



إحدى شركات مؤسسة البترول الكويتية
A Subsidiary of Kuwait Petroleum Corporation

Non-Technical Summary

KOC Feed Pipelines to New Refinery Project (NRP)

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ACRONYMS

EIA	Environmental Impact Assessment
eMISK	Environmental Monitoring Information System of Kuwait
EMP	Environment Management Plan
FG	Fuel Gas
HSSEMS	Health, Safety, Security and Environment Management System
KEPA	Kuwait Environment Public Authority
KIPIC	Kuwait Integrated Petroleum Industries Company
KOC	Kuwait Oil Company
LPG	Liquefied Petroleum Gas
LSFO	Low Sulphur Fuel Oil
MAA	Mina Al-Ahmadi
MEW	Ministry of Electricity and Water
NMHC	Non Methane HydroCarbons
NRP	New Refinery Project
NTS	Non-Technical Summary
PAH	Polycyclic Aromatic Hydrocarbons
P&MS	Pumping & Metering Station
SPT	Standard Penetration Test
STF	South Tank Farm
TDS	Total Dissolved Solids
UNFCCC	United Nations Framework Convention on Climate Change
USEPA	United States Environmental Protection Agency
ZOR	Zour Oil Refinery

1. INTRODUCTION

1.1 Purpose and Content of the Non-Technical Summary (NTS)

This NTS provides an overview of the main environmental findings from the Environmental Impact Assessment (EIA) during the Engineering, Construction, Commissioning and Operating phases of the Project. The content of the NTS is summarized below:

- Section 1 gives an introduction of the project background, its regulatory context and standards, and the project Environmental Impact Assessment;
- Section 2 provides a summary of the project, project location and scope and assessment of alternatives;
- Section 3 outlines the baseline conditions;
- Section 4 focuses on the environmental impacts and mitigation measures;
- Section 5 gives the conclusion.

It is important to note that this NTS does not, and is not intended to, convey all the information relating to the aspects and impacts of the Project. Its intention is to present key information, describe the main findings and conclusions, enabling the reader to understand the significant environmental effects of the Project without needing to refer to the detailed assessments.

1.2 Project Background

Kuwait Integrated Petroleum Industries Company (KIPIC) is building the Zour Oil Refinery (ZOR) in the Al-Zour area of South Kuwait. The '*KOC Feed Pipelines to New Refinery Project (NRP)*' project provides the necessary crude feed-stock and fuel gas (FG) to the ZOR refinery and transports finished products Low Sulphur Fuel Oil (LSFO) and Liquefied Petroleum Gas (LPG) from ZOR to the Mina Al-Ahmadi (MAA) Refinery.

Kuwait Oil Company (KOC) has awarded the Contract #17052456 titled "*KOC Feed Pipelines for New Refinery Project (NRP)*" to Saipem S.p.A to carry out the scope of works including detailed design, site surveys, procurement, supply, installation, pre-commissioning, commissioning, staff training, handover of the facilities and assistance in performance testing as per the Contract requirements.

1.3 Regulations and Standards

The Kuwait Environment Public Authority (KEPA) is the lead government agency in the State of Kuwait responsible for the environment and its mandate revolves solely around environmental management and protection. Environment Protection Law No. 42 of 2014 as amended by Law 99 of 2015 and its Executive Regulations and Decisions are the prevailing environmental legislation in Kuwait.

In addition, the project complies with KOC's own Health, Safety, Security and Environment Management System (HSSEMS) procedures. The State of Kuwait has also signed and ratified a number of international environmental conventions including the three so-called Rio environmental conventions and the Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC).

1.4 Environmental Impact Assessment (EIA)

Item 14 of Article-7 of the Environmental Protection Law no. 42/2014 amended by 99/2015 states the following:

"Preparing a system for environmental impact assessment of the different projects in the State of Kuwait, and developing the necessary guidelines and procedures, as well as giving its firm opinion prior to the approval of their execution by the concerned authorities."

As per KEPA requirement, an Initial Environmental Impact Assessment (IEIA) study was conducted by Bureau Veritas in July 2013 and submitted to KEPA. KEPA has reviewed the report and issued its opinion on the requirement for a final and detailed EIA study. The Final EIA report has been prepared by Bureau Veritas in August 2018 prior to construction of the project as per the recommendations of KEPA on the IEIA report.

