

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT & EMP REPORT

FOR

**PROPOSED GRAIN BASED DISTILLERY (60 KLPD),
MALT SPRIT PLANT (6 KLPD) ALONG WITH
COGENERATION POWER PLANT (3 MW)**

AT

**VILLAGE PACAHRIA DALARPATAR, MOUZA PUB
BONGSOR, TEHSIL HAJO, DISTRICT KAMRUP, ASSAM.**

PROJECT PROPONENT:

**M/S. MANGLAM DISTILLERS & BOTTLING
INDUSTRIES**

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PREFACE

M/s. Manglam Distillers & Bottling Industries is proposing to set up a 60 KLPD Grain Based Distillery, 6 KLPD Malt Spirit along with co-generation Power plant of 3.0 MW to manufacture Extra Neutral Alcohol (ENA)/RS/Industrial Alcohol at Village Pachari, Dalarpathar, Mouza Pub Bongsor, Tehsil Hajo, District Kamrup, Assam, As per EIA Notification 2006, the proposed project is categorized as A under 5(g), (ii) (All Cane Juice/Non-Molasses based Distilleries ≥ 30 KLD). In order to assess the likely impacts arising out of the proposed project, M/s. Manglam Distillers & Bottling Industries had appointed M/s. En-vision Enviro Engineers Pvt. Ltd., Surat (Gujarat), to undertake the Environmental Impact Assessment (EIA) study for the various environmental components which may be affected, to assess the impact arising out of the proposed project and to prepare a detailed Environmental Management Plan (EMP) to minimize those adverse impacts.

The cooperation and assistance rendered by M/s. Manglam Distillers & Bottling Industries in the preparation of this report is gratefully acknowledged.

M/s. En-vision Enviro Engineers Pvt. Ltd.

EXECUTIVE SUMMARY

OF

EIA & EMP REPORT

FOR

**PROPOSED 60 KLPD GRAIN BASED DISTILLERY, 6 KLPD
MALT SPIRIT ALONG WITH 3 MW CO-GENERATION
POWER PLANT**

AT

**VILLAGE PACHARI, DALARPATHAR, MOUZA PUB
BONGSOR, TEHSIL HAJO, DISTRICT KAMRUP, ASSAM.**

OF

**M/S. MANGALAM DISTILLERS & BOTTLING INDUSTRIES
HOUSE NO. 17, CHITRALEKHA LANE, USHA NAGAR,
DISPUR, GUWAHATI – 781006, ASSAM**

1. INTRODUCTION

M/s. Manglam Distillers & Bottling Industries, Company incorporated on 17th day of April 2008 with its Registered Office at House No. 17, Chitralekha Lane, Usha Nagar, Dispur, Guwahati – 781006, Assam and Factory/Works at Pachari, Dalarpathar, Mouza Pub Bongsor, Tehsil Hajo, District Kamrup, Assam, set up a 60 KLPD Grain Based Distillery, 6 KLPD Malt Spirit along with co-generation Power Plant of 3 MW. Project comes under Category A, 5(g), (II) All Can Juice/Non Molasses based Distilleries \geq 30 KLPD as per EIA Notification dated 14th September, 2006 and its subsequent amendments.

2. PROJECT DESCRIPTION

2.1. PROJECT DETAILS

Name of the company	M/s. Manglam Distillers & Bottling Industries.
Category of the project	A
S. No. In the schedule	5(g), (II) All Can Juice/Non Molasses based Distilleries \geq 30 KLPD
Location of the project	Village Pachari, Dalarpathar, Mouza Pub Bongsor, Tehsil Hajo, District Kamrup, Assam.
Capacity of the project	Proposed Grain Based Distillery (60 KLPD ENA/RS/Industrial Alcohol) Malt Spirit (6 KLPD) along with co-generation Power plant of 3 MW)
General condition & Specific condition	Does not attract general condition & Specific conditions.
Total project cost	Rs. 80.00 Crores
Cost for EPCM	Capital Cost: Rs. 950.00 lacs & Recurring cost: Rs. 75.0 lacs.
Cost for CSR activity	Rs. 400 lacs shall be utilized over a period of 5 years.

2.2. PROJECT REQUIREMENT

Land requirement	Total 36,120.7 sq. m. private land is already acquired.
Water requirement & its source	Total 720 KLPD water will be required for the proposed project which will be met through ground water. Necessary permission will be obtained from competent authorities.
Electricity requirement & its source	3.0 MW Cogeneration Power Plant.
Manpower requirements	60 personnel and local people will be employed as far as possible.
Fuel requirement & its source	Coal: 70 TPD or Rice Husk: 100 TPD for 30 TPH Boiler, Coal will be Source from Assam and Meghalaya while Rice Husk from Nearby sources. HSD: 300 lit/hr for D. G. Set, from nearest sources
D.G. set for emergency use	One 900 KVA Capacity for initial start up and emergency purposes

2.3. RAW MATERIAL REQUIREMENT

SR. NO.	NAME OF THE RAW MATERIAL	CONSUMPTION MT/DAY	SOURCE	MODE OF TRANSPORTATION
1.	Grains (Broken Rice / Maize / Sorghum / Bajra / Wheat)	150 TPD	Assam, Bihar, West Bengal, Uttar Pradesh.	By Road
2.	Malt	15 TPD	Assam, Bihar, West Bengal, Uttar Pradesh.	By Road
3.	Alpha Amylase	30 Kg	Directly from the Chemical Companies	By Road
4.	Amyloglucosidase	30 Kg	Directly from the Chemical Companies	By Road
5.	Sulphuric Acid	50 Kg	Authorized Dealers	By Road
6.	Urea	60 Kg	Local Market	By Road
7.	Nutrients Ammonia	150 Kgs	Local Market	By Road
8.	Antifoam	0.6 kg per KL 36 kgs	Local Market	By Road
9.	Yeast	As per requirement	Authorized Dealers	By Road
10.	Biocides	30 kg	Local Market	By Road

Mode of Transportation:

Road traffic to and from the proposed plant during operation of proposed project will be increased to some extent (around 85 trucks/day). The regular maintenance of vehicle shall limit the pollution within limits.

