

Executive Summary

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BACKGROUND

Hindustan Petroleum Corporation Limited (HPCL) is the one of the largest PSU oil companies and a Fortune Global 500 ranked organization. Its Corporate Office is located at Petroleum House, Nariman Point, Jamshedji Tata Road, Mumbai. HPCL's growth post-nationalisation (in 1976) has been phenomenal. During the financial year 2009-10, the annual turnover of HPCL was Rs. 1,08,599 Crores and sales/ income from operations was Rs. 1,14,889 Crores. HPCL operates two major refineries, one in Mumbai (West Coast) of 6.5 MMTPA capacity and the other in Vishakapatnam (East Coast) with a capacity of 8.3 MMTPA. It has 44 nos. of LPG bottling plants (2.5 MMTPA capacity), two major import terminals (Mangalore and Visakhapatnam) and 4 TOPs, catering to approximately 3.0 crores LPG customers all over in India. HPCL has strong market infrastructure with 25% marketing share in LPG sector in India.

The transport of LPG by truck has already put tremendous pressure on the highway networks. Presently, LPG is being transported through road from BPCL's Uran bottling plant and HPC/BPC Mumbai Refineries resulting in congestion of highways along with other environmental issues related to pollution, risk and hazard. To overcome these issues, HPCL proposes to lay 164.65 km long 12" /10" dia. underground pipeline from Uran (near Mumbai) to Chakan-Shikrapur (near Pune) for transporting LPG.

PROJECT PROPOSAL

The proposal of laying of 164.65 km long cross-country pipeline (Uran-Chakan-Shikrapur) would provide an assured outlet for evacuation of LPG from BPCR/HPCR to narrow the demand supply gap in the consumption centers in the state of Maharashtra.

This pipeline is an extension of proposed LPG pipeline from BPC/HPC, Mumbai Refinery to BPCL LPG plant at Uran. The sub-sea pipeline between BPCR/HPCR to BPCL, Uran has already been accorded EC from MoEF. This pipeline section shall be executed & operated by BPCL whereas the Uran-Chakan-Shikrapur pipeline section shall be executed & operated by HPCL.

The breakup of total pipeline length i.e. 164.65km is as under:

Main Uran-Chakan-Shikrapur Pipeline	:	150.09 Kms
Station piping inside BPCL Uran bottling plant	:	00.70 Km
Spur line from Tape-off (I) to HPCL Chakan bottling plant	:	09.00 Kms
Station piping inside HPCL Chakan bottling plant	:	00.58 Km
Spur line from Tape-off (II) to IOCL Chakan bottling plant	:	04.28 Km
Total Length	:	164.65 Km

NEED FOR URAN-CHAKAN PIPELINE

Uran-Chakan pipeline is of great strategic importance to the nation for supply of LPG to various parts of Maharashtra for the following reasons:

- Drastically reduce bulk road transport on the Ghats between Mumbai & Pune,
- Eliminate road accidents,
- Environment friendly transportation,
- Enhanced safety in and around Mumbai and Pune areas.
- The economics of pipeline transportation would ultimately result in better services to customers.

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OBJECTIVE OF EIA STUDY

The EIA study has been carried out as per the approved TOR (Compliance attached as Annexure – J. The major objective of this study is:

- To evaluate present environmental conditions along the project corridor through available data / information supported by field studies, wherever necessary;
- To predict the impacts on relevant environmental attributes due to the construction and operation of the proposed cross-country pipeline;
- To suggest appropriate and adequate mitigation measures to minimize/ reduce adverse impacts and prepare an Environmental Impact Assessment (EIA) report including Environmental Management Plan (EMP) for timely implementation and scheduling of mitigation measures.
- To assess Risk due to the proposed pipeline and mitigation measure (covered in the separate report).

PROJECT DESCRIPTION

The salient features of proposed Uran-Chakan LPG pipeline has been summarized in Table-E-1.

