsenic, Cadmium, Cyanide).

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- **Harmful**: wastes containing substances and preparation which, if inhaled or ingested or penetrates the skin, may involve limited health risks. (e.g: lube oil)
- **Ecotoxic**: wastes which may have toxic effects on biotic systems and which if released may present immediate or delayed environmental adverse impacts by means of bioaccumulation and/or toxic effects on one or more sectors of the environment. (e.g: Pesticide, DDT).
- **Carcinogenic**: waste which, if inhaled or ingested or penetrates the skin may induce cancer in man or increase its incidence. (e.g: Gasoline)
- **Teratogenic**: waste containing substance and preparations which if inhaled or taken internally or penetrates the skin may induce non-hereditary genetic deformations, or increase their incidence. (e.g: tetra ethyl lead).
- **Mutagenic**: waste containing substances and preparations, which if inhaled or taken internally or penetrates the skin may induce hereditary inherent deformations, or increase their incidence. (e.g: DDT, Alderin)
- **Radioactive**: wastes containing the characteristics of radioactive materials.
- **Non Hazard wastes**: any other wastes rather than hazard wastes.
- **Household wastes (Domestic wastes)**: wastes from a domestic property, caravan, residential home, official waste.
- **Controlled wastes** are defined as any scrap, unwanted, surplus, broken, Worn out, contaminated or otherwise spoiled materials, which would have to be disposed of as if they were wastes.

- **ضارة**: هي المخلفات التي تحتوي على مواد أو تضريرات إذا تم استنشاقها أو اختراق الجلد قد تؤدي إلى مخاطر صحة محددة. (مثل: زيوت التزييف)
- **الضارة للبيئة**: المخلفات التي لها تأثير سام على الأنظمة البيئية، أو التي إذا أُبتلع في البيئة في الحال أو على مر السنين عن طريق التراكبات البيئية قد تؤدي إلى تأثيرات بيئية غير مزعجة فيها أو إلى تأثيرات سامة في قطاع أو أكثر من قطاعات البيئة. (مثل: دي دي تي، المبيدات الحشرية).
- **مضررة**: المخلفات التي إذا استنشاقها أو اختراق الجلد من الممكن أن تصيب الإنسان بمرض السرطان أو تزيد نسبة الإصابة المرض بالسرطان. (مثل: الجازولين).
- **منشوية**: المخلفات التي تحتوي على مواد التي إذا استنشاقت أو تم تناولها أو تم اختراقها للجلد قد تؤدي تلوثات غير وراثية أو زيادة معدل الإصابة بها. (مثل: شباع الصدأ).

المخلفات المشعة هي المخلفات التي تحتوي على خصائص المواد المشعة.

المخلفات غير خطيرة هي أي مخلفات أخرى التي لا تحتوي على كل ما سبق

المخلفات المنزلية: المخلفات الصادرة من الممتلكات بالمنزل، الكشفات، المخلفات السكنية والمكتبة.

المخلفات المتحكمة فيها: تعرف بأنها أي خردة أو فضلات أو مواد غير مزعجة فيها أو مكسورة أو تلف أو ملوثة والتي يجب التخلص منها.
4- Used Forms:
- Hazardous wastes Register for all GASCO sites. (GASCO-HSE-F-031)
- Hazardous wastes Register for all GASCO plants. (GASCO-HSE-F-031')
- List of hazard wastes disposed

5- Responsibility:
Since waste management includes dealing with wastes at the generation source, transportation, storage & final waste disposal. The responsibilities of this practice will be divided on the waste generators in site/plants and H.Q., Operation Dept., Maintenance Dept., E&I Dept., HSE Dept. & S.S. Dept. ...etc.,

5.1 Waste Generator
- Commitment with the obligations stated in this practice Meet GASCO HSE policy and expectations.
- Ensure legislative compliance.
- Contribute to achieve the waste reduction.
- Ensure that all personnel (staff / contractors) are aware of their responsibilities with regards to waste management and receive training on this procedure.
- Ensure the provision of appropriate container facilities for waste collection, segregation, storage, transported, reused and/or disposal, including labeling of these containers.
- All Depts. generate hazard wastes must send the types of wastes and their quantities periodically to HSE dept./ Env. Dept. (H.Q.).

4- النماذج المستخدمة:
- سجل الخلفات الخطرة لمناطق جاسكو (GASCO-HSE-F-031)
- سجل الخلفات الخطرة لمصانع جاسكو (GASCO-HSE-F-031')
- بيان التخلص من الخلفات الخطرة

5- المسؤوليات:
حيث أن عملية إدارة الخلفات تتعلق بمصادر هذه الخلفات وعمليات النقل والتخزين والتخلص النهائي منها إذا فإنة مسئولة تغييد هذا الإجراء تقع على جميع القطاعات التي يتول guardar نشاطها أنواع الخلفات المختلفة في المناطق/المصانع/المركز الرئيسي مثل قطاع التشغيل/الكهراء والأجهزة/الصيانة/السلامة والخدمات المساعدة ...، أخرى.

5.1 مصدر توليد الخلفات
- التعهد بالالتزام بالمعايير القانونية في إدارة الخلفات بما يتوافق مع السياسة العامة للشركة تجاه السلامة والصحة المهنية وحماية البيئة وكذلك مع ماهو توقعات إدارة الشركة.
- التأكد من التوافق مع القوانين.
- الإسهام في الوصول إلى خفض الخلفات.
- التأكد من أن كل العمال والعمالاء المقاول قد أطلعوا على مسؤولياتهم تجاه إدارة الخلفات وأنهم تلقوا تدريب على إجراء إدارة الخلفات.
- التأكد من استخدام الحاويات المناسبة لجمع وفصل وتخزين ونقل واعدة الاستخدام والتخلص من الخلفات على أن يتضمن ذلك وضع لائحة على الحاويات تدل على ما فيها.

الالتزام بالالتزام بالإجراءات المولدة للمخلفات الخطرة بارسل نوع وكمية هذه الخلفات دورياً لإدارة السلامة والبيئة لمناطق/المصانع ولإدارة البيئة بالنسبة للمركز الرئيسي.
Waste Management Procedure

- Ensure that all waste transfers records are kept, in order to legislation compliance.
- Waste generated from the non-routine activity and not considered in the list of wastes should be communicated to HSE dept./ Env. Dept.
- Apply Pollution Prevention concept (if applicable).

5.2 Sites/ Plants HSE Dept.

- Identify all the laws and regulations used for Waste Management and send it to all interested departments.
- Provide Waste Management training to all interested depts.
- Provide advice and assistance as and when requested on waste management options, standards, and practices.
- Provide information and advice on any new/forthcoming legislation, waste management options and minimization practices.
- The above practices should be reviewed and maintained.
- Ensure that the waste management program is developed & regularly reviewed covering all operations.
- Ensure waste management activities are included in asset audit programs.
- Collect the types and quantities of hazard wastes from all depts. in the waste disposal form (GASCO-HSE-F-031) to be transported to the related Temporary Segregation area.
- In WDG&C LPG, HSE dept. collect the records of hazard wastes from the Materials& Ware house dept. and also supervise, monitor and inspect the segregation area periodically.

5- 2 قطاع السلامة والصحة المهنية وحماية البيئة

- الالتزام بأن جميع أنشطة إدارة الخلفات قد تم إدراجها في برنامج المراجعة.
- يمكن أن يحقق من أن برامج إدارة الخلفات يتم تطويرها ومراعبتها دورياً وأنها تستند إلى عمليات التشغيل.
- تتضمن كل أنواع وكميات الخلفات الصادرة من كل الإدارة في النموذج الخاص بالتخلص من الخلفات (GASCO-HSE-F-031) للمناطق وذللك تلقائياً إلى مناطق الفصل المؤقتة للمخلفات لكل منطقة.
- بالنسبة إلى مجمع غازات الصحراء الغربية ومصنعين يوتباجز العامية تقوم إدارة السلامة والبيئة بتجميع سجلات الخلفات الخطرة الخلفات من إدارة المهندس المخزني كما تقوم بالإشراف والمراقبة والتفتيش الدوري على منطقة فصل المخلفات. 

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Waste Management Procedure

5.3 Site Support Service Dept./Materials dept.& Warehouse dept.
- Manage the supervision and handling way of wastes with the contractor.
- Ensure legislative compliance during solid/liquid wastes transportation.
- Don’t transfer unknown wastes.
- Facilitate the availability/receiving of used lube oil drums for the assigned person of Misr Petroleum Company under the supervision of HSE Dept. (except in suez area)

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- In LPG and WDGC, the Materials & Warehouse dept. collect the hazard wastes (liquid/ solid) from all concerned Depts., if there, and stores them in the segregation area under the supervision of HSE to be treated and/or disposed in environmentally proper manner.
- Report the quantities and types of hazardous wastes stored in the segregation area periodically to HSE dept.
- Provide suitable packing for the wastes for the liquid & solid wastes as per the landfill requirements.
- Coordinate with HSE Dept. before transferring the wastes for final disposal.
- Apply Pollution Prevention concept (if applicable).

5.4 Environmental General Dept.

- Recognize and analyze the laws and regulations and other requirements specific for waste management and provide it to all GASCO sites and plants.
- Provide advice and assistance as and when requested on waste management options, standards, and practices.
- Provide information and advice on any new/forthcoming legislation, waste management options and minimization practices.
- Review and maintain this practice.
- Ensure a waste management program is developed & regularly reviewed covering all operations.

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- Ensure a waste management program is developed & regularly reviewed covering all operations.

5.4 Environmental General Dept.

- Recognize and analyze the laws and regulations and other requirements specific for waste management and provide it to all GASCO sites and plants.
- Provide advice and assistance as and when requested on waste management options, standards, and practices.
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- Provide information and advice on any new/forthcoming legislation, waste management options and minimization practices.
- Review and maintain this practice.
- Ensure a waste management program is developed & regularly reviewed covering all operations.
Ensure waste management activities are included in asset audit programs.

Keep records for the waste generated in the H.Q. and all GASCO's areas.

Analyze the records of the quantities and types of hazardous wastes in all Gasco's sites to follow-up the waste minimization approach for complying with Env. Law and its regulations to consider needed recommendations.

Coordinate the handling of hazardous waste between Gasco's site and local authority (ex:- the Nassrya landfill (EEAA) ……etc).

Ensure that the waste management process implemented in a proper manner through planned and unplanned audits.

Manage the license order of the Hazardous waste of Gasco's sites and H.Q. with the competent authority.

Recommend and apply Pollution Prevention approach (if applicable).

5.5 Maintenance & Operation Dept.

Facilitate the availability of used/defected spare parts to the Support Service Dept. which transfer the solid wastes & keeping it in a good condition.

Facilitate the transfer of Liquid and Solid wastes for support services Dept.

In Suez Area, Facilitate the availability /receiving of used lube oil drums for the assigned person of Misr Petroleum Company under supervision of HSE & S.S Depts.

Apply Pollution Prevention concept (if applicable).

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- Keep records for the waste generated in the H.Q. and all GASCO's areas.
- Analyze the records of the quantities and types of hazardous wastes in all Gasco's sites to follow-up the waste minimization approach for complying with Env. Law and its regulations to consider needed recommendations.
- Coordinate the handling of hazardous waste between Gasco's site and local authority (ex:- the Nassrya landfill (EEAA) ……etc).
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- Manage the license order of the Hazardous waste of Gasco's sites and H.Q. with the competent authority.
- Recommend and apply Pollution Prevention approach (if applicable).

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In Suez Area, Facilitate the availability /receiving of used lube oil drums for the assigned person of Misr Petroleum Company under supervision of HSE & S.S Depts.

Apply Pollution Prevention concept (if applicable).
5.6 Medical Department

- Ensure legislative compliance during solid/liquid wastes transfer.
- Facilitate the availability/receiving of medical wastes for the assigned party of under the supervision of HSE Dept./Env. General Dept. in H.Q..
- The Medical dept. collect all types and quantities of medical wastes on form (GASCO-HSE-031) and signed in others in the form to dispose them in environmentally manner.
- Apply Pollution Prevention concept if applicable.

6-General:

6-1 This procedure will be illustrated using selected life examples existing at GASCO sites'.
6-2 The objective of the procedure is to ensure consistently high standards of waste management in order to:

- Minimize environmental damage.
- Pollution Prevention
- Ensure effective and efficient use of limited resources.
- Assure legislative compliance.
- Prevent liability.
- Minimize costs.
- Prevent occupational health and safety risks
- Profitability

5-الإدارة الطبية

- التأكد من التوافقي القوانين أثناء نقل المخلفات الطبية.
- يتم تسليم المخلفات الطبية للجهة المخصصة (حسب الجهة المتعاون معها) تحت إشراف إدارة السلامة والصحة المهنية وحماية البيئة بالمنطقة / المصنع أو إدارة حماية البيئة المركز الرئيسي.
- تقوم الإدارة الطبية بتجميع جميع أنواع المخلفات الطبية على النموذج GASCO-HSE-031 ويتم توقعها في خانة بيانات أخرى بالنموذج ليتم التخلص منها بطريقة بيئية سليمة.
- تطبيق مفهوم الحد من التلوث (كلياً أمكن).

6- عام:

1- هذا الإجراء يتم توضيحه باستخدام أمثلة حية مختارة من واقع ما هو موجود في مناطق الشركة.
2- الهدف من هذا الإجراء هو التأكد من اتباع المعايير عالية المستوى في إدارة المخلفات وذلك بهدف الوصول إلى :

- الإقلاع من التأثير الضار على البيئة.
- الحد من التلوث
- ضمان الاستخدام الفعال والأمثل للموارد المحدودة
- التأكد من التوافق مع القوانين والتشريعات.
- تجنب المسؤولية القانونية.
- تخفيض التكلفة.
- منع المخاطر المحتملة على السلامة والصحة المهنية.
- زيادة المكاسب المالية (الربحية).
6-3 This practice intended to comply with the regulations governs solid /liquide waste management process.

These regulations are:
2- EGAS and shareholders regulations.
3-The Regulations of EEGP.
4- Others

6-4 Types of wastes in GASCO:
1- Office waste.
2- Lamps
3- Batteries
4- Toner Cartridges (Copiers, Fax and printers)
5- Foaming pigs.
6- Radiography films
7- Paints
8- Chemicals used in Labs
9- Tyres
10- Clinical wastes
11- Used Lube oil
12- Condensate
13- Others

7- Procedures:
7.7.1 Waste minimization management program
- Waste minimization is a fundamental aspect of good waste management practice. Waste generators in each area follow up its waste minimization approach.
- Assets and operations must be periodically reviewed to identify opportunities for improvement as part of their waste minimization and management program.
- The program should identify clear targets and set out a strategy for their achievement.
7.7.2 Waste Reuse /Recycle and Disposal

7-7-2-1 THE HAZARDOUS LIQUID WASTES.

The liquid waste (used Lube oil)
- Is collected from all Depts. in specific drums and transferred to concerned Petroleum Companies (Misr Petroleum & Petrotrade Companies), under the supervision of Support service(S.S) and HSE, to be Recycled.
- Also, lube oil of vehicles is exchanged in service station.

The liquid wastes/ chemical wastes In LPG and WDGC facilities are collected from all concerned Depts. (if there), under the supervision of Support service and HSE departments and treated and/or disposed in environmently proper manner.

Condensate is collected from all condensate tanks in specific drums and returned to petroleum companies.

7.7.2.2 The Non-Hazardous Solid Wastes.
* The Solid Wastes (tires, wood, pipes, glasses, scrap metal, plastics, empty cans, non-contaminated drums...) are collected from all Depts. and transferred to Support Service Dept-materials.
* The Solid Wastes (papers, garbage,...) are collected from all Depts. and received to the contractor to be Disposed it in the local Authority damping area, Under the supervision of Support service and HSE Depts.
* Technical committee from the concerned parties and material Dept. is feasible to carryout reuse, recycle or sell of these solid wastes, adhere to do that.