2.4. WASTE WATER GENERATION

The effluent generated from the ENA production process is segregated as process effluent (spent wash and spent lees) and effluent from utilities like Boiler, Vacuum pump, washings. The company proposes to follow & set up a “Zero Effluent Discharge” scheme. The condensates from evaporation shall be recycled and reused in Process & Make up water streams. Spent wash shall be decanted for separation of Suspended Solids and Multi-Effect Evaporation arrangement. Condensate shall be reused and spent less shall be recycled back to Distillation.

Wastewater from Boiler (Blow down) as well as miscellaneous Water shall be used in Gardening and Green Belt development. Domestic wastewater generated shall be disposed off through septic tanks followed by soak pit/well.

2.5. AIR EMISSION & AIR POLLUTION CONTROL MEASURES

NO. OF STACK	STACK ATTACHED TO	NAME & QUANTITY OF FUEL	POLLUTION CONTROL EQUIPMENT	STACK HEIGHT & DIAMETER (M)	POLLUTANTS
1.	30 TPH Boiler	Coal 70 TPD or Rice Husk 100 TPD	Bag Filter / ESP	Ht. 45 m & dia. - 2 m	PM – 150 mg/Nm ³ SO ₂ – 100 ppm NO _x – 50 ppm
2.	D. G. Set of 900 KVA (Standby facility)	Diesel 300 Lit./Hr	Industrial Grade Resistive Mufflers and RCC room with proper ventilation	Ht. - 9 m & dia. - 0.4 m	PM – 150 mg/Nm ³ SO ₂ – 100 ppm NO _x – 50 ppm

2.6. SOLID WASTE GENERATION & DISPOSAL

SR. NO.	TYPE OF SOLID WASTE	SOURCE	QUANTITY PER DAY	DISPOSAL METHOD
1.	Grain Residue (DDGS/DWGS)	Process	Approx 120 MT as DWGS or approx 42 MT as DDGS	Dried and sold for cattle feed
2.	Fly ash	Boiler	Approx 10 MT	Sold to Cement or brick manufacturers.

3. DESCRIPTION OF THE ENVIRONMENT

3.1 INTRODUCTION

The baseline environmental quality of air, water, soil, noise, socioeconomic and ecology has been assessed during November 2014 to January 2015 in a study area of 10 km radial distance from the project site.

3.2 ENVIRONMENTAL SETTING OF THE AREA

Project location	Village Pachari, Dalarpathar, Mouza Pub Bongsor, Tehsil Hajo, District Kamrup, Assam.
Site coordinates	Latitude : 26° 14' 24.73" N Longitude : 91° 38' 39.53" E
Nearest Village	Pacharia
Nearest Town	Changsari at 5 km in North-East Direction
Nearest City	Guwahati at 11 km South-East Direction
Nearest Dist Headquarter	Kamrup at 12 km in South-East Direction
Nearest National Highway	NH 31 at 4.5 km in East Direction
Nearest Railway Station	Changsari at 5.2 km in North-East Direction
Nearest Airport	Guwahati at 13 km in South Direction
Nearest River	Brahmaputra River at 4 km in South Direction
National Park / Reserve Forest, Biosphere Reserve	Sila RF - 1.5 km in East Direction Agyathuri RF - 3.5 km in South-East Direction Diregheswar RF - 6.5 km in North-East Direction Sildar RF - 8.6 km in West Direction Hajo RF - 9.2 km in West Direction
Seismicity	Seismic Zone-V

3.3 BASE LINE DATA

Base line data has been collected during the study period i.e. November 2014 to January 2015.

3.4 SITE SPECIFIC MICRO-METEOROLOGY

The maximum and minimum temperatures observed in the study period are 39.3 °C and 14.2 °C with average relative humidity 71%. The predominant wind direction is North-East and South-West.

3.4.1 AMBIENT AIR QUALITY

The ambient air samples were collected from eight locations and analyzed for PM₁₀, PM_{2.5}, SO₂, NO_x, CO and hydrocarbons. As per the ambient air monitoring, PM₁₀, PM_{2.5}, SO₂, NO_x, CO and hydrocarbons level were in the range of 33.5 - 89.3 µg/m³, 17.1 - 45.3 µg/m³, 4.4 - 9.3 µg/m³, 12.5 - 24.6 µg/m³, 162 - 510 µg/m³, BDL respectively. The results of the monitored data indicate that the ambient air quality of the region in general is in conformity with respect to rural / residential norms of National Ambient Air Quality standards of Central Pollution Control Board (CPCB).

3.4.2 SURFACE WATER QUALITY MONITORING

Total eight nos. of surface water samples were collected from the study area. The pH varied is from 6.62-7.56, the turbidity varied from 1.9-3.6 NTU, the total dissolved solids varied from 138-328 mg/l, Conductivity varied from 218-512 µS/cm, The total alkalinity varied from 50-100 mg/l the total hardness varied from 60-180 mg/l, calcium varied from 16.0-40.0 mg/l, chloride varied from 25-75 mg/l and the sulphate varied from 16.0-45.0 mg/l.