Table: E-1
Salient Features of the Project

Transport material	LPG
Pipeline length	164.65 Km
Take-off Point	Main Line – Existing LPG Plant at Uran of BPCL – 00 Km
Tap-off Points	Usar Bottling Plant - 15.73 km (Provisional) HPCL Chakan - 114.49 Km IOCL Chakan - 132.42 Km.
Terminal	BPCL Shikrapur – 164.65 Km
SV Stations	06 Nos.
Block Valves	17 Nos.
ROU	18-m & 10-m all along the pipeline route aggregating 2.7432 km ²
District en-route	Two districts viz. Raigad and Pune in the State of Maharashtra.
List of Crossings	
National Highway	3 Nos. (NH-4, NH-17 & NH-50)
Expressway	1 No. (Mumbai-Pune)
State Highway	9 Nos.
Railway	4 Nos.
Rivers/ Major Canals/ Creeks	Pej, Ulhas, Patalganga, Bhama, Bhima and other small streams. Maximum length of river crossing is 130-m (River Bhama).
Project Cost & Schedule	Rs. 309.82 Crores, 24 months after EC

PIPELINE ROUTE

The proposed underground LPG pipeline shall originate from BPCL Uran bottling plant which is located near Bhendkhal village under Uran tehsil of Raigad district of Maharashtra. The proposed pipeline shall give tap offs to HPCL Chakan LPG plant near village Khalumbre and IOCL Chakan LPG plant near village Bhoose. Both these bottling plants are located in Chakan & fall under Khed tehsil of Pune district. The pipeline shall terminate in the LPG plant of BPCL at Shikrapur which falls under Shirur tehsil of Pune district of Maharashtra.

The pipeline runs through fairly rolling terrain followed by flat, gradually undulating terrain, steep rising terrain and rolling terrain. The minimum elevation of the pipeline is 3-m near Karanja Creek and maximum elevation is about 775-m (Chainage 104 km) after Bhivpuri Ghat near Navalakh Umbre. The pipeline runs through well developed area around Patalganga Industrial Area, Karjat town and Talegaon MIDC area. The pipeline will not

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pass through areas which are environmentally sensitive such as low lying marshy lands, breeding places, wild life sanctuary, national parks, etc.

Geographically, the take-off point of the proposed pipeline is located at longitude 72°58'35" East and latitude 18°52'39" North at Uran and the terminal point is located at longitude 74°04'42" East and latitude 18°41'34" North at Shikrapur. The proposed pipeline gives off three tap-off points- first, provision for Usar bottling plant at 15.73 Km, second for HPCL's Chakan bottling plant at 114.49 Km and the third for IOCL's Chakan bottling plant at 132.42 Km in between Uran & Shikrapur. The HPCL's Chakan bottling plant is geographically located at 73°47'19" East and 18°44'45" North whereas IOCL's Chakan bottling plant at 73°54'34" East and 18°44'29" North. All the four terminals are located in the industrial area and well connected with infrastructural facilities. The nearest airport to the take-off point is located in Mumbai and that to Chakan and Shikrapur terminals are located in Pune. The nearest railway station to take-off point is at Panvel and that to Chakan & Shikrapur is at Pune.

The main pipeline encounters Expressway - 1 no., National Highway - 3 nos., State Highway - 9 nos., Canals - 27 nos., other Roads - 70 nos., Rivers - 7 nos., Railway line - 4nos., Nala/Drain - 118 nos. & the spur line encounters Canal - 1 no., other Roads - 3 no., River - 1 no. and Nala/Drain - 3 nos.

Pipeline Route Selection Criteria

Route selection is a process of identifying constraints, avoiding undesirable areas and maintaining the economic feasibility of the pipelines. Diversion of pipeline around obstacles can be very costly. The ideal route, of course, would be a straight line from the origin to the terminal point. However, physiographic, environmental, design & construction constraints usually alter the route. The proposed underground pipeline route has been selected away from major developments and developing areas. Every effort has been made to minimize forest land, low lying areas, difficult-to-construct areas etc.

