

Terms of Reference

Terms of Reference (TOR) for the proposed oil evacuation pipeline with associated facilities from Mangala Terminal in Rajasthan to Salaya Terminal in Jamnagar District via Viramgam in Gujarat

1) ABOUT THE PROJECT

In order to facilitate the early production from the discovered field in Rajasthan, Cairn India Ltd. (CIL) in partnership with ONGC propose to lay an onshore oil evacuation pipeline of approx. 600 Km length with associated facilities from Mangala Terminal in Rajasthan to Salaya terminal in Jamnagar District via Viramgam in Gujarat. Out of the total 600 km pipeline proposed, the pipeline will traverse about 150 km in Rajasthan and 450 km in Gujarat. The establishments of associated facilities include heating and pigging stations, storage and handling terminals etc. Viramgam and Salaya terminals will have 150,000 m³ and 190,000 m³ storage and handling of crude oil capacity.

The overall pipeline project envisages setting up of the following facilities.

1. Laying of approx. 600 km oil evacuation pipeline (24” oil pipeline and 10” gas pipeline) from Mangala Terminal to Salaya in Gujarat via Viramgam
2. Establishment of associated facilities such as heating stations (31 nos.) and pigging stations along the pipeline route etc.
3. Establishment of storage, handling and pumping stations, diluent’s mixing terminals at Viramgam (Ahmedabad dist.- 150,000 m³ storage capacity) and Salaya (Jamnagar dist. 190,000 m³ storage capacity) in Gujarat
4. Establishment of captive power generating facilities at all heating stations and Viramgam and Salaya terminals. The total peak power requirement is estimated at 62 MW.

As the crude oil is waxy in nature, it requires the Skin Effect Current Tracing (SECT) and/or contingency gas fired indirect heating system and blending of diluents for continuous flow assurance in the buried pipeline. Thus the total energy requirement for the evacuation pipeline project is estimated at 62 MW spread across several location. Power requirement will be met by dual fired generators based on gas and/or oil. Gas will be preferably used for power generation. A parallel gas pipeline of 10 “ dia. from Raageshwari deep gas terminal will be laid along the main crude oil pipeline corridor for supply of natural gas.

The proposed pipeline route has been finalized based on the least disturbance to the environment and would not pass through any environmentally sensitive areas, human habitations, coastal stretch archeological monuments and reserves forests. The major land use along the proposed pipeline is agricultural / barren land.

2.0 ENVIRONMENTAL SETTING OF THE AREA

The pipeline route in Rajasthan falls within the Thar desert region with vast expanses of sandy soils with minimal vegetation. From the land use pattern it can be observed that most of the land is barren and covered under sand dunes. The baseline status indicates that the proposed development area falls in Thar Desert area and the topography of the area is generally plain and is characterized by arid landscape. The area does not have any natural forest and is characterized by rolling sand plains and scattered thorny trees (Babool). The area as a whole is sparsely populated with isolated pockets of habitation. The population density is 69 persons per km² in Barmer district. 90% of the total population lives in rural areas. The entire stretch of the block is covered by sandy soils with golden colored sandy dunes. There are rivers in the area. The area is characterized by scanty vegetative cover and is represented by xerophytic plants. The groundwater in many parts of the block especially in the north-western part of Barmer district is saline and has very limited suitability for drinking or agricultural use.

The pipeline route in Gujarat would not pass through any environmental sensitive and reserved forest areas. Major land use along the proposed pipeline is agricultural / barren land. There are no established breeding grounds and migratory routes along the pipeline route and in the proposed storage terminals. No major hills and valley systems, archeologically important monuments, ecologically sensitive zones are observed.

The Desert National Park in Rajasthan is at a distance of more than 100 kms from the periphery of the Mangala terminal in Jaisalmer district. The Wild Ass Wildlife sanctuary located in Little Rann of Kutch, Gujarat is about a minimum of 10 km from the pipeline route and related facilities near– Viramgam. The Marine National Park which is located along the coastal area between Jamnagar and Salaya is at a minimum 10 Km north of the pipeline route.

3.0 PROPOSED SCOPE OF WORK FOR EIA STUDY

Objective: Preparation of REIA/EMP and Risk Assessment studies as per EIA notification, 2006 and its requirements.

The proposed pipeline project envisages 1) Laying of approx. 600 km oil evacuation pipeline 2) establishment of associated facilities such as heating stations (31 nos.) and pigging stations along the pipeline route etc. 3) establishment of storage, handling and pumping stations at Viramgam and Salaya terminals in Gujarat and 4) captive power generating facilities at all heating stations and storage terminals. EIA and EMP will be prepared to address these developmental activities.

The EIA study includes determination of baseline conditions surrounding to the proposed developmental facilities, assessment of the Impacts on the environment due to the construction and operation of pipeline and storage facilities and making recommendations on the preventive measures to be taken, to minimize the impact on the environment to acceptable levels. The primary and secondary field data around proposed storage terminals and along the infield pipeline route will be collected.