3.4.3 GROUND WATER QUALITY MONITORING

Eight nos. of ground water samples in the study area were collected and analyzed during November, 2014 to January, 2015. The pH varied in the range of 6.99-7.52, turbidity 0.6-1.2 NTU, total hardness 160-320 mg/l, total alkalinity 100-240 mg/l, total dissolved solids 288-868 mg/l, Conductivity 460-968 µS/cm, Chloride 55.0-120.0 mg/l, Sulphate 37.7-60.4 mg/l, and nitrate was found in the range 3.7-6.9 mg/l. All the samples are conforming to the prescribed drinking water standards.

3.4.4 BACKGROUND NOISE LEVEL

Background noise level was measured at eight different locations in the study area. The day time noise levels at all the locations ranged between 40.3-71.2 dB(A). The night time noise levels at all the locations ranged between 37.3-60.3 dB(A).

3.4.5 SOIL QUALITY

Total eight nos. of samples were collected from the study area and tested in the laboratory. Mostly texture of the soil is clay followed by loamy sand, clay loam and sandy clay loam soil. Regular cultivation practices increase the bulk density of soil, thus inducing compaction.

3.5 LAND USE PATTERN

The land use classification within a distance of 10 kilometers from the project location and the areas falling under the respective classifications are as given in the following table:

S.NO.	LAND USE	AREA (SQ. KM)	%
1.	<u>BUILT UP LAND</u>		
	a. Settlements/IIT	27.004	8.6
	b. Industrial area	13.188	4.2
2.	<u>WATERBODIES</u>		
	a. Tank / River etc.	41.134	13.1
	<u>FORSET</u>		
	a. Scrub forest	22.294	7.1
4.	<u>CROP LAND</u>		
	a. Single crop	103.934	33.1
	b. Double crop	41.134	13.1
	c. Plantation	18.212	5.8
5.	<u>WASTELANDS</u>		
	a. Land with scrub	23.864	7.6
	b. Land without scrub	3.454	1.1
	c. Water logged area	19.782	6.3
	TOTAL	314.000	100.0

3.6 BIOLOGICAL ENVIRONMENT

In the project area, the wild animals as well as other fauna are not seen excepting domestic animals. The study area doesn't form any part of National park, wild life sanctuary, and natural biosphere reserve. Only five reserve forests are present in the study area of 10 km radius.

3.7 SOCIO-ECONOMIC STUDY

In 2011, Kamrup district had population of 15,17,542. Decadal growth rate of District Kamrup is 15.69% during 2001-2011. As per 2011 census, 90.62% of total population live in rural are while 9.38% of total population live in urban

area comparing to 2001 census. The initial provisional data released by the Census of India 2011, shows that density of population in District Kamrup is 489 people per sq. km. Average literacy rate of District Kamrup in 2011 census were 75.55 compared to 67.73 of 2001. Male and female literacy were 81.30 and 75.89 respectively in 2011 census.

4. ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

4.1 IMPACT ASSESSMENT

An effort has been made to identify various environmental, social and ecological impacts due to proposed project during construction and operation phases considering present environmental scenario as baseline. The corresponding mitigation measures to take care of the adverse impacts are also discussed in following sections.

4.2 IMPACTS DURING CONSTRUCTION PHASE & ITS MITIGATION MEASURES

During Construction Phase, the fugitive dust emission due to civil work and vehicular movement is not expected to spread too far as water spraying will be carried out to suppress the dust emission at the site and as well as on road. The increase in noise levels due to the movement of vehicles will be taken care of by regulating the movement of vehicles and the impact on the human beings will be taken care of by providing the working people with ear plugs / ear muffs. During construction, drainage pattern and water supply system of overland water flow will not be changed during the site preparation activities. Suspended solids can be controlled by sprinkling water and by employing enclosures to construction area to allow the particles to settle down, prior to discharge. During construction period, the project is likely to generate substantial employment and income.

4.3 IMPACT DURING OPERATION PHASE & MITIGATION MEASURES

4.3.1 AIR ENVIRONMENT

Major air emissions are anticipated by the gaseous emissions from a single stack is a local phenomenon. The ISCST3 scientific model has been used to predict the proposed air quality on the environment. The maximum 24 hourly average GLC's for Particulate Matter, SO₂ and NO_x is observed to be 1.16 µg/m³, 1.97 µg/m³ and 0.72 µg/m³ respectively at a distance of 1000 m towards south-west direction. Fugitive emission will be generated from storage and processing vessels, loading and unloading section.

Mitigation measures:

- Effective stack height with proper air pollution control equipment shall be provided to stack.
- Regular maintenance of APCE shall be done and recorded.
- Green belt shall be developed on 33% are of the total plant area.

4.3.2 NOISE ENVIRONMENT

The noise pollution management will be taken up in the following manner;

- By selecting low noise generating equipment, which would have below 75 dBA noise level at 1 m distance. This is taken care at the equipment design stage.
- By isolating the noise unit from the working personnel's continuous exposure by providing acoustic aids for plant personnel.
- By administrative & safety measures, providing noise level monitoring, remedial measures, providing noise safety appliances to the working personnel.

By these measures, it is anticipated that noise levels in the plant will be maintained below 75 dBA.

4.3.3 WATER ENVIRONMENT

The company will follow zero discharge effluent concept wherein waste water from Boiler Blow down, bottle washing etc. shall be utilize for ash quenching and green belt development after suitable treatment confirming norms prescribed by Pollution Control Board. Hence, no significant impact on water environment due to the proposed activities is envisaged.

4.3.4 LAND ENVIRONMENT

All the solid waste will be stored separately in the isolated storage area within premises. Solid waste generated in the form of DDGS/DWGS (approximately 120/42 MT/day) will be sold for cattle feeding and fly ash approximately 10 MT per day shall be trapped and sold to brick manufacturers.