Geographical location of originating and terminating station

Table: E-2

Point ID	Latitude (N)	Longitude (E)	District	State	Place
TP-0	18°52'36.64"	72°58'5.77"	Raigad	Maharashtra	Take off point at BPCL (Uran)
TP-419	18°41'42"	74°4'28.52"	Pune	Maharashtra	End Point at BPCL (Shikrapur)

STATION PARAMETERS

Detail of stations parameters is summarized below in Table E-3 and E-4:

Table: E-3
DISPATCH STATION PARAMETERS

Location	Uran
Supply Temp., oC	12/40 (Min/Max)
Supply Pressure	80.7 Kg/cm²g
Flow Rate	313m ³ /hr
Facilities envisaged	LPG Booster Pumps, Filtration skid, Metering skid, Pressure Control Valves, Mainline Pump and Pig Launcher

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**Table: E-4
RECEIVING STATION PARAMETERS**

<i>Location</i>	<i>HPCL, Chakan</i>
Supply Temp., oC	12/40 (Min/Max)
Battery Limit Pressure,	12 Kg/cm ² g (min) at station inlet
Max. ambient temp., oC	12/40 (Min/Max) based on Pune IMD Data
Facilities envisaged	Filtration skid, Metering skid and Pressure Control Valves. SCADA RTU terminal for monitoring of the pipe line integrity. Emergency control centre. Temporary Pig launcher at SV-5 and Pig receiver at HPCL, Chakan
<i>Location</i>	<i>IOCL, Chakan</i>
Supply Temp., oC	5/50, (Min/Max)
Battery Limit Pressure,	12 Kg/cm ² g (min) at station inlet
Max. ambient temp., oC	5/50 (Min/Max) based on Pune IMD Data
Facilities envisaged	SCADA RTU terminal for monitoring of the pipe line integrity Temporary Pig launcher at SV-6 and Pig receiver at IOCL, Chakan
<i>Location</i>	<i>BPCL, Shikrapur</i>
Supply Temp., oC	5/50 (Min/Max)
Battery Limit Pressure,	12 Kg/cm ² g (min) at station inlet
Max. ambient temp., oC	5/50 (Min/Max) based on Pune IMD Data
Facilities envisaged	SCADA/RTU terminal for monitoring of the pipe line integrity, Pig receiver

PIPELINE PARAMETERS

Summary of the physical, construction and operational parameters of the proposed pipeline are given in Table: E-5.

**Table E-5
Summary of Pipeline Parameters**

Item	Details	
Length, Km	Overall Length	164.65 Km
	BPCL Uran to Tap-off for HPCL Chakan	114.49 Km
	Tap-off HPCL Chakan to Tap-off IOCL Chakan	18 Km (Approx.)
	Tap-off IOCL Chakan to BPCL Shikrapur	18 Km (Approx.)
Line Size & thickness	12" /10 " Dia., thickness 8.38 mm /7.14 mm & 10" dia,6.35 mm (6.35 mm for 10" for spur lines)	
Pipeline material & grade	Carbon Steel Grade: API 5L Gr. X-60 / X-52 PSL 2 depending upon the section	
ROW (m)	18 m all along pipeline length, 10 m width near Forest lands, Developed areas.	
Throughput	1.0 MMTPA	
Burial depth (m)	1.2 m for normal terrain, 2.5 m for cased railway crossings, 5.0 m HDD for river crossings	
Pipeline design basis	The pipeline shall be designed for a service life of 35 years	
Methods for rail/ road/ river/ canal crossings	Rail, road, river/ canal crossings shall be designed to withstand superimposed loads by using heavy wall pipe, concrete coating, additional cover, or by using other measures to ensure adequate distribution of all superimposed loads	

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Cathodic protection details	The pipeline would be coated outside with a high quality three layered PE coating and provided with cathodic protection to ensure corrosion protection
Item	Details
Sectionalizing Valve Details	There will be 06 nos. of sectionalizing valves.
Communication System	Three types of communication systems have been envisaged for proposed pipeline 1) Optical Fibre Communication System 2) Satellite Communication System, and 3) Mobile Communication System.
Leak Detection & Protection System	SCADA & Application Software (APPS) System. In emergency situations, SCADA system enables shut down by closing operations in orderly manner.
Inspection & Patrolling System	Regular Patrolling in the pipeline route would be followed.