1.5 Project Resource Requirements

The peak direct manpower requirement for this project is approx. 3,600. During operation phase, the project will require operating manpower at the Pumping & Metering Station (P&MS) facility and the other areas during maintenance activities.

The land take for the pipeline route is acquired based on the right of way. The majority of the land take is from KOC. In addition, at other areas the land has been acquired from KNPC / KIPIC and other government sectors. The pipelines are buried below ground level as per KOC procedures.

Various types of civil construction materials are required for construction and commissioning of the project including fresh water, gatch, concrete blocks, scaffolding materials, etc. Procurement is done through local & international suppliers as and when required.

Construction equipment and machinery is deployed at the construction site by local contractors. This includes cranes, welding machines, gas cutters, water pumps, compressors, trailers, pick-up trucks, boom trucks, vacuum tankers, diesel tankers, water tankers, man lifts, power generators, passenger buses, commuting sedans and ambulance.

The fresh water requirement includes approximately 5,000 m³ for construction works, plot preparation, concrete curing and miscellaneous requirements. Approx. 22,000 m³ is required for hydrotesting, which will be met from external suppliers (MEW) / KOC brackish water supply. The average demand for potable water is approx. 156 m³/day.

The power required during the construction stage is provided by the Contractor through portable power generators at site as and when required. During the operation stage, the facilities are connected to the nearest MEW power supply facilities.

2. PROJECT DESCRIPTION

2.1 Project Location

The route for the feed pipelines is parallel to the existing pipeline corridor from Ahmadi to Al-Zour (Project EF/1760). The pipelines start from Mina Al-Ahmadi (MAA) Refinery / South Tank Farm (STF), and end at the Zour Oil Refinery (ZOR). The pipeline corridor crosses various roads, desert area, and Sabhka land area. The total width of the pipeline corridor varies from 260 to 350 m. The total length of the pipeline corridor varies between 50 and 60 km. In addition, a Pumping and Metering Station (P&MS) is located at Al-Ahmadi to pump the crude feedstock to ZOR. The overall project location map is provided in the below Figure 1.



Figure 1. Project location map

2.2 Project Scope

The '*KOC Feed Pipelines for New Refinery Project (NRP)*' project comprises the following components and facilities:

- Feed and product pipelines;
- Pumping and Metering Station;
- Sectionalizing valves;
- Pig launchers and receivers;
- Pipeline portable flares;
- Fuel gas burn pit;
- Drip barrels;

- Corrosion monitoring;
- Cathodic protection;
- Thermal oxidizers;
- Instrumentation and Control Systems; &
- Electrical systems, etc.

During the operation phase, transportation of crude oil, FG, LSFO and LPG to and from the ZOR refinery will be carried out. In addition, all related components will be in operation to ensure safe working and transporting of the feeds and products. Operation of the various facilities and components includes the pumping and metering system, valves, pig launchers and pig receivers, controls and instrumentation, etc.

2.3 Alternative Assessment

The route map for the pipeline has been selected based on the proximity to the existing utilities and pipeline corridor while avoiding any interference and disturbance to the existing facilities. This also facilitates proper execution of tie-ins with existing facilities. A number of process safety studies have been conducted for the project to study the risks emanating from the project during construction / operation stages.

The 'No Go' alternative would preserve the existing environmental setting and current conditions at the project site. On the other hand, implementing the project will have some impact on the existing environment; however, the majority of these impacts assessed are temporary in nature and will occur over a short period only, i.e. during construction stage. By applying the recommended mitigation and recovery measures, most of these impacts will be either minimized or even eliminated. Considering the fact that the identified environmental and social impacts will be suitably mitigated, it has been determined that the 'No Go' option can be eliminated.

3. ENVIRONMENTAL BASELINE SURVEY

The environmental and social baseline data collection has been conducted in the context of the project's area of influence that represents the surrounding environment, which is likely to be affected by the Project. This includes Contractor's activities and KOC facilities that are directly owned, operated or managed (including by contractors) and that are components of the project, as well as unplanned but predictable impacts caused by the project and indirect impacts that affects ecosystem upon which the impacted communities' livelihoods are dependent.

3.1 Climate and Meteorology

Kuwait has a hyper arid desert climate, hot and dry. Typical average rainfall is 116 millimeters a year across the country. Minimum annual levels have been recorded as low as 31.3 millimeters while maximum annual rainfall has reached 242.4 millimeters. In summer months, average daily high temperatures range from 42 °C to 46 °C, with the highest-ever recorded temperature of 53.5 °C at Mitiriba meteorological station in the North West on August 3, 2011. The lowest temperature recorded was -4 °C at Kuwait City in January 1964.