4.3.5 INFRASTRUCTURE AND SERVICES

As a result of development of industry, the neighbouring areas shall be developed for commercial use. The infrastructure services e.g. roads, state transport, post and telegraph, communication, education and medical facilities, housing, etc. shall be improved in the surrounding areas.

4.3.6 GREEN BELT DEVELOPMENT

About 11,920 sq. m. area shall be developed as green belt at plant boundary, road side, around offices & buildings and Stretch of open land. In Green belt area about 1,000 tree per acre of land shall be planted.

5 ENVIRONMENTAL MONITORING PROGRAMME

5.1 ENVIRONMENTAL MONITORING

A regular monitoring of environmental parameters like air, water, noise and soil as well as performance of pollution control facilities and safety measures in the plant are important for proper environmental management of any project. The following routine monitoring programme as detailed in as under will be implemented at site.

- Stack monitoring for the parameters like PM, SO₂, and NO_x, once in a month
- Ambient air quality monitoring for the parameters like PM₁₀, PM_{2.5}, SO₂ and NO_x, once in a six months.
- Work zone environment monitoring for the parameters like HC and VOC once in a six months.
- Liquid effluent monitoring once in a month.
- Ground water, surface water and soil quality monitoring once in a year.
- Noise monitoring near noise generating units once in six months and within plant premises once in a month.

6. ADDITIONAL STUDIES

6.1 PUBLIC HEARING

Public hearing is applicable for the proposed project as per Para 7(i) III (b) of EIA Notification, 14th September, 2006 as the project is located outside the notified industrial area. Details of the Public hearing will be incorporated after completion of public hearing.

6.2 RISK ASSESSMENT

The management is very much aware of their obligation to protect all persons at work and others in the neighbourhood who may be affected by an unfortunate and unforeseen incidence occurring at the works. Any hazard either to employees or others arising from activities at the plant site shall, as far as possible, be handled by the personnel of the company and prevented from spreading any further. However in the case of eventuality the Disaster Management plan adopted by the proponents is sufficient and may be able to control the situation.

7. PROJECT BENEFITS

7.1 PHYSICAL INFRASTRUCTURE

As a project M/s. Manglam Distillers & Bottling Industries will adopt CSR activities which will surely develop the existing scenario of the area. As in the existing scenario, condition of the physical infrastructure is not so good.

7.2 EMPLOYMENT POTENTIAL

For the proposed project, 60 personnel are required for manufacturing activities of proposed unit. Preference shall be given to local people. This is for the direct employment and indirect employment will also increase that will improve the socio-economical status of area.

7.3 CORPORATE SOCIAL RESPONSIBILITY (CSR)

Funds to the extent of Rs. 160 lacs will be utilize for the CSR activities for the five years after words Rs. 5 lacs shall be utilized per annum as recurring expenditure. The company will utilize the fund as per regulations for CSR activities like Safe drinking water facility, Health care, Education and Training, Infrastructural development, Awareness programme on environment, Rain water harvesting plan, Plantation, Sports, etc.

8. ENVIRONMENTAL MANAGEMENT PLAN

8.1 ENVIRONMENTAL MANAGEMENT PLAN (ADMINISTRATIVE ASPECTS)

Environmental monitoring of different parameters will be done regularly and the activity will be coordinated by the Environmental Management Cell (EMC). Mitigation of environmental impacts has to be implemented according to the suggestions and will be monitored regularly to prevent any lapse. The EMC will be under the overall supervision of the Manager (Environment). The cell will report on a regular basis to the Unit Head. The EMC will prepare a formal report on environmental management and mitigation at six month intervals. The company will undertake various training programme for improving the performance of the working personnel. Special training will be arranged in regular intervals to combat emergency scenarios that may occur during the plant operation.

9. CONCLUSION

Company has committed to implement all the pollution control measures to protect the surrounding environment. The project can definitely improve the regional, state and national economy. Industrial growth is an indication of socio economic development. The implementation of this project will definitely improve the physical and social infrastructure of the surrounding area.

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CHAPTER – 1

INTRODUCTION

1.1 PURPOSE OF EIA

An EIA is a systematic process that predicts and evaluates the potential impacts a proposed project may have on aspects of the physical, biological, socio-economic and human environment. Mitigation measures are then developed and incorporated into the project to eliminate, minimize or reduce adverse impacts and, where practicable, to enhance benefits. This introductory chapter presents an overview of the project, provides details of the EIA team and outlines the approach taken to undertake the EIA. In addition the structure of the remainder of the report is outlined.

This Environmental Impact Assessment study is carried out as a part of the process to obtain Environmental Clearance for the proposed project of M/s. Manglam Distillers & Bottling Industries. The proposed project is categorized as A under 5(g), (ii) (All Cane juice/non-molasses based distilleries ≥ 30 KLD) as per EIA Notification, dated 14th September, 2006 & its subsequent amendments.

1.2 IDENTIFICATION OF PROJECT PROPONENT

M/s. Manglam Distillers & Bottling Industries incorporated on 17th day of April 2008 with its registered Office at House No. 17, Chitrallekha Lane, Usha Nagar, Dispur, Guwahati – 781006, Assam and Factory/Works at Village Pachari, Dalarpathar, Mouza Pub Bongsor, Tehsil Hajo, District Kamrup, Assam.

The Main Promoter of the Company is Shri Rajesh Jalan aged around 46 years is a permanent resident Hijuguri, Tinsukia, Assam is graduate by qualification. He is one of the prominent businessmen of Assam and is financially very sound. He is proprietor of Gayatri Distillers & Bottling Industries, which is an IMFL manufacturing unit at Tinsukia, Assam is also having bonded warehouse. He is presently director/partner in following concerns:

1. M/s. Manglam Distillers & Bottling Industries, a bottling unit,
2. Arunodaya Tea Industries, a tea manufacturing unit
3. Maruti Nandan Bonded Warehouse,
4. M/s. M. P. Jalan, a petrol pump
5. Rangattu Tea Company Private Limited, a Tea Estate
6. M/s. Master India Breweries, Beer Manufacturing Unit

All the units are running successfully and earning good profits.