UTILITIES**Power Supply**

SCADA & APPS System at SMCS : 230 V AC UPS \pm 10%.Hz \pm 3%
 RTUs at all locations : (-) 48 V DC (Positive Grounded) \pm 15%

Requirement of power shall be met from Maharashtra State Electricity Board (MSEB).

Water Consumption

Insignificant quantity of water shall be required at SV Stations which would be only at the rate of 0.2 m³/day at each station and shall be met from tube wells to be dug within SV Stations.

SCADA & APPS System Instrumentation & Control

PC-PLC based control system shall be provided at SV stations and terminals for the process interlocks/ shutdown logic/ MOVs operation and station monitoring. The entire cross country pipeline shall be monitored and controlled by SCADA using APPS system and controlled centrally from SCADA Master Control Station (S & CS) at BPCL, Mahul Refinery with repeater at HPCL Mahul Refinery & Emergency Master Control Station at HPCL Chakan. Use of APPS package would ensure the accuracy of leak detection upto 2% within 15 minutes time and within a distance of \pm 3 Km.

Telecommunication System

A dedicated Optical Fibre Communication (OFC) based telecommunication system with direct dialing, conference, voice communication, video conference, facsimile facilities, network management system and low & high speed data communication system etc. is proposed to be implemented to meet the operation and maintenance requirement of the proposed pipeline.

Corrosion Protection System

The pipeline shall be protected against external corrosion by three layered polyethylene (PE) coating and additionally by impressed current cathodic protection system.

Fire Protection Facilities

As per requirement of OISD-117, fire protection facilities will be provided at all the SV stations. However, Take-off and Receiving Stations are having adequate facilities to combat fire in case of any emergency. CO₂ flooding shall also be provided at all stations.

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Safety, Health & Environment Policy

LPG is a highly inflammable gaseous mixture of propane & butane. As per the stipulations of MoEF, Inspectorate of Factories, Department of Explosives, OISD & Shri MB Lal's Committee recommendation etc, to ensure safe handling and accident prevention measures, an emergency preparedness plan is essential to combat any disaster by providing suitable measures to contain the incident and minimize the after effects. HPCL has thus formulated its own corporate policy on environment and safety which is followed in all its installations.

An emergency preparedness plan is listed below in Table - E-5:

**Table: E-5
Emergency Preparedness Plan**

Details of Emergency Contact Nos. of HPCL	Emergency Contact number will be displayed on the pipeline warning sign post along the pipeline route.
Copy of Mutual Aid Agreements	Will be provided before commissioning of the cross country pipeline.
Any other emergency communication facility	Three independent modes of communication viz., OFC, VHF Radio & Landline/Mobile Telephones are adequate for communication during an emergency.
List of Safety Equipments Available at Site (e.g., Fire Entry/ Proximity Suits, SCBAs, First Aid, etc.)	Safety equipments like breathing apparatus, safety helmets, rubber gloves, fire extinguishers, fire entry/ proximity suits, first aid box will be made available at all control locations including SV stations before commissioning as per OISD guidelines.
Details of Emergency Control Centre & Standby Locations	Pipeline control station at the respective locations is designated to act as emergency control centre.

BASELINE ENVIRONMENTAL STATUS

Land Environment

The pipeline runs through fairly rolling terrain followed by flat, gradually undulating terrain, steep rising terrain and rolling terrain. Thus, the entire section of the pipeline is critical on account of rugged and intricate terrain.

The data on analysis of soil samples from different villages has been compiled in order to assess the field infiltration rates, crop pattern, limitations of soil for growth of appropriate plant species.

