

EXECUTIVE SUMMARY

FOR

**PROPOSED INSTALLATION OF 2G ETHANOL BIO-REFINERY
PLANT VILLAGE NASIBPURA, TEHSIL TALWANDI SABO,
DISTRICT BATHINDA, PUNJAB**

SUBMITTED TO



M/S HINDUSTAN PETROLEUM CORPORATION LIMITED

PREPARED BY

ULTRA-TECH

Environmental Consultancy & Laboratory

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Introduction

HPCL is a Government of India Enterprise with a Navratna Status, and a Forbes 2000 and Global Fortune 500 company. It had originally been incorporated as a company under the Indian Companies Act 1913. It is listed on the Bombay Stock exchange (BSE) and National Stock Exchange (NSE), India. HPCL owns & operates 2 major refineries producing a wide variety of petroleum fuels & specialties, one in Mumbai (West Coast) of 6.5 Million Metric Tonnes Per Annum (MMTPA) capacity and the other in Visakhapatnam, (East Coast) with a capacity of 8.3 MMTPA. HPCL also owns and operates the largest Lube Refinery in the country producing Lube Base Oils of international standards, with a capacity of 428 TMT. This Lube Refinery accounts for over 40% of the India's total Lube Base Oil production. Presently HPCL produces over 300+ grades of Lubes, Specialties and Greases.

The company appointed M/s. Ultra Tech, (Environmental Consultancy & Laboratory) (MoEFCC recognized and NABL approved), Thane to carry out study of the impacts of the project on local environment and for obtaining Environmental Clearance. Ultra-Tech is an established Consultancy in the field of Environmental Services. Company is giving services in this field for past 30 years. The Notification No. S. O. 1533 promulgated on 14th September, 2006 has covered this type of industries under its schedule 5(g) A. Hence, HPCL intends to approach MoEF&CC for environment clearance for proposed project. The prefeasibility report is prepared for forming a frame work for EIA study, scoping and finalizing terms of reference as may be required. Form I, as is prescribed by the said notification is duly filled up and submitted. The Prefeasibility Report is an accompaniment to the same and prepared as per MoEF guideline.

HPCL proposes to Installation of 2G Ethanol Bio-refinery plant at Bathinda, Punjab. HPCL has acquired 15.1 ha (37.28 Acres) from Government of Punjab on a long term lease in the Village Nasibpura, District Bathinda. The Khasra No are 1136(39-3), 1137/1(12-10), 1138(29-10), 1139/1(13-10), 1139/2(11-10), 1140(25-0), 1141/1/1(8-5), 1141/1/2(3-2), 1143(25-0), 1144/1(13-0), 1144/2(11-0), 1144/3(9-6), 1144/4(1-14), 1145/2(3-18), 1145/3(21-2), 1146/1(16-13), 1146/2(24-13), 1151/1(12-10), 1151/2(7-0), 1151/3(2-10), 1151/4(2-10), 1152(25-0).

Location of the Project	Village: Nasibpura Taluka: Talwandi Sabo District : Bathinda State: Punjab
Coordinates	Geographical Coordinates: 30°3'17.0856"N, 75°0'41.5764"E
Nearest Railway station	Railway: Bathinda: Approx 31.8 km

Nearest Airport	Airport: Bathinda approx 54.6 km
Nearest City	Bathinda: ~30.5 Km
Accessibility	By road mainly through SH17

Project Description

M/s HPCL are planning to establish a 100 KLPD of 2G Ethanol Bio-refinery plant at Village Nasibpura, Tehsil Talwandi Sabo, Dist Bathinda, Punjab. The technology is suited for both Indian and global needs and it is projected to be capable of converting all types of agricultural residues like bagasse, rice and wheat straw, bamboo, cotton stalk, corn stover, wood chips to ethanol in less than 24 hours, with optimum product yields. The Bathinda Bio-refinery will be utilizing agriculture residues for production of ethanol which may be sufficient to meet the ethanol blending requirement of the State. The proposed Bio-refinery will generate indirect employment. The project shall also help in reducing CO₂ emissions from the paddy straw which currently is being burnt after harvesting. One of the major outputs of this Bio-refinery shall be Bio-fertilizer which shall be incorporated into the soil for improving soil fertility and overall productivity of farms in Punjab.