1.3 BRIEF DESCRIPTION OF THE PROJECT

M/s. Manglam Distillers & Bottling Industries proposes to set up a 60 KLPD Grain Based Distillery, Malt Spirit (6 KLPD) along with co-generation Power plant of 3 MW at Village Pachari, Dalarpathar, Mouza Pub Bongsor, Tehsil Hajo, District Kamrup, Assam to manufacture Extra Neutral Alcohol (ENA)/RS/ Industrial Alcohol and Malt Spirit.

1.4 SCOPE OF THE STUDY

The scope of work of EIA/EMP studies of the proposed project of M/s. Manglam Distillers & Bottling Industries includes detailed characterization of various environmental components such as micro-meteorology, air, noise, water, land, ecology & biodiversity and socio economy within 10 km radius from the proposed plant. The main objectives of the study are:-

- To identify and quantify significant impacts due to various operations of the proposed project on various environmental components through prediction of impacts.
- To evaluate the beneficial and adverse impacts of the proposed plant.
- To evaluate and implement the Environmental Management Plan (EMP) detailing control measures and its efficiency to minimize the pollution levels within the permissible norms.
- To assess the probable risks, likely to occur in unit and suggest appropriate measures to avoid the same.

- To design an occupational health & safety plan for the employees.
- To design post project monitoring plan for regulating the environmental quality within the limits and help in sustainable development of the area.

1.5 REGULATORY FRAME WORK

Environment clearance application in form-I along with pre-feasibility report to Ministry of Environment, Forest and Climate Change was submitted and subsequently, Terms of References (TOR) meeting was held and TOR for EIA study was issued.

The EIA/EMP Report has been prepared in line with **Terms of Reference (TOR)** suggested by Expert Appraisal Committee (Industry-II) vide **MoEF letter No. F. No. J-11011/113/2014-IA II (I), dated January 6, 2015** which is enclosed as annexure-I. The compliance of Terms of Reference is given in following table-1.1.

TABLE - 1.1 COMPLIANCE OF TERMS OF REFERENCE

S.N.	TERMS OF REFERENCE	COMPLIANCE
1.	Executive summary of the project.	Refer page no S-1 to S-5 of EIA Report.
2.	Justification of the project.	Refer section 2.2 on page no. 2-1 of Chapter-2.
3.	Detailed breakup of the land area along with latest photograph of the area.	Refer section 2.6.1 on page no. 2-11 and refer figure 2.4 on page no. 2-5 of Chapter-2.
4	Present land use based on satellite imagery and details of land availability for the project along with supporting document.	Refer section 3.10 on page no. 3-20 of Chapter-3. Refer annexure-II on page no. A-6.
5	Details of site and information related to environmental setting within 10 km radius of the project site.	Refer section 2.4 on page no. 2-2 of Chapter-2.
6	Information regarding eco-sensitive area such as national park / wildlife sanctuary / biosphere reserves within 10 km radius of project area. Authenticated map of wildlife Warden, state Government indicating national park/wildlife sanctuary to be submitted.	There is no eco-sensitive area such as national park / wildlife sanctuary / biosphere reserves within 10 km radius of project area.
7	Total cost of the project along with total capital cost and recurring cost/annum for environmental pollution control measures.	Refer section 2.3 on page no. 2-1 of Chapter-2 and refer section 8.7 on page no 8-9 of Chapter-8.
8	A copy of lease deed or allotment letter, if land is already acquired.	Refer Annexure-II on page no. A-6.
9	List of existing distillery units in the study area along with their capacity and sourcing of raw material.	Refer section 3.13 on page no. 3-32 of Chapter-3.
10	Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, green belt area, utilities etc.	Refer figure-2.3 on page no. 2-4 of Chapter-2.
11	Details of proposed products along with manufacturing capacity.	Refer section 2.5.3 on page no. 2-5 of Chapter-2.
12	Number of working days of the sugar unit, distillery unit and CPP.	Number of working days for proposed project will be 330 days / Annum.
13	Details of raw materials, its source with availability of raw materials including cereal grains requirement in case of grain based distillery. If molasses based distillery, then give source and quality available for molasses.	Refer section 2.5.3.1 on page no. 2-6 of Chapter-2.
14	Manufacturing process details of sugar, distillery and CPP along with process flow chart.	Refer section 2.5.3.2 on page no. 2-7 of Chapter-2.