3.1 Components of the EIA study

The components of the EIA study will include:

- Determination of baseline conditions using primary data generation and secondary data available from existing reports and studies and historical data from government published reports
- Detailed description of all elements of the project activities during the pre-construction, construction and operational phases. The elements to be analyzed will include the infrastructures of the project including drainage features, roads, waste collection, disposal and management and utility requirements.
- Identifying the sources of pollution and assessing the impacts on the environment due to proposed hydrocarbon development project. Analysis and assessment of designs to ensure environmental soundness, sustainability and regulatory compliance of the designs will be studied
- Preparation of EIA and EMP documents with recommendations on preventive and mitigative measures for limiting the impact on environment to the desired level during various stages of project. Development of a suitable post study-monitoring program to comply with various environmental regulations will also to be done; and
- Risk Assessment (RA) and Disaster Management Plan (DMP) describing the probable risks and preventive & precautionary measures to be followed in the event of emergency situations such as accidents, fire, oil spills, blowouts etc.

4.0 BASELINE ENVIRONMENTAL DATA GENERATION

Field assessments of the physical, ecological, and socioeconomic aspects of the site and surrounding environs of the development facilities will be conducted. These assessments will be used to determine the potential impacts of the proposed project. The survey will include a photo-inventory of the physical and biological features of the site and environs, and the areas will be viewed with respect to the suitability of the proposed facility.

The data generation will include:

Physical: Climate, air and noise quality, geology, topography, groundwater/surface water hydrology and quality and hazard vulnerability.

Ecological: Terrestrial and aquatic communities; presence of rare, threatened, and endangered species.

Socioeconomic: Demography, regional setting, location assessment, and land uses

5.0 SCOPE OF THE EIA REPORT

The Environmental Impact Assessment Report should cover following major aspects:

Chapter 1: Introduction

- ◆ Genesis of Project
- ◆ Brief description of nature, size, location of the project and its importance to the region and country

- ◆ Scope of the Study – Details of regulatory scoping carried out (as per Terms of Reference)

Chapter 2: Project Description

- ◆ Description of Project
- ◆ Location: Latitude, longitude and elevation of the site (maps showing general location, specific location, project boundary and project site layout)
- ◆ Topography
- ◆ Pipeline design parameters
- ◆ Establishment: pumping, pigging & storage stations along the pipeline route
- ◆ Power requirement for Heat Tracer Electrical sub-station
- ◆ Pipeline construction methodology
- ◆ Pipeline crossings at rivers, railways and highways / roads
- ◆ Pipeline leak detection system
- ◆ Project details including drawings showing project layout, components of project, schematic representations of feasibility drawings
- ◆ Condensed description of those aspects of the project (based on project feasibility report) likely to cause environmental effects
- ◆ Relevant technical information comprising of operational parameters

Chapter 3: Baseline Data: Description of Environment

The project will be divided into three parts for monitoring environmental quality. The parts are 1. Terminal at Salaya, 2. Terminal at Viramgam and 3. The pipeline route from field in Rajasthan to Salaya in Gujarat. Environmental quality monitoring will be carried out within 10 km radius around Viramgam terminal over period of full one season (Summer), secondary data available in Gujarat region in the vicinity of Salaya along with primary data wherever required, and along the pipeline corridor of 600 km at sensitive locations.

3.1 Air Environment

- ◆ Climate and Meteorology :
 - Distance of nearest IMD stations from handling and storage locations
 - Climatologically data of temperature, humidity, wind speed and direction, and rainfall
 - On site hourly meteorological data in respect of wind speed and direction, temperature, humidity, cloud amount and height(type), daily rainfall
 - Hourly mixing heights
 - Wind rose at storage and handling locations
- ◆ Location (distance and direction) of monitoring stations, wind rose to be considered in selecting the monitoring stations
- ◆ Land use map to be provided along with Air quality monitoring stations
- ◆ Air pollutants: SPM and hydrocarbons around storage and pumping locations and around pipeline route
- ◆ 98 percentile of air quality data and applicable air quality standards
- ◆ Fugitive emissions around the storage and pumping locations

3.2 Noise Environment

- ◆ Locations of monitoring stations with direction and distance
- ◆ Land use map to be provided along with noise quality monitoring stations
- ◆ Noise levels i.e. Leq (day) and Leq (night) for residential / industrial / commercial / silence zones along the pipeline route
- ◆ Applicable noise standards
- ◆ Noise levels due to operations at handlings and storage locations

3.3 Water Environment

- ◆ Locations of monitoring stations with direction and distance
- ◆ Ground water potential along the pipeline route: Groundwater recharge, quality and balance available for present and future use
- ◆ Delineation of water sheds and water drainage pattern in study area
- ◆ Quality of surface water bodies like rivers, streams along the pipeline route
- ◆ Oil spillages during routine maintenance / operations