The proposed 100 KLPD plant is based on the DBT-ICT 2G Ethanol technologies developed indigenously at the DBT-ICT Centre for Energy Biosciences (CEB), Mumbai. The CEB at the Institute of Chemical Technology (ICT), Mumbai is one of India's leading multidisciplinary research facilities specializing in Bioenergy and Industrial Biotechnology. The project is designed to produce 100KL fuel grade ethanol per day, primarily from rice straw and will use approximately 400 tons of rice straw per day for the process. An additional 50 tons of straw per day will be used for supplementary fuel for steam generation. The process employed here uses rice straw as feed stock to convert into its cellulose, hemi cellulose and lignin fractions. The cellulose and hemi cellulose fractions are then converted into respective sugars through a process called saccharification. The sugars are then converted into dilute ethanol by fermentation using appropriate yeasts. The dilute impure ethanol stream is then purified and concentrated to fuel grade ethanol. The **Figure 1** depicts the process outline. The rectangular blue blocks represent the main processing sections in the plant. Aside from these, there are ancillary sections like biomass size reduction, steam/steam /power/water supply systems, raw material and finished goods storage yards etc.

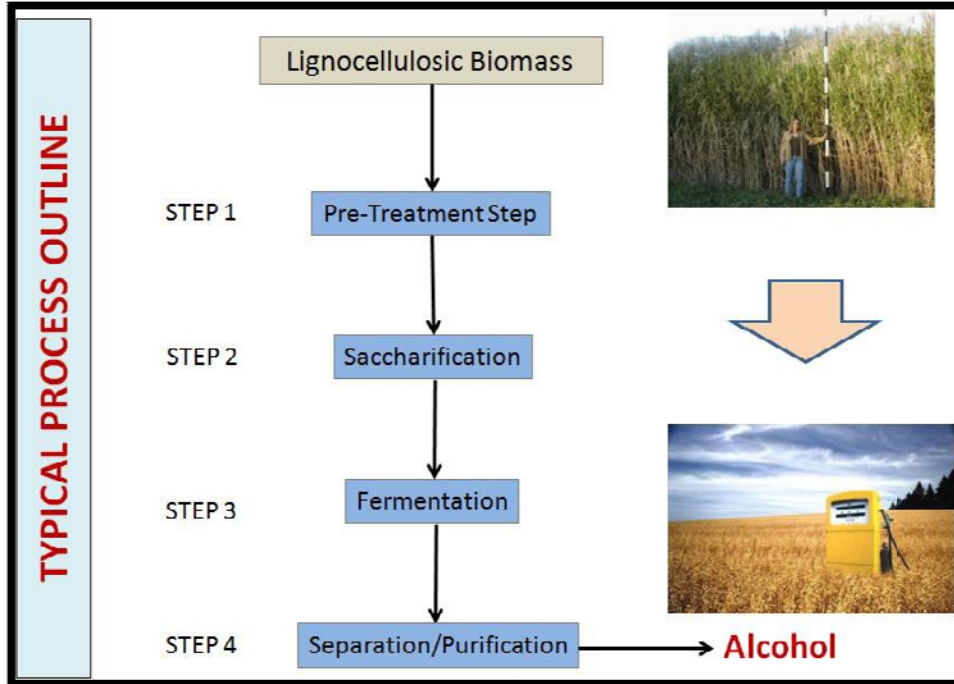


Figure 1: Process Flowchart

The plant has been designed as a zero-liquid discharge plant. The final products will be fuel grade ethanol, silica, mixed solid salts and liquid carbon dioxide.