S.N.	TERMS OF REFERENCE	COMPLIANCE
15	Sources and quantity of fuel (rice husk/bagasse/coal etc.) for the boiler. Measures to take care of SO ₂ emission. A copy of Memorandum of Understanding (MoU) signed with the coal suppliers should be submitted.	Refer section 2.6.5 on page no. 2-13 and refer section 2.7.2 on page no. 2-16 of Chapter-2.
16	Storage facility for raw materials, prepared alcohol, fuel and fly ash.	Refer section 2.5.3.1.2 on page no. 2-6 of Chapter-2 and refer section 6.6 on page no. 6-2 of Chapter-6.
17	Action plan to control ambient air quality as per NAAQES Standards for PM ₁₀ , PM _{2.5} , SO ₂ and NO _x as per GSR 826(E) dated 16 th November, 2009.	Refer section 2.7.2 on page no. 2-16 of Chapter-2.
18	One season site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall and AAQ data (except monsoon) for PM ₁₀ , SO ₂ , NO _x , CO and HC (methane & non methane) shall be collected. The monitoring stations should take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests. Data for water and noise monitoring should also be included.	Refer section 3.4 on page no. 3-4, refer section 3.6 on page no. 3-5, refer section 3.7 on page no. 3-9 and refer section 3.8 on page no. 3-15 of Chapter-3.
19	Mathematical modeling for calculating the dispersion of air pollutants and ground level concentration along with emissions from the boiler' stack.	Refer section 4.3.2 on page no. 4-2 of Chapter-4.
20	An action plan to control and monitor secondary fugitive emissions from all the sources.	Refer section 8.3.2.2 on page no 8-3 of Chapter-8.
21	An action plan prepared by SPCB to control and monitor secondary fugitive emissions from all the sources.	Refer section 8.3.2.2 on page no 8-3 of Chapter-8.
22	Details of boiler and its capacity. Details of the use of steam from the boiler.	Refer section 2.6.7 on page no. 2-14 and refer section 2.6.6 on page no. 2-13 of Chapter-2.
23	Ground water quality around proposed spent wash storage lagoon and the project area.	Refer section 3.7 on page no. 3-9 of Chapter-3
24	Details of water requirement, water balance chart for the existing unit as well as proposed expansion (as applicable). Measures for conservation water by recycling and reuse to minimize the fresh water requirement.	Refer section 2.6.3 on page no. 2-12 of Chapter-2.
25	Source of water supply and permission of withdrawal of water from competent Authority.	Refer section 2.6.3 on page no. 2-12 of Chapter-2.
26	Proposed effluent treatment system for grain/molasses based distillery (spent wash and spent lees) along with utility wastewater including CPP/Co-gen Unit (wherever applicable) as well as domestic sewage and scheme for achieving zero discharge. Details of treatment of effluent generation from sugar unit.	Refer section 2.7 on page no. 2-14 of Chapter-2.
27	Spent wash generation should not exceed 8 KL/KL of alcohol production. Details of spent wash treatment for molasses based distillery.	Refer section 2.6.3 on page no. 2-12 and refer section 2.7.1.1 on page no. 2-15 of Chapter-2.
28	Capacity for spent wash holding tank and action plan to control ground water pollution.	Refer section 8.3.2.3 on page no. 8-4 of Chapter-8.
29	Layout for storage of rice husk/biomass/coal.	Refer figure 2.3 on page no. 2-4 of Chapter-2.
30	Capacity for spent wash holding tank and action plan to control ground water pollution.	Refer section 8.3.2.3 on page no. 8-4 of Chapter-8.

S.N.	TERMS OF REFERENCE	COMPLIANCE
31	Dryer shall be installed to dry DWGS.	Refer section 2.7.1.1 on page no. 2-15 of Chapter-2.
32	Layout for storage of rice husk/biomass/coal.	Refer figure 2.3 on page no. 2-4 of Chapter-2.
33	Details of solid waste management including management of boiler ash.	Refer section 2.7.4 on page no. 2-17 of Chapter-2.
34	Risk assessment for storage and handling of alcohol and mitigation measure due to fire and explosion and handling areas.	Refer section 6.9.1 on page no. 6-7 of Chapter-6.
35	Alcohol storage and handling area fire fighting facility as per norms. Provision of Foam System for fire fighting to control fire from the alcohol storage tank.	Refer section 6.9.1 on page no. 6-7 and refer section no. 6.10 on page no. 6-8 of Chapter-6.
36	Action plan for development of Green belt over 33 % of the total project area within plant premises with at least 10 meter wide green belt on all sides along the periphery of the project area in downward direction, and along road sides etc.	Refer section 8.3.2.7 on page no. 8-5 of Chapter-8.
37	List of flora and fauna in the study area.	Refer section 3.11 on page no. 3-24 of Chapter-3.
38	Noise levels monitoring at five locations within the study area.	Refer section 3.8 on page no. 3-15 of Chapter-3.
39	Detailed Environment management Plan (EMP) with specific reference to details of air pollution control system, water & wastewater management, monitoring frequency, responsibility and time bound implementation plan for mitigation measure should be provided.	Refer section 8.3 on page no. 8-1 and refer section 8.4 on page no. 8-7 of Chapter-8. Also refer section 5.2 on page no. 5-1 of Chapter-5.
40	EMP should also include the concept of waste-minimization, recycle/reuse/ recover techniques, Energy conservation, and natural resource conservation.	Refer section 8.3.2.11 on page no. 8-7 of Chapter-8.
41	Action plan for rainwater harvesting measures at plant site should be included to harvest rainwater from the roof tops and storm water drains to recharge the ground water.	Refer section 8.3.2.3 on page no. 8-4 of Chapter-8.
42	Details of occupational health surveillance programme.	Refer section 6.14 on page no. 6-28 of Chapter-6 and refer section 8.3.2.9 on page 8-7 of Chapter-8.
43	Details of socio-economic welfare activities.	Refer section 7.5 on page no. 7-1 of Chapter-7.
44	Transportation of raw materials and finished products for the project (proposed/expansion) in respect of existing traffic, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.	Refer section 2.5.3.1.2 on page no. 2-6 of Chapter-2.
45	Action plan for post-project environmental monitoring.	Refer Chapter-5.
46	Corporate Environmental Responsibility	Refer section 7.5 on page no. 7-1 of Chapter-7.
47	(a) Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.	Refer section 8.5 on page no. 8-8 of Chapter-8.
	(b) Does the Environmental Policy prescribe for standard operating process/procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the	Refer section 8.5 and refer section 8.6 on page no. 8-8 of Chapter-8.