7.7.2.3 The Solid Hazardous Waste
* Used Batteries of cars (liquid/ dry) or used liquid batteries used in control room are collected to be retained to the Agent to be recycled, under the supervision of S.S. & HSE Depts.

The Solid Wastes (Molecular Sieve, Silica gel & Insulator materials) are collected and disposed in a proper environmental manner such as El Nasseria Landfill by Material and Warehouse dept. and under the supervision of HSE.

* The Solid Wastes (computer stationary / materials, printers and cartridges). are collected by IT Dept./ communication Dept. and transferred to IT Dept. in head office to be reused or transfer to Alex segregation area to safe disposed in environmentally proper manner in Nassrya landfill under supervision of S.S. & Env. Gen. Depts..

* Aerosol canes - dry batteries - welding films graph – contaminated drums – contaminated filter elements – oily rags ....etc collection from all Gasco site’s and transfer to Alex segregation area to safe Disposed in Nassrya landfill under supervision of S.S. & HSE Depts to be disposed in environmentally proper manner.

المخلفات الخطرة (المختلاطات الغازية المدمجة، المواد والطاولات والأجهزة) يتم تجميعها بواسطة إدارة تكنولوجيا المعلومات / الأتصالات بالمدينة / المصنع ويتم إرسالها لإدارة تكنولوجيا المعلومات في المركز الرئيسي حيث لإعادة استخدامها أو نقلها إلى منطقة فصل المخلفات بالاسكندرية للتخلص منها بطريقة بيئة آمنة (مثل: مرفأ الناصرية) تحت إشراف إدارة الخدمات المساندة وإدارة حماية البيئة.

* عبوات الأشرورولات - البطاريات الجافة - أفلام تصوير اللحام – البراميل الملثوتة - عناصر الفلتر الغاز الملتوى - الكهون الملتوية - إلخ يتم تجميع من كل مواقع حاسو وتنقل إلى منطقة فصل المخلفات ب😀 منطقة غرب الإسكندرية للتخلص الأم من منها من خلال مرفأ الناصرية التابع لجهة شنون البيئة تحت اشراف كل من إدارة الخدمات المساندة والصحة المهنية وحماية البيئة بالموقع حيث يتم التخلص منها بالطريقة المناسبةً.
Waste Segregation
Hazardous solid wastes should not mix inappropriately so as to prevent risks to the environment or personnel during storage and handling. Wastes should be segregated in labeled containers (netted skips or drums) suitable to contain the waste. Handling of harmful materials done by the supervision of HSE division. It should be noted that wastes must be collected in a safe proper packing to avoid scattering of wastes. The following segregation models are recommended for GASCO sites’.

7.7.3.1 Workshops
Three containers for solid wastes should be available at workshops as follows:

A. Burnable wastes
[Paper, carton, plastics (small), small pieces of broken wood, , wiping wastes, Etc.].

* The Medical Wastes are collected by clinics in proper packages and in red bags to be sent to an approved incinerators.

* The Rest of Solid Hazardous Wastes is collected and storage in segregated area under safe conditions as per recommendation of EEAA.

* Should be noted that environmental regulations prohibiting recycling hazardous solid waste except under the supervision of competent administrative authorities. Such prohibition is made for harm avoidance that may occur due to improper processing of wastes.

المخاليف الطبية يتم تجميعها بواسطة العيادات في عيون المناسبة وفي أكياس حمراء طبقة وتعليمات وزارة الصحة والسكان ثم ترسل لأحد المحارق المعتمدة من الجهات المختصة.

* باقي المخاليف الصلبية الخطرة يتم تجميعها وتخزينها وفصلها طبقاً وتعليمات جهاز شئون البيئة.

لا يجوز أن يتم خلط المخاليف الصلبية الخطرة بطريقة غير ملائمة لمنع الخطر الذي قد تنجم من ذلك على البيئة أو الأشخاص أثناء التخزين والتداول. لابد أن يتم فصل المخاليف في أوعية مكتوب عليها ما تحتوي عليه من مخاليف وتصور نتيجة للاوعي الصادرة المخزنة بها. يتم تداول المواد الصغيرة تحت إشراف قطاع الصحة والصحة المهنية وحماية البيئة.

لا بيد من ملاحظة ضرورة تجميع المخاليف في أغلفة مناسبة لتجنب بعثة المخاليف.

وبما يلي المهام المطلوبة لتنظيم فصل المخاليف

بمواضع الشركة المصرية للغازات الطبيعية.

13-7-7

لا بيد من توافر 3 أنواع من الأوعية عند الورش لفصل المخاليف الصلبية وهي

أ) المخاليف القابلة للحرق
مثل الورق - الكرتون - القطع البلاستيك الصغيرة - قطع الخشب الصغيرة - الخرق المستخدمة في تنظيف الماكينات

....الخ.

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B. Metallic scrap
[Wires, metallic chips …etc.].

C. Hazards wastes
[Empty paints, oily contaminated/ saturated rages, lube oil and cleaner cans, used paint brushes, oil and fuel filters, glass wool, contaminated broken glasses].

7.7.3.2 Process locations
Containers for solid wastes should be available at process area as follows:
A. Burnable wastes: Paper, carton, plastics (small), wiping wastes.
B. Hazards wastes: cleaner cans.

7.7.3.3 Clinic
Containers for solid wastes should be available at the clinic as follows:
A. Burnable wastes: Paper, carton
B. Hazards wastes: used cotton and Gauze, Syringes, contaminated broken glasses

7.7.3.4 Chemical lab.
Containers for solid wastes should be available at the chemical lab. as follows:
A. Burnable wastes: Paper, carton, plastics (small), wiping wastes, …etc.
B. Hazards wastes: Chemical cans, lube oil and cleaner cans.

7.7.4 Management of wastes:

7.7.4.1 Non-Hazard wastes:
* Solid wastes being collected, transported and disposed by service contractor to the nearest approved disposal sites by garbage truck under the supervision of support service division.

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7.7.4.2 Hazard wastes:
* There are means for management of solid/liquid wastes. Ex:- segregation of wastes under the supervision of the technical committee to be disposed or sold.

The following precaution should be fulfilled during transportation and collection of wastes:
* Commitment to dispose the solid wastes in the locations specified for that purpose.
* Liquid Wastes being collected and transported, under the supervision of S.S/HSE Depts., to petroleum companies.
* Avoid spill of liquid wastes during transportation.
* Follow any instructions issued by Environmental General Dept.

7.7.5 Waste segregation area
Each HSE Site Dept., concerned Depts. and the Site top management selected the segregation area for solid & liquid wastes.

© SPONSOR: ENV. GENERAL DEPARTMENT
1. Each dept. in each sites/plants and H.Q. communicated documentary the types/quantity of its wastes to HSE dept.

2. Each HSE site dept. collect the documented types/quantity of wastes generated in the waste disposal form (GASCO-HSE-F-031) to be transported to Temporary Segregation areas.

3. HSE Dept. in each related Temporary segregation area collected all the quantities/types of areas generated wastes in the waste disposal form (GASCO-HSE-F-031) to be transported to the final Segregation area.

4. The transportation on the the hazard wastes from the Temporary Segregation area to the final segregation area (Merghem) should be done by the coordination with General Environmental Dept.

5. HSE Dept. in final Segregation area collect all the quantities/types of its generated wastes plus the collected wastes from the Temporary segregation areas to be transported to El-Nasseria landfill.

6. In LPG& WDGC, the Material and Warehouse dept. is responsible for collecting the hazard wastes under the supervision of HSE on (GASCO-HSE-F-031)’ to be transported it to the El-Nasseria landfill.

7. Copies from waste disposal forms issued in steps 2,3,4,5&6 are communicated to Environmental General Dept.

**7.7.7 Record keeping**
The SUPPORT SERVICE Dept. should have Solid and Liquid wastes Record Book and summarized through HSE Division.

**7.7.6 Documented Waste Disposal process of controlled wastes from Generator to Landfill**

1. Documented Waste Disposal process of controlled wastes from Generator to Landfill:

   1. Each dept. in each sites/plants and H.Q. communicated documentary the types/quantity of its wastes to HSE dept.

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   7. Copies from waste disposal forms issued in steps 2,3,4,5&6 are communicated to Environmental General Dept.

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**Waste Management Procedure**

### 7.7.7 Auditing program
The debits stated in this document shall be audited biannually through Environmental General Dept.. Operational self-audit must also be conducted in order to verify commitment and compliance with GASCO HSE policy.

### 7.7.8 Training and Maintenance of competency
Waste generators shall ensure that all personnel have received awareness training on waste management, including information on the legislative background to waste disposal procedures. Personnel with specific responsibility for waste shall participate in a recognized waste management course.

### 8- Records needed
Records of Waste Disposal form are maintained at HSE sector and Support Service.

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Annex 1

Hazard Signs

Explosive

Flammable Liquids

Flammable Solids

Spontaneously Combustible

Dangerous when Wet

Oxidizing

Organic Peroxides

Corrosive

Toxic

Infectious

Caution

Radioactive waste

Danger

Annex 1
# Hazard Waste Disposal Form

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<th>Final Segregation area</th>
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- **بيانات الجهاء المستلمة:**
  - الإدارة المستلمة: ............................................................
  - إدارة السلامة و الصحة المهنية و حماية البيئة: ......................
  - إدارات أخرى: ............................................................
  - مدير عام المنطقة: ..................................................
  - مدير المنطقة/ الموقع: .............................................

- **التاريخ:** .................................................................

 Chowra إلى الإدارة العامة لحماية البيئة

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**ISSUE DATE:** 01/04/2013

**SPONSOR:** ENV. GENERAL DEPARTMENT
Annex 8: Grievance Form

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شاطر التسعين - مخرج 12 من الطريق الدائري التجمع الخامس/ القاهرة الجديدة
التليفون: 01111111111
فأكس: 21111111111
أرقام الظوارى: 21111111111
رقم الظوارى دون الحاجة للنداء الآلي: 123

تعليم الشخص المقدم بالشكو

عمر مقدم الشكو

تاريخ مقدم الشكو

موضوع الشكو

الفشل الفتح

التابعة
### Annex 9: Scoping Meeting Participants List

<table>
<thead>
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<th>No.</th>
<th>Name</th>
<th>Job</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Mohammed SolimanIsmaiel</td>
<td>-</td>
<td>01112007557</td>
</tr>
<tr>
<td>2.</td>
<td>Mohammed Sayed</td>
<td>General Waste Management</td>
<td>01005531991</td>
</tr>
<tr>
<td>3.</td>
<td>Esraa Tawfik Ahmed</td>
<td>Environmental Expert (Consultant)</td>
<td>01288688620</td>
</tr>
<tr>
<td>4.</td>
<td>Ramdan Abd El-Wahab Hassan</td>
<td>Head of Environment Department - Elchentor</td>
<td>01276584264</td>
</tr>
<tr>
<td>5.</td>
<td>Hessian Abd El-Azim Hassan</td>
<td>Village secretary - Elchentor</td>
<td>01220302975</td>
</tr>
<tr>
<td>6.</td>
<td>Hany El-Khoderi</td>
<td>Chairman of News Egypt Free</td>
<td>01227218282</td>
</tr>
<tr>
<td>7.</td>
<td>Sahar Seif</td>
<td>Chairman of the Board of Directors</td>
<td>01224207746</td>
</tr>
<tr>
<td>8.</td>
<td>Hoda Youssef</td>
<td>Head of the local unit</td>
<td>01229675900</td>
</tr>
<tr>
<td>9.</td>
<td>Zienab Mohammed Hamada</td>
<td>Department of Environmental Affairs</td>
<td>01146795651</td>
</tr>
<tr>
<td>10.</td>
<td>Wael Abd Alrahman Ahmed</td>
<td>Department of Environmental Affairs</td>
<td>01228709830</td>
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<tr>
<td>11.</td>
<td>Mahmoud Habashy</td>
<td>Secretary of the local community association</td>
<td>01286053971</td>
</tr>
<tr>
<td>12.</td>
<td>Mohammed Ali Wahedi</td>
<td>Assistant Director-General GASCO</td>
<td>01011303702</td>
</tr>
<tr>
<td>13.</td>
<td>Abd Al-Rahman Hassan Ahmed</td>
<td>Technician engineer at the local unit</td>
<td>01210107159</td>
</tr>
<tr>
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الإثنين 21 مارس 2016 - قاعة مؤتمرات الجامعة - كورنيش النيل - بني سويف
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جامعة طيبة في عيد النور

الخاصة بدراسة تقييم الثراء البيئي والاجتماعي - مشروع مقدمة الخدمات الطبيعية (محافظة بنى سويف)

استمارة تسجيل الحضور

التاريخ 21 مارس 2016 - قاعة مؤتمرات الجامعة - كورنيش النيل - بنى سويف

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Annex 10: Public Consultation Participants List

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الجنسية التشار الجماهيرية
الخاصة بعرض نتائج الدراسات البيئية والاجتماعية - مشروع مد خطوط الغاز الطبيعي لمحطات كهرباء سمنوز
استمارة تسجيل الحضور
الإجمالي 17 إبريل 2016 - قاعة مؤتمرات الجامعة - كورنيش النيل - بني سويف

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* الاسم: محمد رضا، محمد صلاح، أحمد أيوب، حسن خليل، محمد إبراهيم
* الوظيفة: مدير، عضو مجلس الإدارة، رئيس القسم، مساعد، مشرف
* الموهيل: 12345، 6789
* الجهة: مكتبة الجامعة، إدارة المشروعات
* الـ M: 1، 2، 3، 4، 5

** примечание:** текст может быть адаптирован для более точной интерпретации.
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كلمة الشكر الجماهيرية

الخاصة بعرض نتائج الدراسات البيئية والاجتماعية - مشروع مخطوطة الغاز الطبيعي لمحطات كهرباء سيمنز

استمارة تسجيل الحضور

الاحد 17 ابريل 2016 - قاعة مؤتمرات الجامعة - كورنيش النيل - بني سويف

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Annex 11: Applying the Rating Matrix Method to Assess the Environmental Impacts in the Construction and Operation Phases

Annex 11 Table 1 - Impact assessment for construction stage environmental aspects