3.2 Topography

The project is executed in the South Eastern part of Kuwait. Average site elevation at the P&MS area is 52 m above mean sea level. Site elevation of the pipeline route around the Shuaiba industrial area ranges from 87 m to 108 m. The Southern section of the pipeline route near the ZOR area ranges from 2 m to 20 m. The major land for the project falls under open desert area. The terrain at Ahmadi STF is observed as flat. The area near KOC STF area is surrounded by an industrial and refinery zone. The nearby urban settlements include East Al-Ahmadi and Fahaheel. Numerous camps including nomadic communities and contractor work camps would be noticed. Near Azzour area, some places are observed as Sabkha wet land. Sparse vegetation can be observed at the Sabkha land at the Southern portion of the pipeline route.

Land use for most of the project area as classified by Environmental Monitoring Information System of Kuwait (eMISK) is under 'Open areas / Desert areas'.

3.3 Soil

A soil investigation study was conducted at the project site at three (3) boreholes drilled to 10.0 m depth below existing ground level. Soil classification tests and standard Penetration Tests (SPT) were conducted at each location. In general, the soil is made up of inter layers of silty sand & clayey sand. The soil has strong reaction with dilute hydrochloric acid. Ground water can be encountered at the borehole in Al-Zour location at a depth of 1.5 m below ground level.

To characterize the soil quality, representative soil samples were collected at all three (3) borehole locations at a depth of 0.1 m below ground level. The analysis of the soil samples revealed that the soil is not contaminated by any past history of oil spills. Heavy metals viz., Arsenic, Beryllium, Boron, Cadmium, Lead, Chromium (Hexavalent), Mercury & Silver exist below detectable limits.

3.4 Hydrology

There are no permanent surface water catchments in the project area. During the rainy season, rainwater will be collected at some low depression areas but it will evaporate due to high evaporation rates and low soil permeability.

The project site does not fall under any ground water field as per the ground water field map of the State of Kuwait. Soil investigation shows that, ground water table can be found near Al-Zour area at a depth of 1.5 m below ground level. This might be due to the intrusion of seawater considering the close proximity to the shoreline. Results of ground water sample infer that Sulfide was found to exist below 0.1 mg/l. As a result of seawater intrusion, the Chloride content and the Total Dissolved Solids (TDS) was analyzed as 38,300 mg/l & 39,400 mg/l respectively.

3.5 Ambient Air Quality

Ambient air quality monitoring conducted at three (3) representative locations, using a mobile laboratory with online ambient air monitoring sensors, shows that all the pollutant concentrations are within the KEPA limits. Polycyclic Aromatic Hydrocarbons (PAH) exist below detectable limits at all the monitored locations.

Being a desert area, sandstorms are a common phenomenon in Kuwait, which induces heavy particulate matter suspension in the air for long hours to even a few days. This is the reason for high concentrations of particulates. Probable sources of Non-Methane HydroCarbons (NMHC's) in ambient air is from vehicle exhaust and Oil & Gas exploration / production activities.

3.6 Noise

Environmental noise levels monitoring conducted at three (3) representative locations, using Type 1 Sound Level Meter, shows that the baseline environmental noise levels (LA_{eq}) are within the standards as specified by KEPA for industrial limits.

The day time noise levels near location 1 (South Sabahiya) ranges from 63.17 dB(A) to 72.18 dB(A) with LA_{eq} of 66.17 dB(A). Noise sources include construction works near the monitoring site and traffic movement (road no. 30). At location 2, the day time noise levels ranges from 53.75 dB(A) to 58.64 dB(A) with LA_{eq} of 56.58 dB(A). The only source of noise includes the traffic noise generated from the nearby road no. 306 (Wafra road). At location 3, the day time noise level ranges from 64.50 dB(A) to 70.37 dB(A) with LA_{eq} of 67.93 dB(A). The elevated noise

levels were due to the high influx of vehicle movement along road no. 270 belonging to ongoing construction activities at the Al-Zour area.