S.N.	TERMS OF REFERENCE	COMPLIANCE
	EIA report.	
	(c) What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the EC conditions. Details of this system may be given.	Refer Section 8.4 on page no. 8-7 of Chapter-8.
	(d) Does the company have a system of reporting of non compliance / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism should be detailed in the EIA report.	Refer section 8.6 on page no. 8-8 of Chapter-8.
48	At least 5 % of the total cost of the project should be earmarked towards the Enterprise Social Commitment based on public hearing issues and item wise details along with time bond action plan should be prepared and incorporated.	Refer section 7.5 on page no. 7-1 of Chapter-7.
49	Total capital cost and recurring cost/annum for environmental pollution control measures.	Refer section 8.7 on page no. 8-9 of Chapter-8.
50	Expansion/modernization proposals:	
	i. Copy of all the environmental clearance (s) including amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest monitoring reports of the regional office of the ministry of environment and forests as per circular dated 30 th may 2012 on the status of compliance of conditions stipulated in all the existing environmental clearance including Amendments should be provided. In addition, status of compliance of consent to Operate for the ongoing/ existing operation of the project from SPCB shall be attached with the EIA-EMP reports.	Not Applicable as the proposed project is a green field project.
	ii. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA notification 2006 shall be provided. Copies of Consent to Establish/No objection certificate and consent to operate (in case of unit operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report o the conditions of consents from the SPCB shall be submitted	Not Applicable as the proposed project is a green field project.
51	Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof.	No litigation is pending against the project and /or any direction /order passed by any Court of Law.
Additional TOR		
52	Availability of grain to be included.	Refer section 2.5.3.1 on page no. 2-6 of Chapter-2.

1.6 STRUCTURE OF THE REPORT

The objective of the EIA study is to prepare Environment Impact Assessment (EIA) and Environmental Management Plan (EMP) report based on the guidelines of the Ministry of Environment, Forests and Climate Change (MoEFCC) and CPCB. The contents of the study are arranged as follows:

- Chapter 1 is an Introduction to the Industry, purposes of the report, Project, information of project proponent and regulatory frame work.
- Chapter 2 presents a Description of Project and Infrastructure facilities including all industrial and environmental aspects of M/s. Manglam Distillers & Bottling Industries during operation phase activities as well as manufacturing process details of proposed product. This chapter also gives

information about raw location, material storage and handling, water and wastewater quantitative details, air pollution and control system, Hazardous Waste generation, storage facility and disposal and utilities for proposed production capacity of plant. It also provides information about proposed Environmental Management Facilities available at the project site.

- Chapter 3 covers Baseline Environmental Status including meteorological details, Identification of baseline status of Environmental components of the surrounding area covering air, water and land environment, study of land use pattern, Biological & Socio-Economic Environment giving details about District and the study area in terms of land use pattern, biological environment, and socio-economic environment.
- Chapter 4 deals with Identification and Prediction of Impact, which provides quantification of significant impacts of the proposed expansion activities of plant on various environmental components. Evaluation of the proposed pollution control facilities has been presented.
- Chapter 5 describes Environment Monitoring Plan to be adopted.
- Chapter 6 gives the information of public hearing and Risk analysis and Disaster management plan that is adopted by the company
- Chapter 7 gives the benefits of the proposed projects.
- Chapter 8 describes Environment Management Plan (EMP) to be adopted for mitigation of anticipated adverse impacts if any and to ensure acceptable impacts.
- Chapter 9 gives the summary and conclusion of the project.
- Chapter 10 gives the information of consultants.

CHAPTER – 2

PROJECT DESCRIPTION AND INFRASTRUCTURAL FACILITIES

2.1 PROJECT DESCRIPTION

M/s. Manglam Distillers & Bottling Industries proposes to set up a Grain Based Distillery (60 KLPD), Malt Sprit Plant (6 KLPD) along with Co-generation Power Plant (3 MW) at Village Pachari, Dalarpathar, Mouza Pub Bongsor, Tehsil Hajo, District Kamrup, Assam.

2.2 JUSTIFICATION OF PROJECT

Ethanol has been used by humans since prehistory as the intoxicating ingredient of alcoholic beverages. Dried residues on 9,000-year-old pottery found in China imply Neolithic people consumed alcoholic beverages. Drinking prevailed in India in all ages of history-“vedic” & “post-vedic”. In India, production of “country liquor”, which is also known as “arrack” has been prevailing since 800 B.C.

The use of alcohol as drink is an age-old story in India and it appears that the technique for fermentation and distillation was available even in the Vedic times. It was then called “Somarasa” and was used not only for its invigorating effect but also in worship. To date, not only has the consumption of alcohol been continued but it is an integral part of the Ayurvedic system of medicine.

The First distillery in the country was set up at Cawnpore (Kanpur) in 1805 by Carew & Co. Ltd., for manufacture of Rum for the army. The technique of fermentation, distillation and blending of alcoholic beverages was developed in our country on the lines of practices adopted overseas particularly in Europe.

The distillery industry today consists broadly of two parts, potable liquor and the industrial alcohol. The potable distillery producing Indian Made Foreign Liquor and Country Liquor has a steady but limited demand with a growth rate of about 7-10 per cent per annum. Over the years the potable liquor industry has shown remarkable results in the production of quality spirits. Indian Liquor industry is today exporting a sizable quantity of India Liquor products to other countries. India has one of the larger liquor consuming crowds in the world.

In the view of the increasing demand and supply, M/s. Manglam Distillers & Bottling Industries has planned to setup Grain Based Distillery (60 KLPD), Malt Sprit Plant (6 KLPD) along with Co-generation Power Plant (3 MW).

2.3 PROJECT COST

Cost of the proposed project shall be approx Rs. 80 Crores. Break up of project cost is given in following table-2.1.