The highlights of the observations are as follows:

- The sand content in the soil samples were observed in the range of 30 to 62%
- The silt content in the soil samples were observed in the range of 11 to 50%
- The clay content in the soil samples were observed in the range of 10 to 34%
- The porosity in the soil samples were observed in the range of 28.20 to 38.00%
- Bulk densities were observed in the range of 1.20 to 1.72 gm/cc.
- The pH of the samples ranged between 7.30 and 9.00
- Electrical conductivity of the soil samples ranged between 0.30 to 0.64 (m-mho/cm)
- Level of Organic matter in the soil samples ranged between 0.43 to 3.90%
- Level of Ca ranged between 19.2 and 156.00 ppm.
- Level of Mg ranged between 4.00 and 160.00 ppm.
- Level of Potassium ranged between 0.10 and 5.80 ppm.
- Levels of sodium varied in the range of 1.50 and 41.4 ppm.

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- Levels of chloride ranged between 4.00 and 88.00 ppm.
- Levels of sulphate ranged between 3.20 and 16.0 ppm.

Meteorology

The meteorology of the area during the study period (October, 2010 to December, 2010) may be summarized as below:

Table: E-6

Sl. No.	Parameter	Take-off point, Uran	Terminating point, Shikrapur
1	Temperature, Min/Max	19.2 °C / 36.4°C	6.1°C / 33.2°C
2	Humidity, Min/Max	28.0 / 94.0%	13.0% / 99.0%
3	Wind Direction	NW, E	E,W
4	Wind Speed	5-27 KMPH	1-13 KMPH
5	Rainfall	52 mm	33 mm

Air Environment

The baseline ambient air quality and expected air quality status at the proposed project site are characterized using the primary data generated at the four no. of terminals & in the 1km corridor of the whole pipeline length.

The summary of the observations are as below:

Table: E-7

S. No.	Parameters	Minimum	Maximum	Average	98 th %ile
Take-off Point, BPCL, Uran					
1	SPM	90	152	122	151
2	RPM	26	51	39	51
3	SO ₂	6.2	21.2	14.2	20.7
4	NO _x	7.8	33.1	23.0	32.7
5	VOC(C ₆ H ₆ /C ₆ H ₅ CH ₃)	1.1 / 1.3	3.4 / 4.2	2.1 / 2.7	3.3 / 4.0
6	Total HC	0.30	0.62	0.48	0.60
Receiving Station, HPCL, Chakan					
1	SPM	91	150	117	147
2	RPM	26	53	38	52
3	SO ₂	7.0	17.2	11.9	17.2
4	NO _x	10.7	28.1	18.6	27.1
5	VOC(C ₆ H ₆ /C ₆ H ₅ CH ₃)	4.4 / 7.6	9.1 / 12.4	7.6 / 9.6	9.0 / 12.2
6	Total HC	0.22	0.57	0.40	0.54
Receiving Station, IOCL, Chakan					
1	SPM	92	168	125	166
2	RPM	28	54	46	53
3	SO ₂	5.49	18.60	12.01	18.43
4	NO _x	9.90	28.08	18.42	27.42
5	VOC(C ₆ H ₆ /C ₆ H ₅ CH ₃)	<1 / <1	<1 / <1	<1 / <1	<1 / <1
6	Total HC	0.23	0.49	0.34	0.46
Receiving Station, BPCL, Shikrapur					
1	SPM	92	160	126	159
2	RPM	28	56	40	56
3	SO ₂	5.49	27.55	13.08	24.03
4	NO _x	10.26	25.08	16.96	25.05
5	VOC(C ₆ H ₆ /C ₆ H ₅ CH ₃)	1.10 / 1.17	3.04 / 3.95	2.11 / 2.68	2.93 / 3.94

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6	Total HC	0.28	1.08	0.84	1.03
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S. No.	Parameters	Minimum	Maximum	Average	98 th %ile
500m on either side of the Pipeline					
1	SPM	92	150	120	150
2	RPM	28	50	38	50
3	SO ₂	4.86	15.39	10.40	14.91
4	NO _x	9.41	27.65	20.64	27.56
5	VOC(C ₆ H ₆ /C ₆ H ₅ CH ₃)	7.35 / 9.3	23.8 / 24.0	15.0 / 17.9	23.3 / 23.8
6	Total HC	0.23	1.52	1.25	1.50

Water Environment

Water quality of surface and ground water resources within the study area has been studied at 20 locations. 10 locations each for surface and ground water resources were studied for assessing the water environment and anticipated impact due to the proposed project activities.