3.7 Sabkha

The southern section of the pipeline route near Al-Zour area has Sabkha areas. Sabkha is an Arabic term commonly used to denote a salt flat, or a shallow depression. Sabkhas normally occur near sea level or at the underground water level. They usually are encrusted with a salt crust layer, the thickness of which depends on the location of the Sabkhas and the evaporation rate. Sabkhas are one of the prominent surface topographical features in the Kuwaiti coastal zone, occupying an area of about 769.4 km², equivalent to 4.3 percent of Kuwait's total surface area.

3.8 Ecology

The project area and surroundings have not been included under any of the protected areas nor are they included in the Biosphere Reserves / National parks of Kuwait. Proposed natural reserves at and around the ZOR refinery include Al-Khiran nature reserve. No fauna was identified along the pipeline corridor route and no endangered species were identified.

The Sabkha land is characterized by the spread of salt-tolerant plants that form nabkas, which have a significant role in fixing the sand, and reduce the impact of sand encroachment. At Al-Zour area there is presence of Arfaj (*Rhanterium epapposum*). No dense vegetation has been identified along the other sections of the pipeline route except near the P&MS area between road no. 30 & 40 where a palm tree plantation is located. At this location, a small portion of the trees is located in the pipeline corridor.

3.9 Socio-Economic

The pipeline route is devoid of any permanent human settlements except for nomadic communities and construction camps for the ZOR project. Hence, major evacuation / resettlement / rehabilitation of people affected by the project is not involved in this project. The project site falls under the jurisdiction of Al-Ahmadi Governorate. Al-Ahmadi Governorate has a total population of 959,009 consisting of 20 residential areas including Fahaheel, Ahmadi, Sabahiya, Rigga and the district extends down south to Wafra and Al-Zour on the border with Saudi Arabia.

4. ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

4.1 Impact Rating

The various environmental aspects and their impacts have been evaluated using the KOC recommended matrix. Both construction and operation stage impacts varied from 'Low' to 'Medium' impact level. To further reduce the environmental impact, a number of measures have been taken as described below.

4.2 Mitigation Measures during Construction Stage

4.2.1 Air Emissions

Air pollution due to generation of engine combustion emissions from construction machinery / equipment, temporary power generators and transport vehicles / trucks is mitigated by applying the following procedures:

- Sensitize drivers and machine operators to switch off engines when not in use;
- Regularly service engines and machine parts to increase their efficiency and reduce generation of exhaust emissions;
- Where feasible, use alternative non-fuel construction equipment.

4.2.2 Noise

Noise impact is an occupational hazard for the workers. The generated noise during construction can be considered as a direct non-cumulative impact with a short-term and reversible nature on any possible receptors on the site (people). The mitigation measures of noise impacts arising from the construction activities are considered as follows:

- Substitution of noisy equipment with others less noisy, whenever and wherever possible;
- Shut down all site engines, when the equipment or vehicle is idling or not in use;
- Install acoustic enclosures for power generators, and other construction machinery;
- Since workers are the main receptors of noise, they are advised to wear adequate ear protection (e.g. muffs, plugs).
- Noise levels emanating from machinery, vehicles and noisy construction activities (e.g. excavation) are kept to a minimum for the safety, health and protection of workers within the vicinity of the site.

4.2.3 Waste

Waste is managed and minimized at site in accordance with KOC HSSEMS procedures and KEPA Decisions. Temporary sanitation facilities are provided via a number of portable cabins. Wastewater is being collected using collection tanks and periodically disposed through KOC / KEPA approved waste management contractors using vacuum trucks.

4.2.4 Hydrotest Water

Hydrotesting occurs during the commissioning stage. This involves filling vessels, pipelines, tanks and piping with water. The hydrotest waste water would not be disposed of untreated. As per KEPA Decision, the measures to prevent pollution and control of hydrostatic test water include the following:

- Use the same water for multiple tests;
- Reduce the need for anti-corrosion and other chemicals;
- Reduce the water retention time of the equipment or the pipelines;
- If the use of chemicals is necessary, the least hazardous alternatives will be selected in terms of potential for toxicity, bioavailability, biological availability, bioaccumulation;
- Water discharged during abrasion and pre-test water is collected in HDPE lined disposal pit and is discharged only after a water quality test has been carried out to confirm and monitor the water quality parameters;
- Final disposal is arranged through KOC / KEPA approved waste management contractors.