Water Requirement

The total water requirement for the proposed project will be 1800m³/day; **Table 1** shows the distribution of the water requirement

Table 1: Proposed Water Requirement

Sr. No.	Water Requirement	TPD
1	Process water	200
2	Cooling water	1450
3	Boiler	144
4	Drinking water	6
5	Domestic water	Blow down water will be used for domestic purpose
6	Green Belt	270 (Blow down water will be used)
7	Floor Washing	Blow down water will be used for floor washing

Power Requirement

Total power requirement (connected load and maximum demand) and source, power exported during season and off-season will be 10.5MW. Emergency power required for cooling water

circulation and water pump for reactor flushing is 740 kW. Thus, the capacity of the DG set will be 2 x 500 kVA

Manpower Requirement

The estimated manpower requirement during operation phase will be around 120 personnel's. The details of the same are provided in **Table 2**

Table 2: Proposed Manpower Requirement

1	Persons for operation of plant in three shifts	45
2	Persons for maintenance of the plant	45
3	Persons for lab-Chemist, Microbiologist	25
4	Managers	5

Waste Management

The details of the Non Hazardous Solid Waste are as provided in **Table 3** and Hazardous Waste is as provided in **Table 4**

Table 3: Non-Hazardous Solid Waste

Type of waste	Qty.	Remarks	
Mud Generation	8 TPD	Dirt will be washed with water and will be filled in trolleys (3-6 ton capacity) and used in construction business.	
Ash (comprising silica)	60 TPD (For Rice straw)	Component	TPD
		SiO ₂	56.00
		Al ₂ O ₃	0.23
		Fe ₂ O ₃	0.05
		CaO	0.08
		MgO	1.53
		P ₂ O ₅	0.76
		MnO	0.01
		K ₂ O	0.22
		Others	1.12
Ash	19.2 TPD (For Cotton Stalk)	Component	TPD
		Al ₂ O ₃	1.10
		Fe ₂ O ₃	0.23
		CaO	0.36
		MgO	7.36
		P ₂ O ₅	3.65
		MnO	0.06
		K ₂ O	1.04
		Others	5.37