Table: E-7

Sl. No.	Parameters	Ground Water		Surface Water	
		Min	Max	Min	Max
1	pH	6.7	7.6	6.9	7.8
2	Total Dissolved Solids	206	356	85	543
3	Alkalinity total as CaCO ₃	144	258	40	220
4	Hardness total as CaCO ₃	136	238	52	256
5	Calcium Hardness	41	64	18	62
6	Chloride as Cl	16	46	10	102
7	Sulphate as SO ₄	6	20	7	110
8	Nitrate as NO ₃	1.1	2.8	2.2	12.0
9	Iron as Fe	0.04	0.1	0.03	0.20

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The summary of the data generated on noise level in the study area are given in table: E-8:

Table: E-8

Location	24 hr Avg. Leq. dB(A)	Leq (Day) dB(A)	Leq (Night) dB(A)
Northern Boundary – Uran Bottling Plant of BPCL	49.26	50.81	45.50
Southern Boundary – Uran Bottling Plant of BPCL	47.60	49.29	43.50
Eastern Boundary – Uran Bottling Plant of BPCL	46.47	47.55	43.86
Western Boundary – Uran Bottling Plant of BPCL	44.91	45.89	42.53
Northern Boundary – Chakan Bottling Plant of HPCL	43.81	44.59	42.15
Southern Boundary – Chakan Bottling Plant of HPCL	47.09	48.65	43.30
Eastern Boundary – Chakan Bottling Plant of HPCL	47.48	48.62	44.69
Western Boundary – Chakan Bottling Plant of HPCL	45.65	46.06	44.64
Northern Boundary – Chakan Bottling Plant of IOCL	45.43	45.82	44.49
Southern Boundary – Chakan Bottling Plant of IOCL	43.70	44.61	41.51
Eastern Boundary – Chakan Bottling Plant of IOCL	47.76	49.31	44.00
Western Boundary – Chakan Bottling Plant of IOCL	46.10	47.79	42.00
Northern Boundary – Shikrapur Bottling Plant of BPCL	44.97	46.05	42.36
Southern Boundary – Shikrapur Bottling Plant of BPCL	43.41	44.39	41.03
Eastern Boundary – Shikrapur Bottling Plant of BPCL	47.06	48.61	43.30
Western Boundary – Shikrapur Bottling Plant of BPCL	45.40	47.09	41.30
Kalambusare Village	44.27	45.35	41.66
Katkarwadi Village	42.71	43.69	40.33
Pimple Jagtap Village	41.45	42.06	39.95
Wajewadi Village	44.89	46.45	41.10

Ecological Environment

The impact on ecological environment in the study area for both flora and fauna of terrestrial and aquatic habitats has been assessed. The study area comprises of tropical humid forest and low grade dry deciduous forests which encompasses Raigad and Pune district of Maharashtra State respectively. The main species of trees in the forests falling under Raigad district are Teak, Khaire, Adulsa, Ain, Amba, Apta, Babul, Bakul, Behad, Bharang, Chinch, Dhailie, Kadu nimb, Karanj, etc. and in Pune district the main species are Arjun, Aamba, Aonla, Anjan, Asana, Bel, Bahao, Bargad, Chandan, Dhaman, Dhawada etc.

The existing fauna in the study area falling in Raigad district are Makad, Vatvaghul, Baul, Mungus, Dukkar, Bhekar, Kutra, Manjar, etc. and the faunal species falling in Pune district are Sasa, Kasav, Sarda, Gharpad, Pal, Sheli, Wagh, Beduk, Vinchu, etc. The bird species observed in Pune district are Badak, Kabutar, Gidhad, etc.