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<th>Aspect</th>
<th>Description</th>
<th>Impact</th>
<th>Severity Ranking (S)</th>
<th>Frequency Ranking (F)</th>
<th>S × F</th>
<th>Significant</th>
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<tr>
<td>Air Quality</td>
<td>Dust emissions are expected to occur during the construction phase due to on-site activities and from trucks fugitive dust.</td>
<td>Adverse health impact on the respiratory system of the workers</td>
<td>4</td>
<td>4</td>
<td>16</td>
<td>✓</td>
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<tr>
<td>Aquatic Environment</td>
<td>Improper disposal of the wastewater resulting from the testing activities</td>
<td>Negative impact on the water bodies receiving this wastewater</td>
<td>4</td>
<td>2</td>
<td>8</td>
<td>✓</td>
</tr>
<tr>
<td>Noise and vibration</td>
<td>Noise arising from the operation of construction equipment and machinery</td>
<td>adverse health impacts on the auditory system of the workers</td>
<td>4</td>
<td>4</td>
<td>16</td>
<td>✓</td>
</tr>
<tr>
<td>Flora and Fauna</td>
<td>The project site is an unused area with no Significant flora and fauna</td>
<td>No flora and fauna will be affected during the project construction.</td>
<td>2</td>
<td>2</td>
<td>4</td>
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<tr>
<td>Land use,</td>
<td>There is no</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Aspect</td>
<td>Description</td>
<td>Impact</td>
<td>Severity Ranking (S)</td>
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<td>S × F</td>
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<tr>
<td>Landscape and Visual Impact</td>
<td>use for the route area as it is located in beside an existing road.</td>
<td>significant effect on the land use during the construction phase</td>
<td></td>
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<tr>
<td>Soils, Geology and Hydrogeology</td>
<td>The excavation activities will result in disturbance of the soil and geological characteristics</td>
<td>Negative impact on the soil and geology during the construction phase.</td>
<td>2</td>
<td>2</td>
<td>4</td>
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<tr>
<td>Traffic</td>
<td>Traffic and delivery of construction materials and equipment to the project site</td>
<td>Minimal adverse impact concerning the traffic during the construction phase.</td>
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<td>4</td>
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<td>Archaeological, Historic and Cultural Heritage</td>
<td>There is no any archaeological concerns encounters the pipeline route</td>
<td>No archaeological impact will take place during the construction phase.</td>
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<td>Natural Disaster Risk</td>
<td>Earthquake and floods may disturb the construction activities</td>
<td>Negative impact on the time schedule of the construction activities</td>
<td>3</td>
<td>4</td>
<td>12</td>
<td>✓</td>
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<tr>
<td>Aspect</td>
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<td>Frequency Ranking (F)</td>
<td>S × F</td>
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<tr>
<td>Major Accidents and Hazards</td>
<td>The construction activities may include leaks of the oil equipment and machinery</td>
<td>Negative impacts on the soil and generation of hazardous waste</td>
<td>3</td>
<td>4</td>
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<tr>
<td>Solid Waste Management</td>
<td>Generation of construction waste e.g. Soil Concrete; Welding belts; Used oils</td>
<td>Adverse impacts on the environment from the possible improper disposal of the solid wastes. Furthermore, adverse impacts from increased traffic load when transporting waste to designated landfills and/or disposal sites are expected.</td>
<td>4</td>
<td>4</td>
<td>16</td>
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<td>Public Health</td>
<td>The dust resulted from the construction activities may</td>
<td>Negative impact on the residents along the pipeline route</td>
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<td>3</td>
<td>6</td>
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<tr>
<td>Aspect</td>
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<tr>
<td><strong>Occupational Health and Safety</strong></td>
<td>Health and safety hazards during the construction phase from the on-site construction activities.</td>
<td>Adverse impacts on occupational health &amp; safety of the workers</td>
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<td>3</td>
<td>12</td>
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<tr>
<td><strong>Existing Infrastructure</strong></td>
<td>The construction phase may lead to breaking any of the underground infrastructure pipeline (water, sewerage or telecommunication)</td>
<td>Negative impacts on the water supply or the telecommunication service for the surrounding areas</td>
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<td>4</td>
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<td><strong>Energy Use</strong></td>
<td>Fuel consumption by vehicles and equipment</td>
<td>Air pollution and the associated health effects</td>
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### Annex 11 Table 2 - Impact assessment for operation stage environmental aspects

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<td><strong>Air Quality</strong></td>
<td>Gaseous emissions form maintenance activities, No gaseous, dust or odor emissions are expected during the operation of the line.</td>
<td>Small amounts of CH₄ release during maintenance. General decrease in gaseous emissions from power plants due to fuel switch.</td>
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<td><strong>Aquatic Environment</strong></td>
<td>The project operation will not affect the aquatic environment</td>
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<td><strong>Noise and vibration</strong></td>
<td>Minimal noise will be generated from the operation of the valves and compressors in the valve rooms</td>
<td>Noise resulting from the valve rooms is not considered to be significant</td>
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<td>4</td>
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<td><strong>Ecology (Flora and Fauna)</strong></td>
<td>The pipeline is laid underground with minimal maintenance activities</td>
<td>The project will not impact the flora and Fauna</td>
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<td><strong>Land use, Landscape and</strong></td>
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<td>The project will not impact</td>
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<td>6</td>
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<td><strong>Visual Impact</strong></td>
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<td>the land use</td>
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<td><strong>Soils, Geology and Hydrogeology</strong></td>
<td>The operation of the pipeline will not affect the soil or the geology of the land</td>
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<td>The operation of the pipeline does not include any truck movement except during maintenance and inspection</td>
<td>Very small increase in traffic volume during the operation except during maintenance</td>
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<td>Earthquakes may lead to pipeline breakage</td>
<td>Negative impact on the gas network connections</td>
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<td><strong>Major Accidents and Hazards</strong></td>
<td>Release of significant amounts of natural gas due to any failure in the pipeline or during the maintenance activities in</td>
<td>Adverse impact on the surrounding environment</td>
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<td>Apart from the release of significant amounts of natural gas discussed above, The project operation will not affect the public health</td>
<td>The project activity will not have a negative impact in that regards</td>
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<td>Occupational Health and Safety</td>
<td>The pipeline operation will not affect the occupational health and safety as there will be a small number of workers during the inspection and maintenance activities</td>
<td>The project activity will not have a negative impact in that regards</td>
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<td>The pipeline operation will not dispose any type of solid waste except occasionally during maintenance.</td>
<td>The project activity will not have a negative impact in this regards.</td>
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## Operation Phase

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<td>The project operation will not include any activities affecting the historic heritage</td>
<td>There is no negative impact concerning the historic heritage during the operation</td>
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<td>Energy Use</td>
<td>This project will help in supplying the region with natural gas for generation of electricity which will enrich the national electricity grid</td>
<td>Positive impact on the energy resources</td>
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<td>4</td>
<td>12</td>
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</table>
PROJECT H.S.E. PLAN
36" El-Wasta – Beni Seuif Pipeline
(60 Km)
CONTENTS

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29.0 LOCK OUT AND TAG OUT SYSTEM
30.0 SUB-CONTRACTORS
31.0 GENERAL SAFETY RULES.
1.0 INTRODUCTION
1.1 GENERAL
The HSE philosophy is based upon the principle that the level of HSE and its related standards and legislations requirements can be controlled. Likewise, the adverse environmental impacts of project activities can be minimized, by considering environmental performance from the outset of the design process and during the site activities.

2.0 SCOPE
The scope of this plan covers all HSE activities and all essential measures shall be taken by PETROJET and SUB-CONTRACTOR during project execution to ensure full compliance with CLIENT standards & regulations. 
PTJ shall furnish, all facilities, tools, labour, supervision, technical and professional services, material, equipment, supplies (except those items to be supplied by CLIENT) required to project execution in accordance with the Contract.

3.0 PURPOSE
The purpose of this HSE plans is to ensure that all HSE issues will be addressed by PETROJET AND CONSTRUCTION SUBCOTRACTOR during project execution, according to international standards and legislations and comply at all times with all applicable EGYPT Government HSE regulations and all CLIENT specifications & other related rules and regulations.

4.0 DEFINITIONS

PROJECT
36" El-Wasta – Beni Seuif Pipe line (60km)

HSE:
Health, Safety and Environment

WORKING ENVIRONMENT:
The term working environment is to be understood as encompassing:
- The physical working environment
- The social working environment.

ENVIRONMENTAL PROTECTION:
This term is to be understood to mean the control of emissions to atmosphere, discharges to water (principally to the sea), disposal of solid waste materials outside the site boundary and impacts on local communities such as noise, vibration… etc.

EMISSIONS AND DISCHARGES:
Emissions and discharges include hydrocarbons and other chemicals

HAZARDS:
Source or situation with a potential for harm in terms of injury or ill health, damage to property, damage to work place environment, or a combination of these.

HAZARD IDENTIFICATION:
Process of recognizing that a hazard exists and defining its characteristics.
**RISK:**
It is the chance low or high which somebody or something can be harmed by the hazard and it's the combination of the likelihood and consequences

**RISK ASSESSMENT:**
Risk assessment is the process of identifying hazards, characterizing the hazards, analyzing the risks, evaluating the risks and determining the appropriate options for risk control.

**AS LOW AS REASONABLY PRACTICABLE (ALARP):**
This means you must do everything that can be done to reduce a risk to its lowest possible level, except that you don’t have to do something where its cost is clearly excessive, compared to the size of the risk reduction.

**5.0 HSE POLICIES**
The Contract is being conducted in the Sight of the following goals
- No accidents
- No harm to people
- No damage to the environment
This commitment will be met by appropriate application of PETROJET HSE Policies

**6.0 RESPONSIBILITIES**

**6.1 GENERAL RESPONSIBILITIES**
- Full awareness's and implementation of CLIENT HSE rules.
- The safety and health of all permanent and temporary staff and others affected by work in the area for which that manager has responsibility and authority.
- Ensure that permit to work and risk assessments are carried out where necessary and work programmed to ensure compliance with CLIENT HSE rules, manuals and procedures.
- A duty of care of all visitors and SUB-Contractors whilst within the area for which they have responsibility and control.
- Efficient distribution and understanding of safety instructions and publication.
- Establish action plans to implement the objectives for improved HSE performance, in compliance with CLIENT HSE rules and procedures.
- Ensure that arrangements are in place, for fire precautions management for all those for whom they are responsible;
- Training of staff, for whom they are responsible, with regard to responsibilities and the necessary information, instruction and training is provided to subcontractors and the necessary information provided to visitors;
- All necessary equipment and systems are provided, maintained and are safe without known risks to health;
- All materials, new machinery and equipment purchased by the project complies with the legislative requirements and/or manufacturers recommendations and that information is available to employees to enable their safe use;
- The use, handling and storage of articles and substances are conducted safely without known risks to health;
- That special attention is paid to the training of young or inexperienced employees or those that have special needs;
- Any issue raised by an employee, which could reasonably be foreseen as causing a threat or potential hazard is dealt with and/or reported to those responsible for action and monitoring of Health & Safety;
- All injuries and dangerous occurrences or situations which arise in the area of responsibility are reported according to CLIENT incident and reporting
- The necessary information, instructions and training is provided to visitors and subcontractors;
- The place of work is maintained in a condition which is safe and without known risks to health;
• Protective clothing and equipment is issued where appropriate;
• All practical steps are taken to include a safe working environment including the reduction of noise and sound levels to an acceptable degree.
• Finally, to ensure that all risk assessments (as necessary) have been undertaken and communicated and are regularly monitored by way of systematic HSE inspections of the work areas.

6.2 PROJECT HSE ENGINEER RESPONSIBILITIES:
• Define roles, responsibilities, authority and provide resources for ensuring that Corporate HSE-MS requirements are implemented and maintained in all locations and their areas of operation.
• Ensuring that all personnel attend the site HSE orientation program and other specific trainings.
• Ensure that HSE responsibilities of all staff are fully embedded in their Job Descriptions.
• Follow up and revise & approve HSE program at suitable intervals
& departmental aspect registers.
• Conduct regular reviews of the HSE system to ensure its continuing suitability, adequacy and effectiveness & maintain regular and effective liaison with all levels of management together with the HSE authorities;
• Participate in major HSE studies and audits & Carry out regular audits on subcontractors to identify compliance to the project HSE program.
• Reviewing/auditing the work of other disciplines to ensure that HSE requirements are addressed and documenting these reviews.
• Maintain a systematic log of non-conformances and Corrective actions related to HSE audits.
• Identify the HSE-Critical Activities within their area and develop strategy for control of identified hazards.
• Ensure a program is in place to record and monitor substances brought onto site, which may be hazardous to health.
• Preparing and issuing HSE deliverable.
• Ensure that review of all significant incidents (incl. near-misses) is conducted; ensure that accident and dangerous occurrences investigations are carried out, to monitor and maintain Environmental records and to recommend changes to HSE Policies.

6.3 SUPERVISORS:
• Read the HSE Policy and understand my HSE responsibilities.
Set good example for my team by working safely following the “Golden Rules” and Procedures.
• Make my team members aware of their responsibilities, and the importance of following the “Golden Rules”, Procedures and Work Instructions.
• Participate in HSE meetings and take every opportunity to talk to my team about HSE issues.
• Regularly check HSE training compliance with the Mandatory Training Matrix.
• Focus attention on supervising the most hazardous activities
• Make sure my team members follow the job safety plans and Permit to Work requirements.
Understand my role in the event of an emergency and participate in emergency drills and exercises.
• Support my team to achieve their ‘Tasks and Targets’.
• Check that HSE controls are in place before any activities are carried out by my team, and stop any operations where they are not in place.
• Notify and report and follow-up on HSE incidents, near misses and non-compliances.
• Provide accurate information to audit teams.
• Implement audits.
• Ensure all corrective actions assigned to my team arising from audits, incidents and HSE reviews are implemented on time.

6.4 EMPLOYEE’S RESPONSIBILITIES
All employees, permanent or otherwise, must:
• Take reasonable care for the Health and Safety for themselves, their fellow employees and all other persons attending the workplace as well as familiarize themselves with the hazards associated in work prior to its commencement.
• Co-operate with management in the performance of their duties and work in accordance with the HSE policies and procedures; Read the HSE Policy and understand his HSE responsibilities, Know his ‘Tasks and Targets’ and strive to meet them, …
• Avoid intentionally or recklessly interfering with or misusing anything provided in the interests of Health, Safety and Welfare; "Do not start, and stop, any activity unless it can be done safely, & doesn't fail to meet environmental and health standards.
• Follow the job safety plans and requirements laid down in the Permit to Work form
• Follow the “Golden Rules”, Procedures and Work instructions & follow all general project safety rules and follow all additional rules which are notified and apply to their particular area of work.
• Attend toolbox talks, Induction training,
• Call attention to any potential hazard and/or raise any concerns relating to Health & Safety standards by contacting their immediate supervisor/manager or, if they are unavailable, contact the HSE Supervisor.
• Ensure all corrective actions assigned to my team arising from audits, incidents and HSE reviews are implemented on time.
• Provide accurate information to audit teams.
• Only undertake duties, which they are authorized for, and for which training has been given.
• Understand his role in the event of an emergency.
• Keep workplace tidy and free of obstructions.

6.5 SUBCONTRACTORS, SUPPLIERS AND VISITORS RESPONSIBILITIES
Subcontractors, suppliers whether self-employed or employed by CLIENT and / or PETROJET and all visitors are required to follow the project HSE Rules and comply with CLIENT HSE RULES, also they are required to:
• Take reasonable care for the Health & Safety for themselves and for others
• Co-operate with project HSE management in the performance of their duties
• Avoid intentionally or recklessly interfering with or misusing anything provided in the interests of Environment, Health and Safety.

7.0 HAZARDS IDENTIFICATION & EFFECTS ON MANAGEMENT PROCESS

HAZARD IDENTIFICATION AND MANAGEMENT PROCESS (HIMP)

1) Identify the potential health, safety and environmental hazards and effects of your activities and operations. Hazards and effects need to be identified as early as possible and tracked through the life cycle of each activity.
Hazards can be identified and assessed in a number of ways:
 Through experience and judgment.
 Using checklists.
 By referring to codes and standards.
 By undertaking more structured review techniques

The Company has reviewed the content of the Work/Services to be provided under the Contract and has identified activities/tasks and hazards that, as a minimum, should be considered by PTJ when developing the contract HSE Management Plan
The activities, tasks and hazards identified shall include but not be limited to the following:
 Transportation/Driving
 Lifting (Loading/offloading)
 Handling Materials
 Waste
 Welding
- Trenching and Excavation

2) Assess the health, safety and environmental risks of all activities, and then to rank these risks. Assessment of risk may be qualitative or quantitative. Once the hazards and effects have been identified, their consequences and likelihood can be assessed and the risk determined. Qualitative methods are best used for risk assessments of simple facilities or operations, where the exposure of the workforce, public, environment or asset is low. Qualitative risk assessments are a combination of judgment and experience, and structured review techniques. Qualitative risk assessments should be carried out with input from those people directly involved with the risk.

3) ensure the necessary steps are planned to be able recover from the release of a hazard, should the controls that have been put in place fail to prevent its release, Recovery measures can reduce the likelihood that the first hazardous event will develop into further consequences and provide life saving capabilities should the ‘top event’ develop further. To assist with a recovery, it is important that all personnel are fully briefed and drilled as to the response measures planned, including evacuation and restoration procedures.

Performance against all recovery procedures should be recorded and formally reviewed periodically.

RISK ASSESSMENT

- Assess the risks of the identified hazards and effects by assessing the likelihood of the effect occurring and its consequence.
- Categorize each risk as Low, Medium, or High.
- Use QRA on all activities posing medium or high risk that could result in one or more fatalities.