Table 4: Hazardous Waste

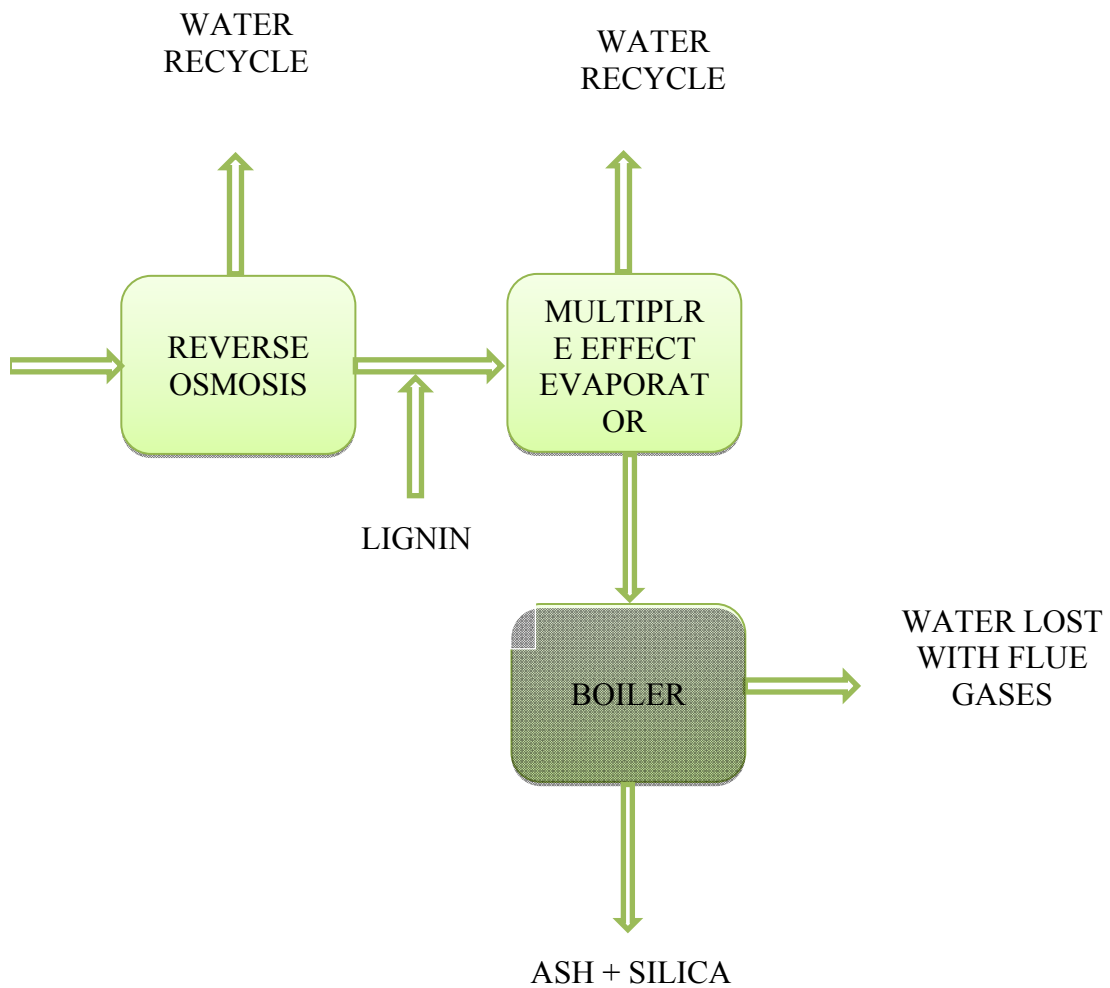
Cat.	Type of waste	Source	Qty. per month	Method of Disposal
5.1 Sch – I	Used Lubricants	Plant & Machineries	0.5 MTM	CHWTSDF
33.3 Sch – I	Used Containers (Metal & Plastic)	Raw Material Storage	1200 (Nos.)	Decontamination & Re-use or sell to Scrap vendors
	HDPE/ LDTE/ Gunny Bags	Raw Material Storage	800 (Nos.)	Decontamination & Re-use or sell to Scrap vendors

Zero Liquid Discharge

Rising concerns of pollution in India have forced the Government to tighten the norms for industrial effluent discharge. Zero-liquid discharge (ZLD) is a water treatment process in which all wastewater is purified and recycled, therefore leaving zero discharge at the end of the treatment cycle. ZLD is an advanced wastewater treatment method that includes ultra filtration, reverse osmosis, evaporation/crystallization, and fractional electro-deionization.

The DBT-ICT Centre for Energy Biosciences has developed a technology for effluent treatment with zero-liquid discharge. Water in the process is recycled using membrane filtration techniques and multiple effect evaporators ensuring that no effluent is discharged into the environment.

The lignocelluloses ethanol plant is a Zero Liquid Discharge process plant. The water from the blow-down of the boiler and cooling tower will be treated through reverse osmosis and recycled. Reject from reverse osmosis will be used for gardening.



Requirement and Source of Fuel:

Table 5: Characteristics & Requirement of Fuels

SN	Parameter	Unit	Fuel	
			Cotton Stalk	Rice straw
1	Heat value, GCV	Kcal/kg	3700	3300
2	S content,	%	0.38	0.40
3	Ash content	kg/T	131.00	48.10
4	Steam/fuel ratio	kg/kg	4.9	4.4
5	Requirement	TPD	280.0	320.0

Steam and power requirements

Table 6: Proposed Boiler Details

SN	Stack Emission Details	Details
1	Number of stacks	1
2	Number of flues per stack	2
3	Physical stack height (m)	25
4	Sack diameter (m)	30
5	Flue gas exit velocity (m/s)	4
6	Flue gas exit Temperature (°C)	180
7	Flue gas density (kg/m ³)	0.75
8	Emission rate per flue of	
	SPM (kg/h)	98.0
	SO ₂ (kg/h)	3.50
	NO _x (kg/h)	9.00