PREDICTION OF IMPACT & MANAGEMENT PLAN**Land Environment**

There would be no negative impact on the land environment of the study area due to the proposed project. HPCL shall co-ordinate with Department of Forest to plant the trees at an alternative place with regard to trees cut along the ROU. 10% of the total area of each SV Station shall be developed towards green belt development/afforestation. The proposed project would lead no solid and hazardous waste generation and

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consequently adverse impact on land is not envisaged. There would be no change in soil characteristics and landscape due to the construction and operation of the proposed project.

Air and Meteorology

Two meteorological stations were installed for wind speed, wind direction, temperature, relative humidity and rainfall measurements at the roof of Security Gate Gate No. 6 of Uran bottling plant and security gate of Shikrapur bottling plant of BPCL at Raigad and Pune districts respectively. There would be no negative impact on the meteorology of the study area.

The baseline values of air pollutants are much below the permissible limits of National Ambient Air Quality Standards as per findings. No adverse impact on air environment is envisaged from the proposed project. However, the SPM shall increase temporarily during the construction period which can be controlled by regular water sprinkling in the area.

Water Environment

The surface and ground water characteristics of the samples collected within the study area were found well within the permissible limits laid down in Drinking Water Standards (IS: 10500-1991). The requirement of water is envisaged only at the 6 nos. of manned SV stations @ 0.2 m³/day/SV Station and waste water generation is about 0.18 m³/day/SV Station. The waste water would be disposed through soak pit post treatment in septic tanks.

Noise Environment

The noise generation anticipated from laying of pipeline and operation of pumps etc. is very less. Community noise levels are not likely to be affected because of the existing vegetation and attenuation due to the physical barriers. The proposed mitigation measures while laying of pipeline are outlined below:

- Noise levels specifications of various rotating equipment as per NAAQS standard;
- Erecting suitable enclosures if required, to minimize the impact of high noise generating sources;
- Ear plugs shall be provided to the workers and shall be forced to use while working in high noise generating areas;

Ecological Environment

The impacts on terrestrial and aquatic ecology due to construction and operation of the proposed project are insignificant and do not require measures. Existing green cover and the proposed afforestation will reduce the impact and improve the environment.

Socio-economic Environment

On the basis of analysis of various relevant parameters associated with proposed project, the following conclusions are drawn:

- The proposed project will not have any impact on the cultural environment, demographic profile, land use pattern, basic amenities, agricultural activities and industrial environment existing in the surrounding area.
- It will have a positive impact on the economic environment and occupational pattern of the area as it would provide direct and indirect employment, majority of which will be drawn from local population.

Transport System

The study area is well developed with respect to transport system. All the villages are connected with pucca roads and bus stops are within one kilometer distance from a village. The entire study area crosses 3 nos. of

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NH, 1 no. of Expressway, 6 nos. of State Highways, 35 nos. of village roads. The proposed project will have no impact on the existing transport system and it would impart a positive impact during the pipeline operation by way of withdrawing LPG tank lorries from the road transport system.

SAFETY AND FIRE FIGHTING

M/s HPCL has a separate safety cell and the same is responsible for safety of proposed pipeline project. Safety and fire fighting facilities shall be in place as per OISD norms. Fire protection and safety management group consist of fully trained and experienced firefighting crews.

Mock Fire Drill

Mock fire drill shall be conducted regularly to combat any situation immediately. This will help in keeping the firefighting equipment in good working condition.

Safety Audit & Planned Inspection

Safety audit will be done as per recommendations of OISD. Health study of important equipment shall be done regularly. Performance of important instruments will be checked regularly.

CONCLUSION

The overall impact of the proposed project is beneficial as impacts on air, noise, water, land and ecological environments are insignificant and the socio-economic benefits are predominantly positive. Economy output and other related facilities viz., employment, health, education, communication and transportation including human settlements will definitely improve the overall quality of life. All the relevant safety norms with latest technology have been incorporated in the pipeline system. Hazard and associated Risk w.r.t safety and security provision appears to be acceptable. Hence, pipeline project in totality may be considered environmentally safe.