3.4 Land Environment

- ◆ Locations of monitoring stations with direction and distance
- ◆ Collection of information on intersection with roads, railway lines, drinking water mains, sewage pipelines, crude oil pipelines, petroleum product pipelines, gas pipelines, river, cooling water and effluent discharge pipelines
- ◆ Collection of information on reserved forest, wildlife habitat, habitat of endangered/endemic species, mangroves, lakes/reservoirs/dams, historical/archaeologically important monuments within 1 km of the either side of pipeline/right of way
- ◆ Fertility status of soil samples at different sampling stations
- ◆ Study of landuse pattern, cropping pattern, vegetation cover along the pipeline route employing remote sensing techniques and ground truthing and also through secondary data sources
- ◆ Study of topographic features of pipeline corridor
- ◆ Analysis of data (Toposheets) available with Survey of India/National Bureau of Soil Survey and Landuse Planning related to proposed pipeline corridor
- ◆ Study in relation to the trend of change in land use pattern for the last 10 years based on remote sensing data and its extrapolation to future 10 to 20 years with and without EMP for oil evacuation activity

3.5 Biological Environment

- ◆ Locations of monitoring stations with direction and distance
- ◆ Observations on biodiversity of aquatic biological component
- ◆ Assessment of plant species with respect to density, frequency, abundance, diversity index, similarity index, Importance Value Index etc. within the study area in different ecosystems
- ◆ Collection of primary / secondary data on forest and non-forest flora in impact zone with respect to above parameters and forest area and floristic structure, rare and endangered species, endemic species, ethnobotanical aspects, medicinal plants, major & minor forest produce, afforestation / social forestry, migratory avi-fauna, migratory corridors, breeding places etc.

- ◆ Information on avi-fauna and wildlife in study area
- ◆ Collection of secondary data on fishery resource in study area
- ◆ Collection of secondary data on agricultural activity, crops and their productivity, and irrigation facilities
- ◆ Estimation of number of trees and shrubs, which would be cut during deforestation for oil evacuation activity and other facilities.

3.6 Socio-economic and Health Component

- ◆ Collection of baseline data on human settlements, health status of the community and existing infrastructure facilities for social welfare including sources of livelihood, job opportunities and safety & security of people in the study area and their perceptions about the proposed project
- ◆ Collection of information on infrastructure and economic resource base along the pipeline corridor
- ◆ Collection of information on sensitive habitats of historical, cultural, and ecological importance
- ◆ Public consultation

Chapter 4: Anticipated Environmental Impacts and Mitigation Measures

4.1 Air Environment

- ◆ Prediction of impacts on ambient air quality using appropriate mathematical models
- ◆ ISCST or FDM Model be used for Air Quality Impact Prediction
- ◆ Predictions for fugitive dust emission due to construction activities at storage terminals and along pipeline route
- ◆ 24 hourly concentrations at all monitoring stations
- ◆ Isopleth distribution of major pollutants of concern over 10 km radius study area
- ◆ Representation of SPM and other criteria pollutants and hydrocarbons in a tabular form given below

Sr. No.	Location of Monitoring Station	Background Level	Predicted Concentration	Resultant concentration	Air Quality Standard

- ◆ Mitigation measures to lower the emission of pollutants
- ◆ Primary/secondary data with respect to impact of fugitive emissions on flora and fauna

4.2 Noise Environment

- ◆ Impact of noise levels from pumping stations on the surrounding environment
- ◆ Prediction of noise levels through modeling at different monitoring stations

- ◆ Impacts due to noise levels generated by existing and proposed activities in relation to human environment and wild life
- ◆ Impacts due to present and future transportation activity
- ◆ Impact of noise levels on occupational health
- ◆ Identification of mitigation measures for noise abatement including noise barriers for point sources and pipeline routes

4.3 Water Environment

- ◆ Impacts of water withdrawal on surface water / groundwater resources
- ◆ Optimum exploitation of surface/ground water to protect aquatic biodiversity
- ◆ Delineation of proper planning for withdrawal of surface/groundwater below the threshold level of replenishment
- ◆ Impact and domestic sewage from the pigging stations
- ◆ Model study for prediction of groundwater contamination and suggestion of mitigation measures to minimize the pollution level
- ◆ Creation or conservation of water holes in forest for wildlife
- ◆ Suitable spillage handling procedures for any oil spillages during routine maintenance / operations and their disposal to suitable locations