Baseline Environment

Primary baseline environmental monitoring studies in 10-km radius study area were conducted through an NABL approved laboratory [Enviro-Tech Laboratories] during summer (March - May), 2017

Topography, Land use & its Classification –

The topography around the project site is mostly plain. The land use and land cover of the study area analyzed based on multispectral satellite imagery reveals that the major land use category within the study area is represented by Agricultural Land (57.75%) dominates in the present land use pattern followed by fallow lands (20.15%) covering 10 km surrounding the project site. 7.73% of land were built-up, 6.94 % land covers with vegetation. The remaining land uses are water body (4.37%) and open scrub (3.06%). The proposed expansion of plant doesn't change any existing land use pattern within the study area.

Soil –

The primary soil monitoring was conducted at 8 locations within the study area. The soil sampling locations were identified primarily based on the local distribution of vegetation and the agricultural practices. These soils are not very deep and are suitable for most of the crops. Some of the important soil parameters are summarized in the below table;

Parameter	Value
pH	7.84 – 8.66
Nitrogen kg/ha	75 - 107
Organic matter	2.45 - 11
Organic Carbon	1.2 – 5.47
Electrical Conductivity mmhos/cm	120 - 6012
Magnesium	35 - 720

In the absence of soil standards prescribed by CPCB or MoEF&CC or MPPCB, the quality of soil parameters were assessed based on handbook of agriculture by ICAR. The soil quality of the study area is on an average suitable for agriculture.

Weather and Climate–

The weather & climate recorded during the study period are as given below;

Parameter	Value
Temperature °C	17.55 – 48.70
Humidity %	10.74 – 97.80
Wind Speed m/s	4.6
Predominant wind directions	N

Ambient Air Quality–

The Ambient Air quality was monitored for PM₁₀, PM_{2.5}, NO_x, SO₂, CO, NH₃, C₆H₆, BaP, O₃, HC (Methane and Non-methane), Pb, Ni, and VOCs at eleven locations in the study area.

Parameters	Minimum	Maximum	98 th %tile	NAAQS
PM ₁₀ µg/m ³	70	96	95.6	100
PM _{2.5} µg/m ³	22	44	43.6	60
SO ₂ µg/m ³	2	5	5.0	80
NO _x µg/m ³	3	10	9.2	80

In general, the ambient air quality is satisfactory with respect to all major pollutants. The 98th percentile values of all pollutants were found to be below NAAQS. The other parameters such as Ammonia (NH₃), Benzene, Benzo- α -Pyrene (BAP), Ozone (O₃), Lead (Pb), Nickel (Ni), Hydrocarbon (Methane and Non-methane) and Volatile Organic Carbons (VOCs) were found to be below their respective detection limits.

Noise Quality–

The noise quality was monitored at ten locations in the study area during the study period.

Category	Leq daytime	Leq night time	Daytime Standard	Night time standard
	Min	Max		
Residential	60.2	41.0	55	45
Industrial	63.1	49.5	75	70

The noise quality in the study area was found to be satisfactory and well within the prescribed statutory limits except at one residential location might be because of typical anthropogenic activities around any residential location.

Water Quality –

Surface water samples were collected once during the study period at 3 locations to assess the baseline water quality in the study area. The samples were compared with the CPCB's surface water classification and they conform to Class E Water Quality Criteria. Some of the important parameters are summarized in the below table;

Parameter	Value
pH	7.23 – 7.27
TDS	165 - 2630
Alkalinity	50 - 350
Total Coliform No./100ml	Absent
E- Coli No./100ml	Absent

Ground water samples were collected from 4 locations to assess the existing groundwater quality of the study area during the study period. The physico-chemical characteristics of Ground water are confirming to permissible limits of drinking water standards, prescribed in IS: 10500 (Test Characteristics for Drinking Water) and suitable for consumption. Some of the important parameters are summarized in the below table;

Parameter	Value
pH	6.95 – 7.82
TDS	152 - 280
Alkalinity	52 - 70
Total Coliform No./100ml	Absent
E- Coli No./100ml	Absent

Biological Environment - The ecological study of the area has been conducted within 10 km radius of the project site in order to understand the existing status of flora and fauna.