Risk Matrix
### Rating Probability

<table>
<thead>
<tr>
<th>Rating</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Event likely to occur more than once per quarter</td>
</tr>
<tr>
<td>M</td>
<td>Event likely to occur at lease once per year</td>
</tr>
<tr>
<td>L</td>
<td>Event likely to occur less than once per year</td>
</tr>
</tbody>
</table>

**RISK CONTROL**

Risk reduction should be undertaken to achieve a level that is “As Low As Reasonably Practicable” (ALARP)

Controls include preventative measures (reducing the *likelihood* of hazards), mitigatory measures (reducing the *consequence* of hazards) and recovery measures (reducing the chain of *consequences arising* from the first hazardous event).

Depending on what the hazard is, the same control may be used to *prevent*, *mitigate* or *recover* from a hazardous event. For example, all measures ranging from the first steps in mitigation through to reinstatement of the operation assist in preparing for recovery.

An important outcome of HIMP is **identifying the HSE risks arising from operations that are classified as “high”, and identifying the actions that must be taken to manage them.** These actions are defined as HSE Critical Activities and are a focus of HSE Management System.

**For All Controls** Asset Manager should develop and implement control measures to reduce risks to a level deemed ‘As Low As Reasonably Practicable’ (ALARP).

In developing all control measures, consider:

- Preventative measures (which reduce likelihood).
- Mitigatory measures (which reduce the consequences or effects).
- Recovery measures.
- Developing controls commensurate with the risks.
- The entire lifecycle of the asset or activity.

Controls should include preventative and mitigatory measures involving active, passive and/or operational systems. Examples of operational systems to be considered include:

- Training programs.
- Monitoring programs.
- Operational procedures.
- Audit and inspection programs.

**THE FOUR ASPECTS OF THE HAZARDS AND EFFECTS MANAGEMENT PROCESS**

<table>
<thead>
<tr>
<th>Identify</th>
<th>Are people, environment, assets or company Reputation exposed to potential harm?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Ssess</td>
<td>What are the causes and consequences? How likely is loss of control? What is the risk and is it ALARP?</td>
</tr>
<tr>
<td>C Ontrol</td>
<td>Can the causes be eliminated? What controls are needed? How effective are the controls?</td>
</tr>
<tr>
<td>R Ecover</td>
<td>Can the potential consequences or effects be mitigated? What recovery measures are needed? Are recovery capabilities suitable and sufficient?</td>
</tr>
</tbody>
</table>
Objective of this section is to ensure that the company reaches a state whereby:

- All HSE hazards associated with company activities and their effects have been identified, analyzed and are properly managed to reduce the risk to ALARP

**STOP UN SAFE ACT**

8.0 TRAFFIC PLAN& TRANSPORTATION

Passengers shall travel only in vehicles that are provided with passenger seats. This requirement shall apply for travel to and from any work Site, and at the work Site itself. Seat belts shall be installed for all seats and used in all vehicles carrying personnel (except in the case of buses where seat belts are mandatory only for the driver).

This section outlines the procedures and responsibilities for preventing motor vehicle accidents in the project. In addition, it sets the standards for driver performance, responsibility, and vehicle maintenance expected of PETROJET, subcontractors' drivers. All drivers are expected to drive in a defensive manner and maintain control of their vehicles at all times.

All authorized drivers should ensure that their vehicle is in a sound and safe condition in every respect. Specific checks should be made of the following:-

A) Brakes and steering
B) Lights
C) Tire condition and inflation pressure
D) Rear view mirror and horn
The number of passengers carried in company vehicles must be strictly limited to the authorized seating accommodation provided. Under no circumstances are two passengers allowed to travel in the front of a vehicle, where only two bucket type seats are fitted, or where the engine accommodation projects into the driver's cabin. PTJ shall ensure that passengers shall travel only in vehicles that are provided with passenger seats. This requirement shall apply for travel to and from any work site, and at the work site itself. Seat belts shall be installed for all seats and used in all vehicles carrying personnel (except in the case of buses where seat belts are mandatory only for the driver).

PTJ responsible for the safety of employees, & protection of the public from potential construction hazards, during the day, at night and in all weather conditions. Consequently, the marking of construction sites and the safe and efficient diversion and control of traffic must be properly planned and executed.

The towing of small equipment, such as compressors, welding machines, etc., is allowed, but only after the equipment is properly and safely connected to the tow vehicle.

8.1 DRIVER REQUIREMENTS
PETROJET AND CONSTRUCTION SUB-CONTRACTORS must employ only qualified personnel as drivers of motor vehicles. It is the responsibility of the driver's supervisor, foreman, or superintendent to verify the driver's credentials prior to his employment. Each person driving a motor vehicle must possess and have on their persons a valid Government driver's license.

8.2 DRIVER'S RESPONSIBILITIES
• It is the responsibility of the driver to ensure that his vehicle is safe to operate.
• It is the responsibility of each driver to take his vehicle to the proper facility for servicing and repairs when they are required or scheduled
• The driver of the vehicle is fully responsible and accountable for the mechanical and physical condition of the vehicle. He must report any damage.
• Prior to refuelling petrol engine motor vehicles the driver and all Passengers must alight from the vehicle, brakes applied and the engine Stopped.
• The driver is responsible for transporting materials properly and ensuring that a load does not exceed the manufacturer's design load capacity. All loads must be properly secured and tied down.
• Sand tires present a hazard if used on vehicles, which are operated at excessive speed especially when they are not properly inflated.
• Drivers shall not transport unauthorized persons in vehicles.
• The driver and all passengers of a PTJ vehicle shall wear seat belts at all times while the vehicle is in motion.
• Drivers have full authority to refuse to transport any passenger who refuses to use seat belts. Conversely, passengers may refuse to ride with a driver who refuses to wear his seat belt.
• Drivers should not transport more passengers than the number of seat belts provided in the vehicle.
• All drivers shall be familiar with what CLIENT considers unsafe driving practices and avoid them at all times. The driver must not exceed the posted speed limit and should reduce his vehicles’ speed under hazardous weather or road conditions.
• The exhaust gases from a motor vehicle are dangerous and therefore the Engine of motor vehicles should not be left running in an enclosed space.

8.3 MOTOR VEHICLE REGULATIONS
Each driver shall become familiar with, and abide by, the Government Traffic Regulations. To drive safely, speed must be reduced below the Allowable speed limit at night, or during fog, rain or sand storm. All vehicles shall be parked correctly and/or in designated parking areas and shall not obstruct other vehicles, roadways, access ways or fire hydrants.

The following traffic rules should be followed:
• Seat belts are mandatory for all vehicle occupants.
• Windows and windshield must be clean and free of cracks or damage.
• The glass must be in good condition.
• The windows must open and close properly.
• All lights (high and low beam headlights, tail lights, dash lights, stop lights, turn signal lights, and the rear license plate light) must be in working order.
• When fog lights (front & rear) and clearance lights have been provided, they must be also be in good working order.
• All brakes (foot and hand brakes) must be in good working order. Check the foot and hand brake mechanism for correct operation.
• Springs and shock absorbers must be in good condition with no alignment or control problems.
• Tires should have no breaks in the tire casing or exposed fabric and must be inflated to correct air pressure as specified by the Transportation Department.
• Check the wheels for rim damage. Make sure the wheels are not buckled or out of alignment and wheel, lug nuts are in place and secure on the rim.
• If the vehicle is fitted with a trailer, the coupling must be intact and working correctly.
  The trailer should have safety coupling chains, rear brake lights, turn signals, tail lights and rear license plate lights.
• Make sure that the inside and outside rear view mirrors are clean, adjusted, secured and undamaged.
• Check that the windshield wiper blades are in good condition, and operate properly. Inspect the rear window wiper, if fitted. The windshield washer should work properly and there should be water in the washer container.
• The speedometer should be in good working order.
• A properly inflated spare tire with a jack and tire wrench must be provided. The tire wrench should be the correct size to fit the wheel nuts of the vehicle.
• Check the following fluids for leaks and proper levels, especially in hot weather (Radiator coolant, Oil, Brake fluid, Transmission oil (checked when engine running) & Distilled water for the battery).
• The vehicle's horn must be operational.
• Each driver must conduct a vehicle inspection whenever taking charge of a vehicle and periodically thereafter to ensure that all systems are operating properly and there is no damage.
• Passengers will be carried only in the passenger compartment of a vehicle. All vehicle occupants must wear seat belts. Drivers shall insist that all passengers wear seat belts before starting the vehicle. Drivers can receive a moving violation for not adhering to this regulation.

9.0 HSE REPORTS AND RECORDS
PETROJET shall inspect the work site daily to report and correct unsafe methods and conditions. PETROJET AND CONSTRUCTION SUB-CONTRACTORS shall Inspect Report accidents, unsafe conditions and defects in equipment to an immediate report are represented to CLIENT Representative in the case of:
• Fatal injuries
• Injuries requiring medical attention which result in lost time
• Damage plant or equipment
• Damage equipment or property
• Fires
• Damage and near misses to cranes and heavy equipment
• For accidents involving PETROJET AND SUBCONTRACTORS employee fatalities, serious injury to three or more employees, or damage to CLIENT equipment or property, a preliminary written report shall be submitted within 24 hours followed by a detailed written report submitted within three days to CLIENT Representative.
• In case of serious accidents, however, a detailed account of the circumstances, witnesses’ statements and descriptive photographs are required.
In addition to the reports required above, PETROJET must keep a record of all injuries and damages on a form approved by CLIENT.
Monthly HSE report will be issued on weekly basis to CLIENT project Management
• The emergency telephone number used for reporting a fire or any emergency that requires Assistance is .....(To be agreed upon work commencement). PTJ will ensure that this number is posted at all telephones and that instructions are placed indicating how to report the emergency correctly.
• PTJ will ensure that reports of hazardous materials and waste monitoring programs and incident reports shall be reported to and reviewed by the Safety Committee.

10.0 HSE KEY PERFORMANCE INDICATORS (KPIs)
The following key performance indicators will be used to measure HSE performance for the duration of the project including Engineering assessment and site activities;
• Total Manpower
• Total Man-hours worked
• Site Training Hours
• Lost Time Injuries (LTI).
• Medical Treatment Injuries (MTI).
• First Aid Cases (FIC).
• Occupational Incidents Cases (OIC).
• Environmental Incidents (EI).
• Near Miss Reports (NMR).
• Road Traffic Accidents (RTA).

11.0 HSE AWARENESS
It is intended that a high level of HSE awareness be promoted and maintained in the project team during project implementation. Toolbox Talk and other HSE training will be given to raise awareness level between workers.

12.0 HSE INDUCTION AND TRAINING
12.1 GENERAL
Special intensive HSE training programs are provided for all project staff according to their responsibilities to provide awareness of the project HSE rules and the potential hazards that may be encountered and of the responsibilities for maintaining a safe work place, all employees should receive adequate knowledge and appreciation of accident or injury / illness potential.

12.2 ORIENTATION
Before a new or transferred employee starts physical work training should be provided to ensure understanding of gas field hazards (e.g. flammable, toxic materials, high pressures, etc.) use, of common tools, basic work routines and how to avoid the hazard of working around machinery and heavy equipment. This training program will be conducted by the project HSE staff as soon as possible after commencement of employment and no later than the end of the first working week. It will be designed to give the basic information about safety on the project to enable each employee to fulfill his function and responsibilities in accordance with CLIENT HSE rules and procedures.

The orientation program should include the following:
• Project HSE policy and lay out.
• Site access control.
• CLIENT Permit to work system.
• Personal protective equipment (head, eye, hearing, foot, hand, safety belts and body protection)
• Fire / accident prevention
• Hazard and accident reporting
• Scaffolding, housekeeping, trenching, rigging, electrical, industrial trucks and crane safety
• Hazardous material storage, handling and transportation.
• Compressed gas cylinders.

12.3 SPECIFIC JOB TRAINING
Throughout each employee’s work, training should be provided to ensure that he/she knows how to work safely and effectively before being permitted to do it without close supervision. This training program should include:
• Permits to work system and controls
• Fire protection and prevention
• Drivers safety training (Defensive driving course)
• Incident investigation and reporting.
• Electrical safety.
• Scaffolding safety.
• Safety in welding and cutting.
• Safety in lifting operation.
• PPE.
• Working at heights.
• Excavation safety.
• Power and hand tools.
• Confined space entry.

12.4 HSE MEETINGS
HSE meetings will be including & not limited to:
• Weekly HSE meeting.
• Toolbox talks meetings.
• Accidents and Incidents HSE meetings.

13.0 WELDING AND CUTTING OPERATIONS
This item outlines the principles involved and the precautions to be taken in gas welding, cutting, and brazing and electric arc welding operations so the following precautions should be taken during welding and cutting operation:
• Personnel working with welding equipment shall be trained, competent, and provided with personal protection equipment. Welding goggles, helmets, screens
• Forced ventilation and similar equipment shall be provided to all workers and to trainees in the immediate area.
• Grease and oil must never be used near oxygen as this could cause fire.
• Oxygen cylinders or apparatus shall not be handled with oily hands or gloves.
• A jet of oxygen must never be permitted to strike an oily surface, greasy clothes or enter fuel, oil or other storage tanks.
• All cylinders should be capped and kept vertically
• Cylinders should be stored safe.
• Flammable substances such as oil and volatile liquids or corrosive substances should not be stored in the same area.
• All storage areas shall have Arabic and English "No Smoking Permitted" signs prominently displayed.
• All cylinders should be chained or otherwise secured in an upright position.
• Cylinders stored in the open should be protected from ground contact, extremes of weather, or contact with water.
• Valve caps shall be kept in place when cylinders are not in use.
• Cylinders shall be stored out of the direct rays of the sun, in protective enclosures or sun shelters.
• Cylinder storage should be planned so that cylinders will be used in the order in which they are received from the supplier.
• Empty and full cylinders must be stored separately with empty cylinders plainly marked as such, to avoid confusion.
• Smoking or any other source of ignition shall be prohibited near storage areas
• All wiring shall be in conduit and electric switches shall be located outside the room.
• All electrical installations shall meet the National Electrical Code (NFPA 70) for hazardous areas.
• Cylinders should never be lifted by their valves since the valves are not designed to take such stress.
• When the cylinder is not in use, the valve shall be protected with the valve cap.
• If cylinders are to be lifted by a crane, specially designed bottle holders with lifting eyes should be used. Chain and wire rope slings can allow cylinders to slip where a trolley is to be used for slinging, its base should be strong enough to take the weight of the cylinders.
• Cylinders in transit on vehicles shall have valve caps in place and be firmly secured to prevent movement.
• Cylinders shall be secured to avoid any violent contact.
• Loading and unloading shall take place carefully. Cylinders shall not be dropped, thrown, dragged, used as rollers, or as a support.
• No damaged or defective cylinder shall be used.
• Cylinders and valves should be kept clean. Valve sockets shall be kept free of grit, dirt, grease or oil.
• Hoses should be used for one type of gas only and colour coded for identification. They should be examined before use for any signs of splitting which might give rise to leakage.
• All connections should be made by clips or crimps. The hoses used for acetylene and for oxygen shall not be interchangeable.
• Connections and check valves should be regularly examined.
• Equipment should be fitted with the correct pressure regulators and a regular check should be made to ensure that the regulator is working properly.
• The torch nozzle should be kept closed.
• It is dangerous to let the torch flame come into contact with gas cylinders or for the lighted torch itself to be left unattended.
• Cylinders in use should be kept upright on a custom-built stand fitted with a bracket to accommodate the hoses and equipment or otherwise secured.

14.0 PERSONNEL PROTECTIVE EQUIPMENT
Personnel protective equipment is the last defensive line after the engineering protection Personal Protective Equipment is required when there is a reasonable probability of injury that could be prevented by the use of such equipment. In such case, Petrojet H.S.E Department will make available suitable protection for the work to be performed, and employees must use such protection. Contractors, Vendors and Client personnel working within Petrojet fabrication area must provide their employees with suitable Personal Protective Equipment. Such equipment must be up to an acceptable International/European standard.