4.4 Land Environment

- ◆ Estimation of anticipated impacts of proposed oil evacuation activity on topography, water drainage pattern, land use pattern with respect to agriculture, forestry and fisheries
- ◆ Scientific oil exportation methods to mitigate the impacts of exportation activity on land resource
- ◆ Analysis of data (Toposheet) available with Survey of India/National Bureau of Soil Survey and Landuse Planning related to proposed pipeline corridor
- ◆ Study of the problem of landslides, and assessment of soil erosion potential and their impact
- ◆ Management plan for checking soil erosion
- ◆ Impact of oil exportation on local biodiversity, and forest cover
- ◆ Methods for treatment and disposal of domestic solid waste
- ◆ Selection of suitable local plant species for greenbelt development at and around storage and pumping stations

4.5 Biological Environment

- ◆ Loss of forest resource, economically important plants, medicinal plants, and threat to rare and endangered species due to deforestation
- ◆ Mitigation measures to compensate the loss of forest cover
- ◆ Impact of oil evacuation activity on terrestrial and aquatic biodiversity and suggest mitigation measures
- ◆ Impact of oil evacuation activity on wild life and suggest mitigation measures
- ◆ Prediction of biological stress in the study region

- ◆ Delineation of measures for abatement/reduction of biological stress
- ◆ Impacts of oil evacuation activity on biodiversity, wildlife habitats, migratory corridors, migratory avi-fauna, rare and endangered species, medicinal plants and suggest mitigation measures
- ◆ Assessment of potential impact on flora and fauna due to laying of pipeline
- ◆ Impact of oil evacuation activity on fishery resource and agricultural production
- ◆ Identification of rare plants of economic importance including medicinal plants and wildlife species which require protection and conservation
- ◆ Improvement of biodiversity, wildlife and forest cover due to adoption of scientific oil exportation methods
- ◆ Identification of measures for protection and conservation of flora, fauna including wildlife, migratory avi-fauna, rare and endangered species, medicinal plants etc.

4.6 Socio-economic and Health Environment

- ◆ Assessment of aesthetic impairment
- ◆ Prediction of disruption in social life due to relocation of human settlements at compressor stations, if applicable
- ◆ Prediction of impacts on project affected people
- ◆ Preparation of Rehabilitation Action Plan (RAP) for the project-affected population covering aspects such as compensation, employment generation, compensation for loss of livelihood, resettlement site, provision of infrastructural facilities etc.
- ◆ While preparing the rehabilitation action plan, emphasis should be given on the interest of the poorer section of the population who will be more affected due to the nearness of their habitation to the pumping, pigging and storage stations
- ◆ Local people especially the women and women self help groups should be involved in selecting alternative vocation to be made available to the affected people
- ◆ In plantation work, local species specially fruit bearing trees should be planted to provide a regular source of income
- ◆ Nature of tenure of landholdings specially for the poorer section of the people indicating if such people are land owners or share croppers
- ◆ Assessment of economic benefits to community and environment arising out of the project

Chapter 5: Environmental Monitoring Programme

- ◆ To examine the effectiveness of adopted EMP and to enable to take corrective actions
- ◆ To delineate Technical aspects of environmental monitoring to examine the effectiveness of adopted EMP
- ◆ Regular and adequate surveillance of pipeline particularly at its joints and along the length of water crossing and close to transport network

- ◆ Monitoring of entire length of pipeline at pumping and heating stations for various parameters like temperature, pressure and other pipeline conditions
- ◆ To perform stress and surge analysis where pipeline is crossing at rivers, railways, highways / roads
- ◆ Monitoring of voltage, current and other important parameters associated with the skin effect tracing system

Chapter 6: Risk Assessment

The pipeline will convey crude oil which will require heating to keep crude oil in fluid condition. It is proposed to use electric coil for heating the crude. The captive generators will be kept at select intervals for supply of power. The hazards due to electric failure if any and impact of temperature on the surrounding area due to failure or leakage of pipeline will also be addressed in risk assessment at strategic / sensitive locations.

- ◆ Hazard identification through computation of hazard indices and inventory analysis (FEI)
- ◆ Generation of credible and worst case scenarios for accidental release of natural gas and crude oil during transportation, handling and storage
- ◆ Computation of damage distances based on consequence analysis for credible and worst case scenarios including heat load contours
- ◆ Assessment of risk and suggesting risk mitigation measures
- ◆ Delineation of approach to Disaster Management Plan.

Chapter 7: Project Benefits

- ◆ Improvement in the physical infrastructure
- ◆ Improvement in the social infrastructure
- ◆ Employment potential – skilled; semi-skilled and unskilled
- ◆ Other tangible benefits

Chapter 8: Environmental Management Plan

- ◆ Description of the administrative aspects of ensuring that mitigative measures are implemented and their effectiveness monitored, after approval of the Environmental Impact Assessment

Chapter 10: Summary and Conclusion

(this will constitute the summary of the EIA report)

- ◆ Overall justification for implementation of the project
- ◆ Explanation of how, adverse effects have been mitigated