Flora: 106 species of Trees, 18 species of Shrubs and 8 species of Herbs were identified.

Fauna: 19 species of mammals, 40 species of Amphibians, 6 species of Reptiles, 11 species of Butterflies were identified.

Avifauna: 40 species were identified within the Study Area.

Phytoplankton

Amongst 5 groups, Chlorophyceae dominated over Cyanophyceae and Bacillariophyceae. Euglenophyceae and Pyrophyceae were rarely present. Genera like, *Anabaena* sp., *Phormidium*, & *Oscillatoria* from cyanophyceae and *Spirogyra*, *Chlorella*, *Ankistrodesmus*, *Pediastrum*, *Scenedesmus*, *Microspora*, *Cosmarium*, *Oedogonium*, *Sorastrum* and *Ulothrix* from Chlorophyceae were dominant.

Zooplankton

Cladocera group was dominant followed by Rotifera and Copepod while Protozoa and Ostracoda were rarely present. Genera like *Daphnia*, *Moina*, *Keratella*, *Philodina* etc., besides Nauplius larva were dominant.

None of the identified species within the study area are Schedule I species of the Indian Wildlife Protection Act, 1972 or listed in IUCN Red List of Threatened Species. There are no legally protected areas such as National Parks or Wildlife Sanctuaries within 10 km of the terminal.

Socio-economic Environment –

Nasibpura is a Village in Talwandi Sabo Tehsil in Bathinda District of Punjab State. It is located 18 km towards South from District headquarters Bathinda, 16 km from Talwandi Sabo and 216 km from state capital Chandigarh. While discussing the baseline scenario of the socio-economic environment in the 10 km radius area from project location, total 33 villages are covered under study area all villages are from Bathinda District (Punjab state).

The socio-economic aspects of the study area is summarized in the table given below;

Parameters	Study area (10 km)
Total No. of Villages	34
Total no. of Households	47949
Total Population	243015
Sex ratio	817
SC population %	30.45

Anticipated Environment Impacts

Construction Phase:

The proposed project is a green field project. The construction phase of the proposed project will be of shorter duration for about 18-24 months only.

The potential impacts will be localized, very limited and insignificant due to the construction activity like fugitive dust, noise during excavation, civil works, operation of construction equipment's, storage & handling of construction material, surface water runoffs etc

These impacts shall be minimised by providing appropriate storage for construction material, provision of acoustic barriers and enclosures for high noise generating equipment, fugitive dust control by water sprinkling on road used by vehicles, construction activities shall be avoided during night time, surface runoff shall be checked for contaminations such as oil & grease by routing the surface runoffs in small bunds around the construction areas, all hazardous & non-hazardous material shall be handled as per statutory requirements.

Therefore, the impacts during construction phase to be short term, reversible, localised and are not expected to contribute significantly.

Operational Phase:

Air Environment:

The atmospheric emissions during operation phase will result from:

- Fugitive VOC from, pump, compressor seals, valves, flanges etc.
- Emissions from vehicular traffic
- Gaseous emissions from DG set as and when operated

The impact envisaged due to emissions of pollutants such as NO_x, PM, CO from the operation of DG sets during emergency has been evaluated using point source model. The modelled concentrations for all the pollutants have been found to remain within the corresponding National Ambient and Air Quality Standards (NAAQS) barring VOC, which do not have any standards. Mitigation measures will be in place to minimize potential adverse impacts of air emissions on health of receptors. In view of this, the atmospheric emissions during the operation phase are anticipated to be localised and the impact significance is assessed as negligible.