14.1 HEAD PROTECTION
Safety hats or helmets are rigid headgear made of materials designed to protect the head from impact, flying particles, electric shock, etc and each helmet consist of a shell, a suspension cradle, and a chin strap.
Employees shall wear an approved hard-hat at all times on work sites except in administrative office and lunch areas during non-work period.
This is a non-negotiable condition for access to the Company Property.
Hard hats shall not be altered in any fashion and defective hard hats shall be replaced immediately.
Hard hats shall be worn with the peak facing forward unless signalling cranes or looking up to carry out effective work methods.

14.2 EYE AND FACE PROTECTION
Protection of the eyes and face from injury by physical or chemical agents or light radiation is of prime importance in an industrial environment.
Safety Glasses (APPROVED) with side shields shall be worn.
Street wear impact resistant glasses are not approved.
Personnel who require prescription glasses to perform their daily work activities shall wear approved safety prescription eyeglasses with side shields or over-glasses.
Welders shall be required to wear safety glasses or goggles under their welding hoods.

14.3 HAND PROTECTION
The gloves are very important to be used during construction and operation phase so you have to determine the kind of gloves used depends primarily upon the material or equipment being handled and can be resistant against one or more of the following (heat, acid, caustic, slipping, wear, fire, oil, sharp edges, general wear and tear, cold, etc and the gloves should not be used near moving machinery as they can be caught and trap the hand before it can be withdrawn from the glove.
Employees shall obtain and wear gloves, where they do not pose a hazard, to prevent hand injuries.
Employees should avoid wearing gloves when operating drill presses and like power tools as the gloves can become entangled in the tools causing injury. Employees handling materials or chemicals that are toxic or skin irritants shall wear impervious gloves applicable to the hazard present.

14.4 FOOT PROTECTION

Foot protection used must be met with ANSI standard and there are many safety footwear is with special soles to resist oil, abrasion, heat, and other abuses to which the footwear may be subjected.

Safety toed shoes are mandatory.

Shoes or boots must be constructed of leather. Shoes or boots made of canvas or synthetic materials are not allowed.

Tennis shoes, athletic type shoes, sandals or open toed shoes are not allowed regardless of the type of materials they are constructed of.

14.5 HEARING PROTECTION

Noise can be defined as "any unwanted sound". The intensity of noise is commonly expressed in terms of decibels (dB) and measured by a sound level meter. Medical authorities state that continual exposure to noise levels above 90 dB for an eight hour day, five day work week may endanger a person's hearing so the following exposure period in the below table should be followed on site to avoid hearing loss which result from overexposure to excessive noise levels. Hearing protection devices shall be provided and used incase of exposure to high more than 90 db and there are two types of hearing protection available, the plug type and the cup (or muff) type.

- **Ear plugs**: are placed into the canal of the outer ear, the materials used for these plugs are rubber, plastic, wax, foam or Swedish wool and disposable types are preferred as they give good protection and are very sanitary.
- **Ear muff**: Ear muffs cover the external ear to provide an acoustic barrier. The effectiveness of ear muffs varies considerably due to differences in manufacturer, size, shape, seal material, shell mass, and type of suspension. Head size and shape can also affect their performance.

<table>
<thead>
<tr>
<th>Decibel (DB)</th>
<th>Exposure time</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>8 hours</td>
</tr>
<tr>
<td>95</td>
<td>4 hours</td>
</tr>
<tr>
<td>100</td>
<td>2 hours</td>
</tr>
<tr>
<td>105</td>
<td>1 hour</td>
</tr>
</tbody>
</table>

14.6 FALL ARRESTING DEVICES

Employees exposed to falls from a height in excess of 2 metres shall wear and correctly use an approved harness/lanproject.

An employee will be considered exposed to a fall if not protected by a complete deck and standard guardrail system.

Employees working on permanent structures such as concrete floors, grating platforms or catwalks which are free of floor openings or open sides, and all fall protection devices such as guardrails and safety gates on ladders are in place are not required to wear harnesses.

Employees working on any structure in which fall exposures have been created such as open holes in the floor or removal of guardrails shall wear harnesses. Employees working within 2m. (6 feet) of said fall exposures shall secure the safety lanproject properly to the highest point possible which allows full movement during work.

Employees working from temporary work platforms (scaffolds) shall wear a safety belt/harness if the platform is 2m. (6 feet) or more tall. If the platform has a completed deck and guardrail system, the safety lanproject need not be secured. If any portion of the decking is missing or the guardrail system is incomplete all employees working from the incomplete platform shall secure their lanproject properly to a robust part of the structure or taught lifeline. This should be at the highest point possible, which allows full movement during work.
• During all operations conducted from a personnel platform (man basket) at any height above ground level, fall protection devices (lanyards) shall be secured to an anchorage point or a structural member located on the basket.

15.0 HAND AND POWER TOOLS
Hand tools are those tools for which the hand provides the motive force, e.g., picks, shovels, axes, crowbars, wrenches, saws, chisels, hammers, screwdrivers, etc and power tools which is operated by power supply, e.g., grinding machines, drilling equipment, etc.
• All PETROJET workmen shall be properly instructed in the selection and use of the correct Tool for the job.
• Tools constructed of good quality materials should always be used.
• Poor quality tools increase the risk of accidents and also reduce the efficiency of work.
• Power tools, however, allow many jobs to be carried out more efficiently and with greater speed and accuracy.
• The correct use of power tools can only be achieved by the proper training of workmen, By proper maintenance, and by adequate site supervision.
• Many accidents have occurred because unskilled and untrained labours have been allowed to operate power tools in an incorrect manner.
• PETROJET shall ensure that the finest quality tools shall be provided for all jobs where hand tools are used.
• PETROJET shall ensure that hand tools are regularly cleaned and, where necessary, lightly oiled as a protection against corrosion.
• All hand tools shall be regularly inspected before and after use, and before storage. If wear or damage is observed, the tool should be withdrawn from use for repair or disposal.
• Proper racks and boxes shall be provided for the storage of hand tools.
• All metal tools are conductors of electricity. Where work takes place on or near electrical operations, only properly insulated and non-conductive tools should be used.
• Insulation should be checked at regular intervals by a competent electrician.
• It is essential that the correct type, size, and weight of tool should be decided upon before any work is carried out.
• All portable power tools shall be stored in clean, dry conditions.
• PETROJET shall provide a schedule of systematic inspection and maintenance for all power tools.
• All tools shall be returned to the storekeeper at the completion of each individual job.
• Power tools must not be left lying around the job site where they could be damaged.
• Rotating tools should be switched off and held until rotation has completely stopped before they are set down.
• Tools must be disconnected before changing bits, blades, cutters, or wheels.
• Power for tools can be supplied by compressed air or electricity.
• All personnel should be equipped with full personnel protective equipment during the use of power and hand tools.
• Before any electrical tool is used, a careful check shall be made by the supervisor to ensure that the supply voltage is within the range marked on the information plate on the tool.
• All electrical power hand tools shall be of the double insulated type or properly grounded.
• All tools shall be used with extension cords which are as short as possible.
• Over-current protection shall be provided to extension cords in accordance with the requirements of the National Electrical Code.
• Where it is necessary to make electrical splices, these shall be made with proper connector blocks or by plug and socket connectors.
• A proper inspection and maintenance routine shall be established by PETROJET for all electrical tools.
• The inspection and maintenance of all tools shall be carried out at least once in every working week by a competent electrician.
• All tools shall be stored in a clean, dry place, and a record of issue and receipt shall be maintained by the storekeeper.
• All grinders shall be equipped with a protective guard which allows only the working part of the wheel to be exposed. This guard must not be removed
• Grinders shall be clearly marked with their maximum running speed. The maximum running speed of the spindle must not exceed the maximum periphery speed Marked on the grinding wheel. Wheels should be checked for defects before mounting. All defective wheels must be destroyed
• A proper inspection and maintenance routine shall be established by PETROJET for all electrical tools. The inspection and maintenance of all tools shall be carried out at least once in every working week by a competent electrician.
• All tools shall be stored in a clean, dry place, and a record of issue and receipt shall be maintained by the storekeeper.
• Hand operated circular saws shall be fitted with spring loaded guards which allow only the working part of the blade to be exposed.

16.0 LADDERS
Ladders shall comply with the ANSI or equivalent codes OSHA, the hazards which is coming out of using ladder is high so the following instruction should be taken to avoid falling hazard:
• A ladder must be of the proper length for the job to be done.
• Metal ladders, ladders with metal reinforced side rails and ladders which are wet shall not be used near electrical equipment with exposed live conductors. Such ladders shall have a warning notice attached to guard against use near electrical equipment
• Aluminium ladders shall not be used where there is a likelihood of contact with materials Harmful to aluminium, such as caustic liquids, damp lime, wet cement, etc
• Ladders with split or broken side rails, missing, broken, loose, decayed or damaged rungs or cleats or with other faulty equipment shall be tagged and removed from service.
• The side rails of a ladder shall be equally supported on a firm level surface.
• Boxes, blocks, barrels, etc. shall not be used as a means of support.
• The area at the base of a ladder must be kept clear.
• Ladders shall not be used in a horizontal position as platforms, runways or scaffolds.
• Ladders shall be set at an angle of 75° to horizontal ground
• If a ladder is erected close to a doorway, the door should either be locked, shut, or be secured in the open position with a man on guard or properly barricaded
• Where ladders have to be suspended, both side rails shall be lashed top and bottom so As to provide equal support. Where long ladders are used, they shall also be lashed at the centre to prevent lateral movement
• Before mounting a ladder, personnel shall check their shoes for freedom from grease, oil or mud.
• Personnel shall not run up or down or slide down a ladder at any time
• When ascending or descending personnel shall face the ladder and keep both hands on The ladder
• Men ascending or descending ladders shall not carry tools and materials in their hands and tools may be carried in pockets

17.0 ELECTRICAL INSTALLATION AND EQUIPMENT
• The human senses (smell, taste, hearing, etc.) do not provide a warning of an electrical Hazard.
• The great majority of electrical accidents result in burns.
• Fire and explosion from sparks in flammable atmospheres can and does lead to loss of Life and serious damage to property.
• All electrical installations, no matter what voltages are used, should always be treated with great caution.
• The hazard is greater if working conditions are wet
• The severity of electric shock is not entirely dependent upon the voltage of the power Source. The ratio of the voltage to resistance determines the current that will flow Through the body and the resulting injury.
• Contractor is responsible for the temporary electric supply system on a construction site And the safety measures associated with the National Electrical Code.
• Damaged or spliced cords are not acceptable.
• All installation work must be carried out by qualified, experienced electricians.
• Before connecting temporary electrical installations to existing installations, prior approval must be obtained from CLIENT proponent department. This is to ensure that no overloading of electrical devices will occur and system protection will not be compromised.
• Defective extension lights and electric hand tools shall be repaired or replaced.
• A defective electrical tool or cord can cause burns, falls as a result of sudden shocks, or even fatalities.
• Portable electric tools, extension lights and cords should be inspected each time they are issued and returned. This should be part of a tool store procedure. Frequent Random checks should be made where those tools, lights and plugs are being used on site.
• Many accidents occur when lower volt equipment is plugged into higher volt systems. Before any portable tool or extension light is plugged in, the voltage required for the tool or light must be the same as the power source, and the plugs must be checked for damage.
• All non-current carrying metal parts of any electrical equipment must be properly grounded. This will reduce the electrical shock hazard.
• Work Permits must be obtained and the type of equipment to be used discussed and agreed upon before the permit is issued.
• Only qualified electricians should make repairs and carry out maintenance checks.
• Employees must never work alone on live equipment. In addition to the man doing the job, there must be another electrician standing by. A foreman or supervisor should also be in attendance while this work is being carried out, and he must know how to isolate the equipment.
• Work platforms and equipment used near energized equipment shall be properly grounded.
• Before starting a job, the exact voltages should be known. This is important as it determines the type of personal protection required for the work and the procedures established in the work permit. If there is any doubt about voltages, a check must be made before the work is started.
• High voltage or overhead lines are usually uninsulated. Therefore, any kind of metallic object coming near or in contact with them can cause a hazardous situation so it should never be assumed that there is enough clearance; it should always be proved.

It should never be assumed that a cable or line is “dead”; it should always be checked.
• Underground cables, exposed during excavation work should be assumed to be energized and not repositioned or moved until certified to be de-energized.
• Exposed buried cables in open trenches should be properly supported and the area barricaded.
• Equipment to be worked on when it is de-energized shall be isolated from the system and tested for voltage using test equipment rated for the system, and be grounded.
• Grounding cables shall be at, or as close as practicable to, the work location.
• Grounding cables shall be connected to ground first, and then the equipment.
• Grounding cables shall be installed and removed using hot sticks or insulating gloves and protective apparel.
• Grounding cables shall first be disconnected from the line or equipment and then be disconnected from ground.

18.0 SCAFFOLDING
The competent specific has knowledge and experience with scaffold shall be responsible for erection the scaffold and tagging it.
• Scaffold should be provided with the following requirements, (base plates, platforms, ladder, tagging system, handrail, mid-rail, toe-boards, bracing system) and these requirements should be erected according to scaffolding instructions.
• The scaffold with green scaffold tag means that the scaffold is safe and personnel can use it, and if the scaffold is provided with red scaffold tag, it means that scaffold is unsafe to use and it is under construction.
• All CLIENT instruction concerning using, handling, erection of the scaffold should be implemented on site by the scaffolding subcontractor.
• Scaffold inspection checklist will be prepared, reviewed, approved & used at site.
19.0 CRANES AND RIGGING EQUIPMENT
Lifting operation is very dangerous and many accidents have been occurred during this activity, majority of accident are resulted from lifting equipment, slings and shackles, suspended load or crane operator so the following precautions concerning lifting equipment, lifting gears should be considered during this operation.
Lifting operation is very dangerous and many accidents have been occurred during this activity, majority of accident are resulted from lifting equipment, slings and shackles, suspended load or crane operator so the following precautions concerning lifting equipment, lifting gears should be considered during this operation.