4.2.5 Worker Risks and Hazards

Workers at the construction site may be exposed to various risks and hazards including slips, trips, falls, flammable and explosive substances, electrical shocks, dust, noise and vibrations, poor hygiene, fire, bruises and cuts, exposure to H₂S, chemicals, etc. The Contractor has implemented all necessary measures to ensure health and safety of its construction laborers during the construction activities in its Health, Safety and Environment Plan in accordance with the KOC HSSEMS procedures and standards for occupational health and safety.

4.2.6 Habitat

For habitat restoration, replanting of palm tree plantation has been implemented. Impacts from soil disturbance activities on the Sabkha area are mitigated by implementing appropriate spill management, avoiding dumping, preventing sand encroachment and by adopting best management practices. Top soil is preserved at site by segregating and re-instating the same after completion of works.

4.3 Mitigation Measures during Operation Stage

4.3.1 Air Emissions

Air emission control will be applied in accordance with KOC HSSEMS procedures. Best available technology will be used to control emission levels within KEPA limits and where practicable, continuous monitoring and alarm system will be provided for the flare packages and thermal oxidizers. Continuous monitoring of flaring will be done with international approved methods (USEPA). Regular maintenance will be done to reduce air emissions. Flares and oxidizers are designed to limit environmental impacts and are only used intermittently. The flares are elevated to ensure proper combustion of the inlet streams. The oxidizers are

non-visible flame and smokeless and provisions are made for recording of all measured parameters with remote access to controls and alarms. The burn pit is lined with refractory, surrounded by a protective dyke, which minimizes the impacts on the soil / ground water and is located far away from roads and human settlement area located where prevailing winds will reduce fire / thermal hazards and smoke nuisance. Fugitive emissions will be controlled by regular maintenance. Personal exposure to fugitive emissions will not exceed occupational exposure limits as per KEPA standards. Operation specific procedures will be developed especially for emissions with high acute toxicity, e.g. H₂S.

4.3.2 Noise

Noise control measures will be implemented as per KOC HSSEMS procedures. Noise dispersion modeling of flare and oxidizer operation during maintenance case has shown that areas with noise level exceeding 85 dB(A) are observed only within 200 m from the flare location. Specific ear protectors will be used according to KOC standards and HSSEMS procedures for personnel working around noise sources during maintenance cases.

4.3.3 Hazardous Material

Uncontrolled release of hazardous materials may result from equipment failure associated with events such as manual or mechanical transfer between storage systems or process equipment. Spillage / Contamination of land will be avoided by prevention, or where avoidance is not practicable, controlling the release of hazardous materials, hazardous wastes, or oil to the environment. Spill response and containment equipment (for both hydrocarbons and chemicals) will be made available on site, as specified by relevant procedures and the operations spill response plan.

4.3.4 Environmental Monitoring

Besides the various mitigating recommendations and procedures for environmental control, environmental monitoring will be done on a periodic basis and will be reported to KEPA. This monitoring plan will act as a tool to assert the efficient operation of the mitigation measures adopted at the project. Monitoring and periodical reporting to KEPA will be done by KEPA approved environmental consultant once every six (6) months / annually or as recommended by KOC / KEPA.

4.4 Residual Impact Rating

The mitigation measures as described below have been applied to re-assess the 'Medium' impact levels. Implementation of the mitigation measures reduces the impact severity level from 'Medium' to 'Low' for all 'Medium' impacts.

5. CONCLUSION

It is evident that, upon successful commissioning and operation of the project KOC will be able to transport crude and products from / to the ZOR project.

The environmental impacts have been assessed based on KOC HSSEMS Procedures and applicable KOC standards considering all stages of the project.

An Environmental Management Plan (EMP) is being developed to ensure sustainability of the site activities from construction through to operation. The plan provides a general outlay of the activities, associated impacts, and mitigation action plans. Implementation timeframes and responsibilities will be defined.

An Environmental Monitoring Plan has also been framed and highlights some of the environmental performance indicators that should be continually monitored. Monitoring creates possibilities to call to attention changes and problems in environmental quality. It involves the continuous or periodic review of operational and maintenance activities to determine the effectiveness of recommended mitigation measures. Consequently, trends in environmental degradation or improvement can be established, and previously unforeseen impacts can be identified or pre-empted.

It is concluded that all the identified environmental impacts are reduced to the acceptable minimal level ('Low') by adopting suitable mitigation measures.

Due to the operational benefits from the project and the fact that the identified environmental impacts will be suitably mitigated, it has been determined that the 'No Go' option is eliminated.