Mitigations

- DG sets stacks with adequate height to ensure dispersion of pollutants
- Solvent Vapour recovery system
- Fugitive emissions to be monitored regularly and records to be maintained
- Provision of mechanical seals in pumps
- Preventive maintenance of valves and other equipment's
- Developing greenbelt
- Paving of internal access roads

Noise Environment

Major noise generating sources at terminal are due to the activity are DG sets (only during emergencies) & Pumps at gantry. The noise levels will remain well within acceptable limits and will not have any impact outside the boundary from the proposed project

Mitigation

- Selection of the new equipment's should be made with specification of low noise levels, wherever possible;
- Regular maintenance of equipment, pumps should be undertaken to mitigate the noise generation.
- Employees should be provided with personal protective equipment's such as ear plugs or ear muffs;
- Regular Noise monitoring shall be carried out all around the periphery of the terminal facility & records maintained;
- Speed restrictions for all vehicles entering the terminal to minimise noise
- Idle running of machines, equipment and vehicles to be avoided

Water Environment

To start the operation, initially the project requires an amount of 2700 KL. **Total net daily water required for the proposed project i.e 1800 m³/day** (which is 18 KL/KL of alcohol production) will be from the canals in the vicinity. Around 4000 m³/day water will be recycled and reused in the process. Necessary permissions shall be obtained for the same.

Mitigation

- Septic tanks followed by soak pit shall be provided for domestic wastewater
- The storm water drain must be maintained in good conditions;
- Rain water Harvesting

Land Environment

The potential impacts envisaged due to the operation of the proposed project are due to spillages/leakages from operation, waste disposal and change in land use.

The Hazardous & Non-Hazardous wastes generated during the proposed project will be disposed of as per the rules and regulation.

Mitigation

- All hazardous waste sludge will be handled and disposed in accordance with the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.

Ecological Environment

The predicted pollution load after the proposed project will be within the stipulated standards by statutory authorities and therefore there will be minimum or no disturbance to surrounding habitat.

Mitigation

- Strengthening of greenbelt
- Causality replacement and gap plantation to be taken up
- Developing avenue plantation

Socio-Economic Environment

This proposed project will generate local direct & indirect employment in terms of contracts, truck transport related activities etc. Therefore, impact on employment generation aspect is seen as positive.

Environmental Management Plan

The Plant will be certified for internationally accepted Environmental Management System based on ISO-14001, Quality Management and Occupational Health & Safety Management Systems. An environmental monitoring program in place, periodic review & audits are carried out for effective environmental management and the same shall be strengthen and extended for the proposed project activity as well. The terminal has an HSEF department which ensures overall effective implementation of the management plan.

Project Benefits

The following benefits are expected from the proposed project:

- The project shall provide appropriate employment opportunities to unskilled, semi-skilled and skilled categories. The employment opportunities exists mainly in service sector, transportation related jobs etc
- Increase in indirect employment opportunities will help in increasing the economic status of the region. This will result in improvement of overall social structure in the area and infrastructure like transport, communication, housing, sanitation and other amenities
- The proposed project will help reduce the effort farmers had to undertake for the burning process as HPCL would setup extensive infrastructure for speedy collection of straws so that the farmers would not miss out on a crop cycle
- The proposed project will supplement Ethanol blending to Motor Spirit (MS), which will further help in reducing pollution from the vehicular exhaust

Conclusion

This impact assessment study indicates that the overall impact from the proposed project activities will be short term, reversible, localised and are not expected to contribute significantly to the surrounding environment. Also, with the implementation of the pollution control and strengthen the existing environment management measures, these anticipated impacts due to construction and operation of the proposed project will be mitigated to reduce it further.

The terminal will also ensure that the environmental performances of all the activities are monitored throughout execution of the project during both construction and operation phase.

The terminal will continue to report environmental performance and monitoring reports regularly to statutory authorities.

Over the years, HPCL has developed systems and procedures for effective environmental management. These shall be extended to the terminal operations also. The effective management system coupled with monitoring of environmental components and efforts for continual improvements will result in exemplary environmental performance