- A competent person has good knowledge and experience shall supervise all lifting operations.
- Critical lift plan will be required for lifting operations & must provide the following information:
  - Crane radius
  - Boom length
  - Safe working limits of the crane (load chart)
  - Weight of the load
  - Ground and site conditions
  - Placement of the crane
  - Swing and tail clearances
  - Explanation of hand signals
  - Rigging sketch for critical or hazardous lifts
  - Rated capacity of rigging components
  - Sling angles
  - Cranes shall have a valid Crane Safety inspection sticker
  - A valid heavy equipment license and Crane Operator Certificate are required for contractor mobile crane operators.
  - Crane should be provided with valid calibration certificates from third party
  - Hooks should be fitted with a safety catch on the hook opening so that the slings cannot be displaced
  - Hooks should be regularly inspected for signs of damage.
  - The hook shall be removed from service for the following reasons (If there are visible cracks, if it is twisted 10% out of place, if there is a 15% throat opening beyond the manufacturer's specification)
  - There is an area surrounding every power line that is referred to as the absolute limit of approach. It is strictly forbidden to move any crane boom or load line or load into this area unless the line has been de-energized or insulated (250,000 volt is 20 feet a safe distance and over 250,000 volt is 25 feet a safe distance).
  - Slings and other rigging equipment must be constructed according to a recognized standard.
  - The safe working load of rigging equipment is the maximum load which the equipment should be subjected to; this load should never be exceeded.
  - Before use, all new equipment should be subjected to a proof load test by the manufacturer and certified. The safe working load and serial number shall be clearly marked on the sling and the lifting gear, either by tagging, stamping, engraving, or Embossing. Riggers shall not use lifting gear unless the safe working load is clearly visible
  - Slings shall not be tagged with safe working load in the field. Approval by the Inspection and department and subsequent review by HSE Department.
  - All wire rope slings shall be manufactured, inspected, and load tested by a recognized manufacturer.
  - Homemade wire rope slings shall not be allowed.
  - As the angle between the legs of a multiple sling increases, the safe working load decreases. The included angle should be no more than 90 and must never exceed 120 under any circumstances
  - Before storage, chain and wire rope slings should be cleaned, lightly lubricated, and inspected.
  - Slings must be stored in a location where they are not liable to suffer mechanical damage, away from extremes of heat, cold, and especially dampness.
working load as stated in proof load certificate; full details of periodic inspections
• Slings which have been damaged or are defective in any way shall be immediately removed from
  service, cut up and destroyed
• All spreader bars shall be manufactured, tested, and inspected to ANSI B30.20, permanently
  identified with the safe working load, manufacturer’s name and serial number
• Shackles are used for making connections in rigging; they should be tested by the manufacturer
  and marked with the safe working load.
• The pins are separate but matched parts of the shackles, so care must be taken to use the correct
  pin for each shackle.
• PETROJET should assign banks man and he must be well- acquainted with the hand signals, the
  different functions of lifting gear, and the various methods of loading.
• PETROJET should avail competent crane operator has (knowledge with maintenance,
  experience, valid license, have not drugs, has good listening and good watching)
• Suspended load should be tied with tag line to avoid hitting hazard equipment or personnel
• Centre of gravity of suspended load should be determined to allocate the lugs which will be lifted from

20.0 MECHANICAL EQUIPMENT
This item cannot cover all the situations which hazards could arise, but it outlines some of
The hazards likely to be encountered from specific items of equipment, the only safe way of using
mechanical equipment is to have the following:
• Properly trained operators, running equipment that is well maintained and carrying out the work
  for which it was designed.
• Operators shall be trained in the procedures and functions relevant to a specific piece of
  Equipment; they must be fully aware of the capabilities and limitations of the machine and have
  knowledge of the day-to-day maintenance that it requires.
• PETROJET shall train and test all equipment operators and issue them with written authorization
  specifying the equipment, which they are competent to operate.
• All moving parts of machinery must be shielded by guards, examples of equipment which must be
  guarded include cooling fans on compressors and generators, the main drive shafts on pumps and
  dumpers, and the cable drum on winches and concrete mixers.
• Guards removed for routine maintenance or for repair must be replaced before the equipment is
  returned to service.
• Before any mechanical equipment is used in a restricted area, all required work permits must be
  obtained
• All machinery should be inspected before being placed in service and at regular intervals
  thereafter.
• Maintenance schedules should be established for each piece of equipment and strictly followed
• At the start of each shift, the operator must check oil, water, fuel, and hydraulic levels, that all
  gauges are operating and that the machine is functioning smoothly.
• Safety equipment (e.g., guards, limit switches, governors) must be checked daily.
• No repair, adjustment, or replacement of parts on moving machinery is permitted.
• Before making any repairs, all equipment must be stopped and deactivated so that it cannot be
  unintentionally started.
• Equipment travelling or working on the highway must have lights and reflectors.
• Park equipment clear of the roadway. If this is not possible, use flashing lights, cones,
  or other warning devices to alert approaching traffic.
• When vehicles are left unattended (even overnight), engines must be stopped, parking brakes
  applied and the wheels chocked and the ignition key should be removed and/or battery cables
  disconnected to avoid start -up by unauthorized personnel.
• Windows must be kept clean at all times and should be replaced if the glass becomes pitted,
  cracked or broken Where the operator of a mobile machine cannot see the area all around his
  machine
• All equipment must be located so that exhaust fumes will not affect workers in the area.
• Gasoline-driven equipment shall not be used inside a building or other confined space
20.1 CONSTRUCTION ACTIVITIES EQUIPMENT

20.1.1 COMPRESSOR
- All employees on site must know the dangers of compressed air. Never use compressed air to dust off clothing or machinery.
- Horseplay with compressed air must be strictly forbidden.
- When compressed air is used in special cleaning/purging tasks, goggles and full face shield must be worn.
- Before start up, a daily check should be made of the compressor's pressure relief valve, fuel, oil and water levels and the air reservoir should be drained of trapped water.
- The operating manual for the particular type of compressor used should be strictly followed.
- The air intake must be located so that it does not draw in exhaust gas.
- There must be a filter to remove oil mist.

20.1.2 CONCRETE MIXERS AND BATCHING PLANTS
- All chains, gears, and revolving shafts must be guarded.
- Safety chains and catches must be operative, and the lifting mechanism must be in good order.
- Men must not be allowed to work under or near the loading skip unless it is held in position by a safety chain or catch or positively blocked.
- The mixer drum and the area around the machine must be thoroughly cleaned at the end of each day's operation.
- Cement bags must not be allowed to accumulate in the mixer area; they should be collected and disposed of at regular intervals during the day.
- Men must not be allowed to work inside the silo unless they are wearing a safety belt with a lifeline and an attendant is posted outside ready to assist in case of emergency.
- The approach to the sand and aggregate bins should be barricaded, and the barricades should only be removed to allow access for vehicles delivering material.
- Personal protective equipment such as respirators, ear muffs, and goggles shall be worn.
- Loose fitting clothes shall not be worn around moving machinery.
- Lockout and tag system is required in batching plants to ensure the safety of repair and/or maintenance personnel. This is a means to disable process/mechanical electrical 'control' equipment during repairs and maintenance.
- Lockout and tag system rules must be posted in a conspicuous location throughout the plant and workers must be thoroughly trained in the lockout/tag procedures.

20.1.3 EXCAVATORS
- The excavation work permit may require that underground pipelines or cables be located by manual digging.
- Operators of excavators must possess a valid Government license for the machine.
- Outriggers must be fully extended when operating a mechanical excavator so fitted.
- An attendant must be appointed and be available at all times during excavation to assist and guide the operator.
- Excavators with a swinging motion must have a clearance of at least 0.6 meter (2 feet) from any fixed object.

20.1.4 FORK LIFT TRUCKS
- It is essential that drivers be fully trained and experienced.
- They must be able to manipulate loads smoothly and efficiently.
- A specific course of instruction should be established for fork lift drivers. They should not be allowed to use the vehicles on site until they have taken the course.
- The truck shall be equipped with overhead protection.
- When travelling with a load on the forks, the forks should be as low as possible to maintain stability.
- If the load being carried obstructs the operator's forward view, he should travel in reverse.
- Operators, loaders, helpers and other workers should never place any part of their bodies between the mast uprights, cross members, or other moving parts of the fork lift truck.
20.1.5 GENERATORS
• All pulleys, belts, and fans must be totally enclosed or otherwise guarded.
• The machine must be properly grounded before each use.
• The side panels to the engine cover are designed to give access to the machinery for maintenance or repair. They must be closed at all times when the engine is running.
• The machine should be grounded before use
• Repair all fuel leaks.
• Check hose and pipe connections for wear and cracks.
• Clean up all combustible trash around the generator.
• Clean up all fuel spills and place clean sand around area when required.
• Exhaust piping system shall be kept away from work areas and combustible materials.
• Inspect all wiring for damage or improper splices/repairs.
• Fire extinguishers must be readily accessible.
• Conduct daily inspections of all generator sets using this guide

20.1.6 GRADERS, DOZERS AND LOADERS
• Before moving his machine, the driver must walk around it to see that the area is clear.
• Men must not be allowed to sit or lie in the area around the machine.
• The engine shall not be left running when the driver is not at the controls.
• Before leaving his machine, a driver must shut off the engine and remove the ignition key.
• Blades, scraper bowls, etc. must be lowered to the ground before the driver leaves his unit.
• The wheels should be properly chocked

21.0 INJURY AND DAMAGE REPORTING
PTJ shall also take or cause to be taken any additional measures under the direction of the Company Representative to prevent the injury or death of any person, or any damage or loss of property, loss of process, or damage to the environment during Contractor's performance of the work. PTJ shall also take any additional measures which the Company representative may decline to be reasonable and necessary to protect against the injury (or death) of any Person, or damage (or loss) of any property during the contractor’s performance of the work under the contract.
For accidents involving Contractor employee fatalities, serious injury to three or more Contractor employees, or damage to CLIENT equipment or property, a preliminary written report shall be submitted within 24 hours followed by a detailed written report submitted within three days to the Company Representative. Part of this program will be a ten-minute safety discussion with the workmen, at least once a week, on the hazards at the site and the procedures to be followed to prevent personal injury and minimize property damage.
PETROJET is responsible for reporting accidents to CLIENT. This item covers these reporting requirements and the principles behind accident investigation and analysis.
All shoring equipment shall be inspected prior to erection to determine that it is as specified in the shoring layout. Any equipment found to be damaged shall not be used for shoring.
All hand tools shall be regularly inspected before and after use, and before storage. If wear or damage is observed, the tool should be withdrawn from use for repair or disposal. The contractor shall ensure that the storekeeper maintains a record of all tools issued, repaired, and withdrawn from use. Proper racks and boxes shall be provided for the storage of hand tools. Power tools must not be left lying around the job site where they could be damaged.

21.1 ACCIDENT INVESTIGATION
• The point of an accident investigation is to prevent recurrence of similar accidents; to determine facts rather than to find faults, the main reasons for conducting an accident investigation are:
• To find the causes so that similar accidents may be prevented;
• To determine the point at which “unplanned” events took over from the “planned” sequence of events;
• To recommend what corrective action should be taken.
21.2 CASES TO BE INVESTIGATED
• Incidents that result in property damage or serious injuries to personnel and hospitalization of three or more employees must be fully investigated and reported.
• Unless the real cause is known, the hazard cannot be controlled in the future.
• The near-miss incident is equally important from the point of view of prevention and should also be thoroughly investigated.

21.3 ACCIDENT INVESTIGATION GUIDELINES
The investigation should include, but not be limited to the following:
• Questioning the man in charge and finding out what was planned.
• Finding out the injured man's job or the normal configuration and function of the damaged equipment or plant.
• Questioning the injured man as soon as possible.
• Questioning the witnesses separately as to what they actually saw, not what they think happened.
• Studying the equipment or plant layout and noting any signs of misuse.
• Finding the explanation of any irregularities.
• From the information obtained, establishing the reason why the "unplanned" events took over from those that were "planned".
• Recommending items of corrective action and methods of implementing them to prevent the recurrence of the incident.
• Making a scaled drawing of the accident scene and supplement that with supporting Photographs.

21.4 ACCIDENT ANALYSIS
PETROJET can use nine main classifications to analyze industrial accidents. Every PETROJET should go through the following classifications and their breakdowns to determine which of these (if any) apply to the incidents in which they were involved. These records help to illustrate accident trends.

The nine classifications with their individual breakdowns are:

1. Falls (Of Persons from Heights)
   - To the ground or another level
     - From scaffolding
     - From ladders
     - Into holes, trenches, etc.
   1a. Falls (Of Persons on the Level)
     - To the ground
     - Against objects

2. Handling Objects
   - From lifting
   - From pulling or pushing
   - Handling materials
   - Electric shock

3. Striking Against Objects
   - Protruding nails
   - Scaffold tubes and fittings
   - Stepping or kneeling on objects

4. Struck by Objects
   - Falling objects
   - Foreign bodies in eyes
   - Flying objects

5. Equipment
   - Moving Parts
     - Equipment in motion
     - Hot surfaces

6. Hand Tools
   - Power tools
   - Non-power tools

7. Transportation
   - Road
   - Site

8. Lifting Appliances
   - Cranes
   - Hoists and winches
   - Pull-lifts, pulleys, wheels, etc.

9. Hazardous Atmospheres
   - Hydrogen Sulphide
   - Others
22.0 EXCAVATION

Accidents due to cave-in can occur for excavations which are not shored or otherwise supported. Even rock that looks solid from a cursory inspection can collapse without warning. The sides of an excavation may need to be suitably shored, benched or sloped back to a safe angle of repose, depth, and soil composition. Other types of excavation accidents are caused by contact with underground pipes and cables, by falls of equipment and persons, by persons being struck by excavating equipment, and by hazardous atmospheres.

22.1 DEFINITIONS

- **Excavation**: Any man-made cavity or depression in the earth's surface, including its sides, walls, or faces, formed by earth removal and producing unsupported earth conditions by reason of the excavation.
- **Trench Excavation**: A narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench is not greater than 4.5 meters (15 feet).
- **Accepted Engineering and Construction Practices**: Plans for excavations and protective system methods shall be submitted to HSE depart before work start up.
- **Protective Systems**: Methods used to protect employees from cave-ins, from materials that could fall or roll into the excavation onto the workers or from collapse of adjacent structures. Protective systems include supports, sloping and benching, shields and other means to protect workers.
- **Shoring**: Hydraulic, timber or mechanical systems that support the sides of an excavation, designed to prevent cave-ins.
- **Benching**: A method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal steps, with a vertical rise between steps.
- **Sloping**: A method of excavating in which the sides of an excavation are laid back to a safe angle to prevent cave-ins. (The safe angle required varies with different types of soil, exposure to the elements and superimposed loads. There is no single angle of repose. Soil classification must be identified to select safe sloping and benching methods.)
- **Soil Classification System**: A method of categorizing soil and rock deposits as types A, B, and C in decreasing order of stability. Soil type is determined by analysis of the soil's properties.

22.2 GENERAL INSTRUCTIONS FOR EXCAVATION

Before job start the following should be executed:

- **Size and purpose of the excavation.**
- **Nature of the ground including the proximity of made-up ground.**
- **Position of underground obstructions such as pipes, electric cables, and other utilities.**
- **Weather and soil moisture conditions, especially high water table.**
- **Sources of soil vibrations (highway traffic, railroads, machinery, etc.).**
- **Adjacent roads and foot paths.**
- **Method of excavation.**
- **Work permits must be obtained from the appropriate operations supervisor before excavation work is started in any project facility, including residential areas and roadways, and in any place where the presence of underground/utility obstructions is known or suspected.**
- **Whenever the presence of underground pipes, cables, vessels, or structures is known or suspected, mechanical excavators shall not be used until all such obstructions have been exposed by hand digging. Mechanical excavators shall not be used within 3 meters (10 feet) of any such obstruction. Pneumatic breakers shall only be used where necessary to break concrete or other hard surfaces.**
- **All parts of an excavation, including the shoring, shall be inspected every day by a competent person to ensure that there is no danger of collapse.**
- **Barricading around excavation should be installed to avoid falling personnel.**
• Access way with guardrails should be provided to ease cross over personnel to avoid tripping hazard

23.0 FIRE PREVENTION
This item covers measures to prevent fires and protect against all their possible harmful effects, in order to avoid injury to personnel and loss of time and materials
• Avoid congestion around machinery and equipment where there is a high level of activity and traffic
• Operations having a high fire risk, such as welding and spray painting, should be isolated from flammable and explosive materials or specially protected.
• Be sure to provide adequate emergency access and egress
• Storage of flammable materials in the plant site should be restricted and stored in suitable warehouse.
• Plant equipment should be considered to protect them against fire, which could be caused by storing it near combustible material
• Electrical equipment should be checked regularly for defects
• Smoking is permitted only in designated areas.
• Welding equipment, asphalt kettles, heating appliances and other open flames or hot surfaces should be segregated from combustible materials.
• Beware of indirect sources of ignition: hot welding slag dropped from a height for example, or sparks from a fire under workers
• Proper bonding and grounding techniques shall be used for any operation where static electricity could become an ignition source.
• All flammable material should be stored in warehouse fulfilled with safety requirements which are applicable with material safety data sheets
• Transportation must always be in (closed) metal containers. (Plastic containers are prohibited.)
• Daily site clean up of combustible materials waste is required to reduce fire hazards
• In a construction site many materials are potential fuel for a fire: packing material, scaffold planks, form lumber, electrical insulation, tires and other rubber goods, lubricating oil and grease, and diesel fuel, in addition to the flammable liquids (fuels, paints, and solvents) mentioned above so the get ride of waste should be done regularly and daily to avoid fire hazard
• Housekeeping should be done regularly to avoid fire hazard
• PETROJET should provide site during construction phase with suitable fire extinguishers
• Class “A” Fires: Involve ordinary combustion as wood cloth, paper, etc.
• Class “B” Fires: Involve flammable or combustible liquids, greases and gases.
• Class “C” Fires: Involve energized electrical equipment.
• Class “D” Fires: Involve combustible metals such as magnesium, titanium, sodium & potassium.
• Every fire, including those extinguished by PETROJET personnel, should be reported to CLIENT representative and the fire Protection departs. Will inspect the area, to offer suggestions for preventing a recurrence, and to ensure PETROJET has re established his fire fighting capability by recharging extinguishers or replacing equipment.

24.0 FORM WORK
The handling of timber/wood, both new and used which is used in concrete foundation during construction phase is much more hazardous so the following instruction should be paid be attention to:
• Gloves should be worn at all times when handling timber/wood, old or new
• When timber /wood are being handled from a scrap foundations or piles, employees should be alert for protruding nails, wires.
• Protruding nails should all ways be removed from scrap timber/wood whether it has to be used again or discarded, bending nails over helps but it doesn't eliminate the hazard
• All wood/timber scrap should be removed regular from job site on daily basis
• The truck which carries the timber/wood should not be over loaded
• All wood/timber scrap should be fixed properly with truck with rope to avoid falling and cause injury
• When handling timber/wood a firm grip must be kept to minimize the risk of the timber/wood slipping through one's hand and causing injury
• Long pieces of timber/wood should not be carried by one person in congested areas even if the weight is not great, when long pieces have to be carried, this should be two man jobs

25.0 FIRST AID FACILITIES
First aid is the immediate help that is provided at the site to an injured or seriously ill person before professional medical help can be obtained.
• PETROJET to ensure that proper first aid is available to their employees on all job sites.
• Provisions shall be made prior to start-up of the project for prompt medical attention in case of medical emergencies.
• PETROJET shall provide first aid facilities.
• The first aid facility shall be kept in a sanitary condition at all times.
• First aid facilities run by a nurse familiar with first aid cardiopulmonary resuscitation (CPR) requirements and exclusively assigned to medical duties and if the number of his workmen in a location exceeds fifty, he shall employ a nurse who shall be familiar with first-aid services and shall be exclusively assigned to rendering such services; PETROJET shall assign a physician to examine and treat the workmen at the place to be provided by PETROJET for this purpose, and PETROJET shall provide them with the medicines necessary for their treatment.
• The employer shall assign one or more persons to be responsible for administering first aid to the injured at all times during working hours, provided that the person-in-charge shall be one of the establishment's employees who will either be trained in first-aid.
• All first aid cabinets shall be conveniently located in clean place above floor level and shall always be ready for use and easily accessible at all times. Signs shall be posted in conspicuous places at the various work sites to indicate the location of the cabinet and the name of the workmen in charge of first aid.

26.0 HAZARDOUS MATERIAL & WASTE MANAGEMENT
There are thousands of chemicals in existence and hundreds of new ones are being developed for commercial use every year, when dealing with an unfamiliar chemical, it is always wise to assume that it is hazardous. The exposure to hazards associated with a material depends largely on its proper identification, handling, usage, transport, storage and disposal; in addition, materials which may be completely harmless in one application may be deadly in another. When dealing with a potentially harmful chemical, precautions should be taken to ensure that employees do not swallow it, inhale it, or allow it to contact their skin. The chemical must not be allowed to accidentally mix with other substances in transportation, storage, or use. It must not be subjected to undue shock, pressure, or heat. Hazardous material can enter the body of human by three ways (through skin, inhalation, and ingestion), the hazardous of material can be controlled be implement all data in material safety data sheet which available in hazard communication program and include the following:
• Chemical composition and information ingredients
It lists the product individual hazards chemicals and their relative percentages. For example if the exposure limit for chemical compound is equal 8-hr TWA (time weighted average) (0.03), this value means that exposure limit for employees should not exceed this average.
• Hazards identification
This section is providing information on the potential health effects and symptoms associated with exposure to the material, its components
The MSDS must list all the routes of entry this material to the body and its potential health effect.
Rout of entry: how chemicals enter the body (Inhalation, absorption through skin and ingestion)
Acute exposure: symptoms come on rapidly after short term exposure
Chronic Exposure: causes damage after long-term exposure Sings and symptoms of exposure: symptoms of acute exposure such as headache, rash, nausea, eye and throat irritation, skin burns, lung irritation, etc.
Medical conditions: symptoms or conditions generally aggravated by exposure to the Chemical
First aid
It describes medical and first aid treatment for accidental exposure. Any known antidotes that may be administered by a lay person or specially trained personnel will be indicated. Professional medical treatment should be obtained as soon as possible after an accident. If actions are taken in the first few minutes of exposure it can make the difference between a minor and major injury.
You should know the first aid measures for material before you work with it.

Fire fighting measures
It provides basic fire fighting guidance for fire fighters, emergency responders, employees, and occupational health and safety professionals.
Flashpoint: lowest temperature at which a flammable liquid gives enough vapour from ignitable mixture with air. So from data you can tell from a low flash point that a material represents a fire hazard.
Auto ignition temperature: it the temperature which material gives vapours can make explosive mixture with air without spark or flame.
Flammable limits: details about the minimum and maximum concentrations of vapours, so you can prevent fires. Generally it is the concentration that is greater than the LEL but less than the HEL.
LEL – Lower Explosive Limit: the lowest concentration at which a chemical start to cause explosion, Concentrations below the LEL are considered “too lean”. (Concentration below LEL is not danger)
HEL- higher Explosive Limit: the maximum concentration at which a chemical’s vapours will cause explosion. Concentrations greater than the HEL are considered “too rich” (concentration high than HEL is danger because some times gas may be diluted and return to the area of explosion mixture)
Explosion mixture: it the area between the lower explosive limit and high explosive limit
Extinguishing media: which extinguishing material to use (water, foam, fog, carbon dioxide, dry chemicals, etc.)

Accidental release measures
This section provides us with data about spill, leak, emergency procedures and environmental professional.
It describes evacuation procedures, containment and cleans up technique and emergency procedures to protect health, safety and environment.

Handling and storage
It provides safe handling and storage information for employees and safety specialist.
General handling precautions and practice are described to prevent release to the environment and exposure during contact.

Exposure control
This section gives us data about the engineering methods (ventilation …etc.), personnel protective equipment for protection personnel during working with any chemical compound and warning signs for this material (labelling, warning devices, and training) and the types of protections that may be required include:
Type of respiratory protection
Ventilation to be used
Protective clothes to be used
Eye protection to be used
Work and hygienic practice

Physical and chemical properties
MSDS: gives data about the chemical and physical properties
Boiling point: it indicates the temperature at which material gives vapour.
Vapour pressure: the higher the pressure, the greater the chance of inhaling the vapour
Vapour density: vapours which is heavier than air are accumulate in sewer and tank causes danger situation
Solubility in water: it gives information about the solubility in water
Appearance and odour: what the chemical looks and smells like
Melting point: it is temperature which chemical solid converts to liquid state.
Evaporation rate: how quickly chemical will evaporate under normal condition

- Stability and reactivity
It gives data, which is more useful for storing and handling material more safely when you know how it may react to change in temperature or contact with other materials. The information will guide you in your choice of materials for container, PPE. Some material may react with common materials or may burn or spontaneously decomposed to yield bi-products which are toxic than the starting material.

- Disposal
It will assist in determine the proper disposal method to prevent environmental damage, public health hazard, violation of laws.

27.0 IONIZING RADIATION
Ionizing industrial radiation, such as x-rays generated by equipment or gamma rays emitted spontaneously by radioactive materials, are widely used in industry for non-destructive testing, e.g., testing of welds in pipes and pressure vessels, without damaging the material. The material tested does not retain any radioactivity when testing is completed. For all practical purposes, the radiation produced by x-ray equipment or emitted by radioactive sources are the same. X-rays and gamma rays both have properties which should be understood. Even though they penetrate the body, they cannot be perceived by any of our five senses; they can be absorbed and scattered by matter; they travel in straight lines at the speed of light; they ionize gases; they affect photographic emulsions; and by far the most important, they can be harmful to the living cells of the body. So the following safety precautions should be considered:

- Distance is an effective method of protection because gamma and x-rays obey the inverse square law, that is, the radiation intensity decreases with the inverse square of the distance. Conversely, dose rates at close distances can be extremely high, even for low activity sources. It is essential, therefore, that unshielded sources are kept at a sufficient distance from personnel so as not to pose a health hazard to them.

- Decay time chart for gamma rays should be available

- Safe distance is calculated as above and should be taken

- Time is a useful method of protection because high dose rates can be accepted over very short periods of time

- In the use of x-ray equipment, precautions against emitted radiation are necessary until the electric power is turned off and locked out. On the other hand, radioactive materials constantly emit radiation and cannot be switched off. Consequently, to absorb unwanted radiation and facilitate handling, sealed sources are housed in shielded containers or bunkers.

- Radiation workers are further categorized as Competent Persons or Radiographers.

- Competent Persons do not normally use radiation sources, but by training and experience are capable of supervising both routine operations and emergency situations involving radiation.

- Radiographers are expected to safely use radiation sources in the course of their work and must be in possession of a valid Permit to Use Material/Equipment Producing Ionizing Radiation before they can work with a radioactive source.

- Radiographers must wear two personal dosimeters when working with radiation, a direct-reading pocket dosimeter and an integrating permanent dosimeter (film badge or thermo luminescent dosimeter (TLD).

- Radiation dose for competent radiographers and the no radiation workers should not be subjected to dose limit in manual (5 rem/year for radiographer and 1 rem/year for non radiation workers).

- Doses to workers should always be kept as low as reasonably achievable (ALARA).

- No occupational exposure is allowed for persons less than 18 years of age.

- Each radiographer will check at the beginning of each shift on the zeroing and recharging of dosimeters and on the condition of the equipment.

- At the start of each shift, radiographers must ensure that all equipment is in safe working order. All malfunctions must be reported to the supervisor or Competent Person immediately. The
radiographer must also make sure that he is wearing a valid TLD or film badge and a direct-reading pocket dosimeter which has been charged and zeroed.

• Upon arrival at the job site and prior to operating with any sealed source, the radiographer must ensure that non-radiation workers are not subject to radiation levels that would exceed that which is permitted.
• Upon completion of work or at the end of each work period, every sealed source must be returned to a storage area approved by Radiation Protection Committee.

28.0 ABRASIVE BLASTING AND PAINTS/ COATING
Workmen engaged in surface preparation and paint application can be exposed to the dangers of fire, explosion, chemical burns, toxic fumes, dust, and insufficient air so this item will discuss these hazards and how to minimize them.

28.1 FLAMMABILITY HAZARDS OF COATING MATERIALS
• The flash point is defined as the lowest temperature at which a liquid will give off sufficient vapour to ignite when exposed to an open flame.
• The lower and upper flammable (explosive) limits define the range of vapour/air concentrations that are potentially explosive. The lower flammable (explosive) limit (LEL) is typically on the order of 1% to 2% by volume, a level readily obtained in Solvents in paints constitute a significant fire and explosion hazard when in the presence of ignition sources.
• All electrical lighting and equipment shall be explosion-proof when required in areas where solvent vapours are likely to be present.
• All electrical equipment such as switches, panel boards, electrical motors and associated equipment must be de-energized before spray painting to eliminate explosion hazards.
• Solvents and solvent-based paints shall not be applied to surfaces exceeding summer ambient temperatures.
• The use and storage of flammable paints and solvents shall be kept to restricted areas and these areas
• Should be suitably marked with the appropriate warning signs.
• Flammable paints should be kept in a special building or in a sun shelter.

28.2 ABRASIVE BLAST CLEANING
This item covers blast cleaning using abrasives in the form of sand, iron shot, grit, slag or similar materials so the following precautions should be considered.
• Abrasive blast cleaning operators shall have pre-placement physical examinations, including chest X-ray and pulmonary function tests with repeat tests at least every two years
• The abrasive blast cleaning operator shall wear an air supplied protective hood approved (NIOSH or equivalent) for the type of abrasive material being used
• The breathing apparatus and air quality specification shall meet the NIOSH/OSHA standards
• Areas where hazardous work is being carried out shall be suitably barricaded to keep personnel out of the hazardous area, or the timing of the work shall be such that only the work crew doing the job is present at the site.
• Warning signs shall be posted in hazardous areas with suitable warnings of the potential dangers (i.e., "No entry, sand blasting in progress").

29.0 LOCK OUT AND TAG OUT SYSTEM
PETROJET shall establish a lock out and TAG system compatible with CLIENT system as part of PETROJET HSE Program plan in addition to the following:
• Every work place has the need for ongoing maintenance, installation, repair and servicing of machines and equipment may seen routine, but can be dangerous to employees performing the work.
• Serious injury can be caused by the sudden and unexpected start-up of the machinery or equipment contact with live electrical circuit or the unexpected release of stored energy.
• Equipment that is shut down may inadvertently be re-stored or re-energized by a coworker, or equipment that was though to be shut down may be controlled by automatic processors, timers or computers and may be restarted automatically and without warning.
• Lockout devices such as padlocks and keys shall be numbered.
Padlocks and keys shall be stored in such manner as to be available to unauthorized personnel. A master key or second key for each padlock used for lockout purposes shall be kept in secure storage for emergency use only.

**Step 1: Preparation and notification**

Before servicing or installing equipment, you must be able to answer the following questions:
- What is the type of energy source on the equipment?
- What are the potential hazards related to the energy source?
- What steps are necessary to control the energy source?
- Who needs to be notified that the equipment will be shut down for service?

Once these questions have been answered notify all affected employees that a lockout Procedure is about to begin (and that the equipment will be) shutdown for service

**Step 2: Shutdown the equipment**

Follow work procedure and/or manufacturer's instruction for shutdown. Be aware that some equipment has special shutdown procedures (e.g. computer controlled equipment) make sure all energy sources have been located and shutdown (some machines have more than one power source all must be shut down).

**Step 3: Isolate the equipment**

Equipment should be isolated by (Shutting of the main breaker or control switch, Closing valves, Disconnecting process lines, Pulling plugs) and for complex machines or equipment refer to manufacturer's control diagram detailing the locations of all isolation points, including breaker panels, switches, valves, etc.

**Step 4: Attach the lock and tag**

Each authorized employee who is performing maintenance is responsible to inform lockout and tag-out authority for locking and tagging the equipment and employee whose duties require them to work on equipment must be provided with their own lock and key.

If more than one employee is involved in maintenance, multiple locking devices must be used to allow each maintenance employee to lock and tag. This prevents one employee from accidentally starting up the equipment while another employee is still working.

**Step 5: Release any stored energy**

After locking any tagging equipment, you must make sure that any stored energy on the equipment is released this is done by:
- Inspecting equipment to make sure that all parts have stopped moving.
- Bleeding electrical capacitance (stored charge).
- Venting or isolating pressure or hydraulic lines from the work area, leaving vent valves open.
- Draining tanks and valves
- Releasing the tension on springs or balancing the movement of spring driven parts.
- Clamping or chaining any switches or levers that could be moved into the start position

**Step 6: Test equipment**

To verify that all energy has been released and controlled:
- Test the start switches on the equipment to confirm that all power sources have been shutdown and switches cannot be moved to the "on" or "start" position.
- Secure all blocks, clamps, chains and cribs.
- Secure blanks and make sure they are not leaking.
- Check electrical circuits to make sure that voltage is at zero.

Once you have confirmed that all energy sources have been controlled and locks and tags are in place, it is safe to begin the maintenance work.
30.0 PTJ SUB-CONTRACTORS

30.1 PRE-SITE ACTIVITIES MEETING

SUBCONTRACTORS, before starting work at the job site shall attend a pre-construction meeting with PETROJET to understand the project conditions and safety requirements. A job Site tour shall be made to confirm SUBCONTRACTORS awareness of potential safety hazards. Appropriate methods equipment devices and material shall be provided by SUBCONTRACTORS to assure a safe work place. SUBCONTRACTORS shall provide its own project specific safety program and submit it to PETROJET AND CLIENT for review prior to starting work at the job site, such review shall not relieve SUBCONTRACTORS of its responsibility for safety, nor shall such review be construed in any manner, it is SUBCONTRACTORS obligation to undertake any action which may be necessary or required to establish and maintain safe working conditions at the job site.

Subcontractor operates in accordance with rules and standards designed to prevent harm to people or property and protect the environment.

It is SUBCONTRACTORS responsibility to:
• Carry out the work safety in a manner so as to eliminate hazard and minimize risk or Death or injury to his own personnel and OTHER personnel on or off the work site, and of damage to the work, facilities or equipment and perform his task effectively, efficiently and safely.
• Ensure that safety, health and environmental standards and regulations as laid down by law and complying with project HSE rules and procedures by following PETROJET project HSE program.
• Resolve any anomalies between the project safety regulations and PETROJET safety Regulations so that PETROJET remains fully responsible for the safe conduct of the work.
• Ensure that good housekeeping is maintained at all times throughout the period of any work, both at the work area and around any temporary buildings.
• Provide all its employees with personal protective equipment (PPE).
• Provide all works and facilities from risk of fire.
• Provide medical first aid facilities to an acceptable standard.

31.0 GENERAL SAFETY RULES

• PETROJET shall at all times comply with, and ensure that its employees, agents and SUBCONTRACTORS comply with, applicable Government Safety Regulations and all CLIENT Safety and HSE rules and regulations especially the provisions of CLIENT Safety Manual.
• All welding and cutting equipment shall be of a CLIENT approved type and maintained in good condition.
• PETROJET shall, as a minimum, provide, maintain and enforce the use of the items of personal protective equipment listed in CLIENT Safety Manual.
• PETROJET shall ensure that all tools provided by PETROJET and SUB- PETROJET are of the best quality.
• Electrical hand tools shall be properly grounded or be of the double insulated type.
• All tools shall be free from defects and maintained in good condition. CLIENT and PETROJET will reject tools, which are found to be defective.
• PETROJET shall ensure that only metal or timber ladders of CLIENT approved type are provided and used for ingress to and egress from work places where other means of ingress and egress are not available.
• PETROJET shall provide and cause to be used scaffolding, platforms or temporary floors for all work, which cannot be done safely from the ground, from a ladder or from a boatswain's chair.
• All scaffolding shall be constructed of CLIENT approved metal components and erected to comply with the requirements of CLIENT Safety Manual.
• All material and equipment used in temporary electrical installations shall be of CLIENT approved type and maintained in good condition.
• PETROJET shall ensure that all lifting appliances and every part thereof, including all working gear, and all other plant or equipment for anchoring or fixing such appliances shall be of good mechanical construction, adequate strength and free from defect and are properly inspected and maintained.
• All chains, hooks, slings, shackles and other equipment used for raising or lowering on a lifting appliance shall be of a CLIENT approved type and maintained in good condition.
• All mobile heavy equipment and crane operators must possess a valid equipment operator's license and be certified.
• All cranes and lifting equipment must be inspected and certified by CLIENT before being permitted to operate.
• Certified riggers shall be provided.
• PETROJET shall ensure that all mechanical equipment provided is of a CLIENT approved type and maintained in good condition.
• All moving parts of any equipment shall be securely guarded to prevent access to the moving parts by persons working on or passing through the work site.
• PETROJET shall ensure that passengers shall travel only in vehicles that are provided with CLIENT approved passenger seats, this requirement shall apply while travelling to and from the work site.
• Seat belts shall be installed and used in all vehicles carrying personnel (except in the case of buses where seat belts are mandatory only for the driver).
• PETROJET shall ensure that an immediate oral report is made to CLIENT Representative in the case of all:
  Fatal injuries
  Injuries requiring medical attention which result in lost time
  Damage to plant or equipment
  Damage in any amount equipment or property
  Fire
• PETROJET shall ensure that any excavation work carried out during the course of the work is done according to the requirements of CLIENT safety construction manual.
• PETROJET shall provide and maintain in good working order adequate fire fighting equipment and all PETROJET's personnel shall be properly trained in the use of such equipment.
• PETROJET shall ensure that radioactive sources shall be used in compliance with the "General Rules and Regulations for the Use and Handling of Radioactivity and Radioisotopes" as promulgated by the Atomic Energy Department and with prior written approval of CLIENT.
• PETROJET shall provide and maintain first-aid facilities at the work site in accordance with Labour Laws.
• Handling and disposal waste should be executed according to material safety data sheet and in accordance to CLIENT safety manual.
Annex 13: Emissions Reductions Calculations

The pipeline will serve the new extension in 6th of October Power Plant. The power plant will utilize natural gas to generate 300 MW (extension) electricity per year that would have otherwise be generated using a mix of more carbon intensive fuels (Heavy fuel oil, Light fuel Oil and Coal).

1. Baseline Emissions:

The following equation has been used to estimate the baseline emissions:

\[ \text{BE}_{\text{CO}_2,\text{elec},y} = \text{EC}_{y} \times \text{EF}_{\text{grid},y} \]

Where:

- \( \text{BE}_{\text{CO}_2,\text{elec},y} \) are the baseline emissions from electricity generated by the power plant during the year \( y \) (tCO\(_2\)/yr);
- \( \text{EC}_{y} \) is the quantity of electricity that would have been generated by the project activity during the year \( y \) (MWh);
- \( \text{EF}_{\text{grid},y} \) is the emission factor for the grid in year \( y \) (tCO\(_2\)/MWh)

The emission factor of the grid is calculated as follows:

\[ \text{EF}_{\text{grid},y} = \frac{\sum_{i} \text{FC}_{i,y} \times \text{NCV}_{i,y} \times \text{EF}_{\text{CO}_2,i,y}}{\text{EG}_{y}} \]

Where:

- \( \text{EF}_{\text{grid},\text{OMsimple},y} \) = CO2 emission factor in year \( y \) (tCO\(_2\)/MWh)
- \( \text{FC}_{i,y} \) = Amount of fossil fuel type \( i \) consumed by power plant / unit m in year \( y \) (mass or volume unit)
- \( \text{NCV}_{i,y} \) = Net calorific value (energy content) of fossil fuel type \( i \) in year \( y \) (GJ / mass or volume unit)
- \( \text{EF}_{\text{CO}_2,i,y} \) = CO2 emission factor of fossil fuel type \( i \) in year \( y \) (tCO2/GJ)
- \( \text{EG}_{y} \) = Net electricity generated and delivered to the grid by all power sources serving the system in year \( y \) (MWh)
- \( i \) = All fossil fuel types combusted in power plant / unit m in year \( y \)

The methodological “Tool to calculate the emission factor for an electricity system” (Version 2.1), Clean development mechanism
In order to estimate the Emission factor of the grid, data from the latest report issued by the Ministry of Electricity & Renewable Energy (2013/2014) has been used. Additionally, data from the MoEE regarding the future energy mix that will be used to generate electricity in 2022 has been used to estimate the future EF of the grid. The values of grid emission factor in the years between 2014 and 2022 and post 2022 have been estimated.

**Table 5: Net Electricity Production in year 2013/2014**

<table>
<thead>
<tr>
<th>Net Electricity Production in year 2013/2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro</td>
</tr>
<tr>
<td>Thermal</td>
</tr>
<tr>
<td>Generated Energy from Wind (Zafarana)</td>
</tr>
<tr>
<td>Purchased Energy from IPPs</td>
</tr>
<tr>
<td>Generated from private sector (BOOT)</td>
</tr>
<tr>
<td>Total Net electricity generated (excluding isolated units), (GWh)</td>
</tr>
</tbody>
</table>

**Table 6: Fossil fuels amounts consumed in the electricity system in year 2013/2014**

<table>
<thead>
<tr>
<th>Fuel type</th>
<th>Units</th>
<th>2013/2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Fuel Oil (HFO)</td>
<td>Tonnes</td>
<td>7,809,000</td>
</tr>
<tr>
<td>Natural Gas (NG)</td>
<td>m³</td>
<td>28,263,000,000</td>
</tr>
<tr>
<td>Natural Gas (NG)</td>
<td>tonnes *</td>
<td>21,994,553</td>
</tr>
<tr>
<td>Liquid Fuel Oil (LFO)</td>
<td>Tonnes</td>
<td>56,600</td>
</tr>
<tr>
<td>Special Liquid Fuel Oil (LFO)</td>
<td>Tonnes</td>
<td>76,800</td>
</tr>
</tbody>
</table>

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### Table 7: CO2 emissions per ton of fuel

<table>
<thead>
<tr>
<th>Fuel type</th>
<th>Fuel Consumption</th>
<th>Units</th>
<th>NCV TJ/Tonne$^{12}$</th>
<th>CO$_2$ emissions factor (tCO$_2$/TJ)$^{13}$</th>
<th>CO$_2$ Emissions (tCO$_2$/t fuel)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HFO</td>
<td>7809000</td>
<td>Tonnes</td>
<td>0.0404</td>
<td>75.5</td>
<td>23,819,012</td>
</tr>
<tr>
<td>NG</td>
<td>28263000000</td>
<td>m$^3$</td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>NG</td>
<td>21994553</td>
<td>tonnes</td>
<td>0.0480</td>
<td>54.3</td>
<td>57,326,602</td>
</tr>
<tr>
<td>LFO</td>
<td>56600</td>
<td>Tonnes</td>
<td>0.0430</td>
<td>72.6</td>
<td>176,694</td>
</tr>
<tr>
<td>Special LFO</td>
<td>76800</td>
<td>Tonnes</td>
<td>0.0430</td>
<td>72.6</td>
<td>239,754</td>
</tr>
</tbody>
</table>

| CO$_2$ emissions, 2013/2014 (tCO$_2$) | 81,562,062 |
| CO$_2$ emission factor 2013/2014 (tCO$_2$/MWh) | 0.5874 |

### Table 8: Anticipated Net electricity production for Year 2022$^{14}$

<table>
<thead>
<tr>
<th>Net Electricity Production in year 2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro</td>
</tr>
<tr>
<td>Thermal (NG + HFO)</td>
</tr>
<tr>
<td>Wind and solar</td>
</tr>
<tr>
<td>Coal</td>
</tr>
<tr>
<td>Total Net electricity generated (GWh)</td>
</tr>
<tr>
<td>Total installed capacity (MW)</td>
</tr>
</tbody>
</table>

---

$^{12}$ IPCC Guidelines 2006 - Part 2 - Energy

$^{13}$ ibid

$^{14}$ “Addressing Egypt’s Electricity Vision, Minister of Electricity & Renewable Energy: Dr. Mohamed Shaker El-Markabi
Table 9: Anticipated Fossil fuels amounts to be consumed in the electricity system in year 2022 \(^{15}\)

<table>
<thead>
<tr>
<th>Fuel type</th>
<th>Units</th>
<th>2013/2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Fuel Oil (HFO)</td>
<td>Tonnes</td>
<td>9,441,689</td>
</tr>
<tr>
<td>Natural Gas (NG)</td>
<td>tonnes *</td>
<td>45,031,610</td>
</tr>
<tr>
<td>Liquid Fuel Oil (LFO)</td>
<td>Tonnes</td>
<td>-</td>
</tr>
<tr>
<td>Coal</td>
<td>Tonnes</td>
<td>31,271,047</td>
</tr>
</tbody>
</table>

Table 10: CO2 emissions per ton of fuel

<table>
<thead>
<tr>
<th>Fuel type</th>
<th>Fuel Consumption</th>
<th>Units</th>
<th>NCV TJ/Tonne(^{16})</th>
<th>CO2 emissions factor (tCO2/TJ) (^{17})</th>
<th>CO2 Emissions (tCO2/t fuel)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HFO</td>
<td>9441689 Tonnes</td>
<td>0.0404</td>
<td>75.5</td>
<td>28,799,039</td>
<td></td>
</tr>
<tr>
<td>NG</td>
<td>45,031,610 tonnes</td>
<td>0.0480</td>
<td>54.3</td>
<td>117,370,389</td>
<td></td>
</tr>
<tr>
<td>LFO</td>
<td>- Tonnes</td>
<td>0.0430</td>
<td>72.6</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Coal</td>
<td>31,271,047 Tonnes</td>
<td>0.035</td>
<td>94.6</td>
<td>103,538,436</td>
<td></td>
</tr>
</tbody>
</table>

CO2 emissions, 2022 (tCO2) 249,707,864

CO2 emission factor 2022 (tCO2/MWh) 0.5541

2. Project Emissions:

The project emissions are calculated based on the following equation:

\[
\text{PE}_{\text{CO2,elec,y}} = \text{EC}_{\text{HFO,y}} \times \text{EC}_{\text{NG,y}}
\]

Where:

\(\text{PE}_{\text{CO2,elec,y}}\) are the project emissions from electricity generated by the power plant during the year \(y\)

\(^{15}\) Egyptian Holding Electricity Company, Annual Report, 2014

\(^{16}\) IPCC Guidelines 2006 - Part 2 - Energy

\(^{17}\) ibid


\((t\text{CO}_2/\text{yr})\);

\(E\!C_{G\!P\!J\!y}\) is the quantity of electricity that would have been generated by the project activity during the year \(y\) (MWh);

\(E\!F_{N\!G\!P\!y}\) is the emission factor of the power plant that utilizes natural gas in year \(y\) (0.51 t\text{CO}_2/MWh)\(^{18}\)

The following table summarizes the baseline emissions, the project emissions and the emission reductions generated by the project.

<table>
<thead>
<tr>
<th>Year</th>
<th>Electricity generated by 6th of October Power Plant (MWh)</th>
<th>EF grid (t\text{CO}_2/MWh)</th>
<th>Baseline Emissions (t\text{CO}_2/yr)</th>
<th>Project Emissions (t\text{CO}_2/yr)</th>
<th>Emissions Reductions (t\text{CO}_2/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>-</td>
<td>0.5874</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2015</td>
<td>-</td>
<td>0.5832</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2016</td>
<td>-</td>
<td>0.5791</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2017</td>
<td>2376000</td>
<td>0.5749</td>
<td>1,365,965</td>
<td>1,211,760</td>
<td>154,205</td>
</tr>
<tr>
<td>2018</td>
<td>2376000</td>
<td>0.5707</td>
<td>1,356,080</td>
<td>1,211,760</td>
<td>144,320</td>
</tr>
<tr>
<td>2019</td>
<td>2376000</td>
<td>0.5666</td>
<td>1,346,196</td>
<td>1,211,760</td>
<td>134,436</td>
</tr>
<tr>
<td>2020</td>
<td>2376000</td>
<td>0.5624</td>
<td>1,336,311</td>
<td>1,211,760</td>
<td>124,551</td>
</tr>
<tr>
<td>2021</td>
<td>2376000</td>
<td>0.5583</td>
<td>1,326,426</td>
<td>1,211,760</td>
<td>114,666</td>
</tr>
<tr>
<td>2022</td>
<td>2376000</td>
<td>0.5541</td>
<td>1,316,542</td>
<td>1,211,760</td>
<td>104,782</td>
</tr>
<tr>
<td>2023</td>
<td>2376000</td>
<td>0.5499</td>
<td>1,306,657</td>
<td>1,211,760</td>
<td>94,897</td>
</tr>
<tr>
<td>2024</td>
<td>2376000</td>
<td>0.5458</td>
<td>1,296,772</td>
<td>1,211,760</td>
<td>85,012</td>
</tr>
<tr>
<td>2025</td>
<td>2376000</td>
<td>0.5416</td>
<td>1,286,888</td>
<td>1,211,760</td>
<td>75,128</td>
</tr>
</tbody>
</table>

\(^{18}\) US Energy Information Administration (EIA)