TABLE-2.1 BREAK UP FOR THE PROPOSED INVESTMENT

SR. NO.	ITEM	PROPOSED (IN LACS)
	Capital Cost of the Project	
1	Land & Site Development	25.32
2	Building and Civil Construction	1630.25
3	Plant & Machinery	5699.43
4	Miscellaneous Fixed Assets	24.35
5	Miscellaneous Equipment	15.25
6	Preliminary Expenses	0.00
7	Contingencies	105.40
8	Margin for Working Capital	450.00
	TOTAL	7950.00 ≈ 8000.00

2.4 PROJECT SETTING

2.4.1 LOCATION

The project site is located at Village Pachari, Dalarpathar, Mouza Pub Bongsor, District Kamrup, Assam. Geographical co-ordinates of the project site Latitude 26° 14' 24.73" N and Longitude 91° 38' 39.53" E. Details of environmental setting within 10 km radius of the project site is given in following table-2.2.

Location map, Key infrastructure map and detailed layout plan of the proposed project is shown in figure-2.1, figure-2.2 and figure-2.3 respectively.

TABLE-2.2 DISTANCE OF NEAREST KEY INFRASTRUCTURE FEATURES FROM THE PROJECT SITE

NO.	NEAREST INFRASTRUCTURE FEATURE	DISTANCE FROM PROJECT SITE
1.	Village	Pacharia
2.	Nearest Town	Changsari at 5 Km in NE
3.	Nearest City	Guwahati at 11 km SE
	Nearest Dist. Headquarter	Kamrup at 12 km in SE
4.	Nearest National Highway	NH 31 at 4.5 Km in E
5.	Nearest Railway station	Changsari at 5.2 KM in NE
6.	Nearest Airport	Guwahati at 13 km in S
7.	Nearest river	Brahmaputra River at 4 km in S
8.	Nearest Reserve Forest	Sila RF - 1.5 km in E direction
		Agyathuri RF - 3.5 km in SE direction
		Diregheswar RF - 6.5 km in NE direction
		Sildar RF - 8.6 km in W direction
		Hajo RF - 9.2 km in W direction
9.	Nearest Wildlife Sanctuary	Deepor Beel Bird Sanctuary at around 12 km in S
10.	Seismicity	Seismic Zone V

2.4.2 MAP OF KEY INFRASTRUCTURE FEATURES AND SETTLEMENTS

A map depicting administrative boundary up to Taluka level, showing National Highway, State Highways, major, medium and other roads with the railway lines is presented in figure-2.2. The major water bodies with the rivers and the river beds are illustrated in the map to provide a better understanding of the project area. The map marks the area within 10 km the project area.

FIGURE-2.1 DETAILED MAP OF KAMRUP DISTRICT SHOWING PROJECT LOCATION

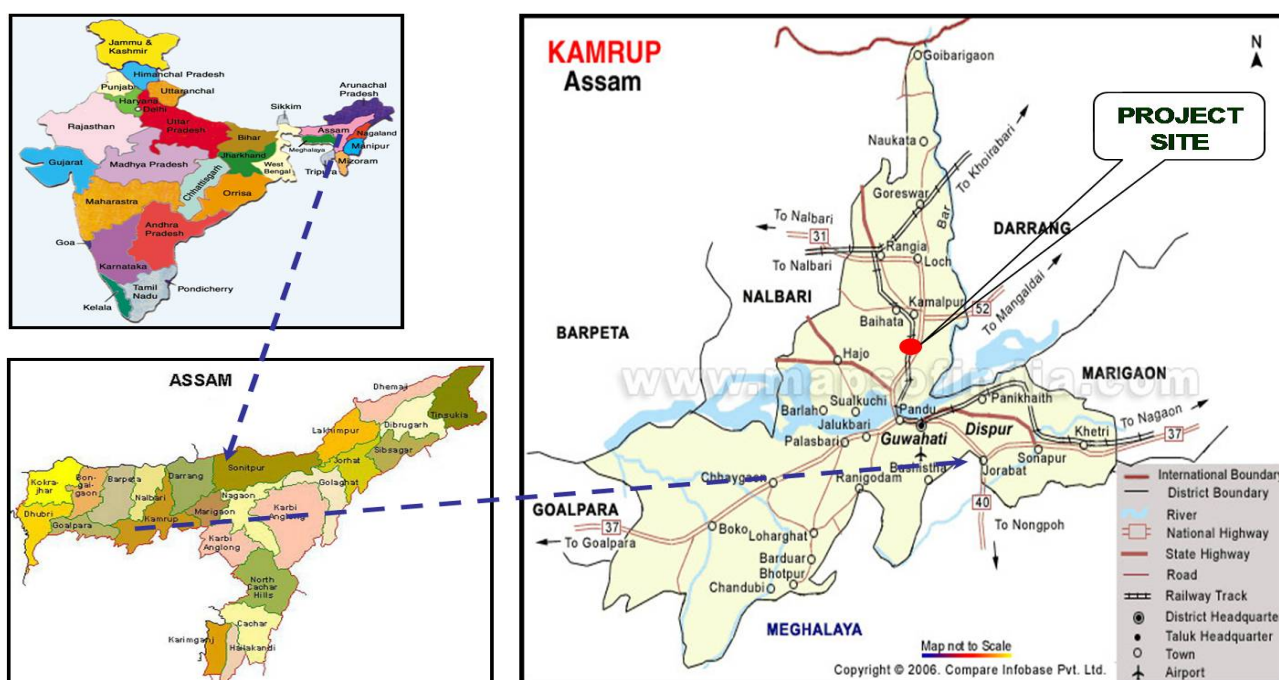


FIGURE-2.2 KEY INFRASTRUCTURE FEATURES AND SETTLEMENTS

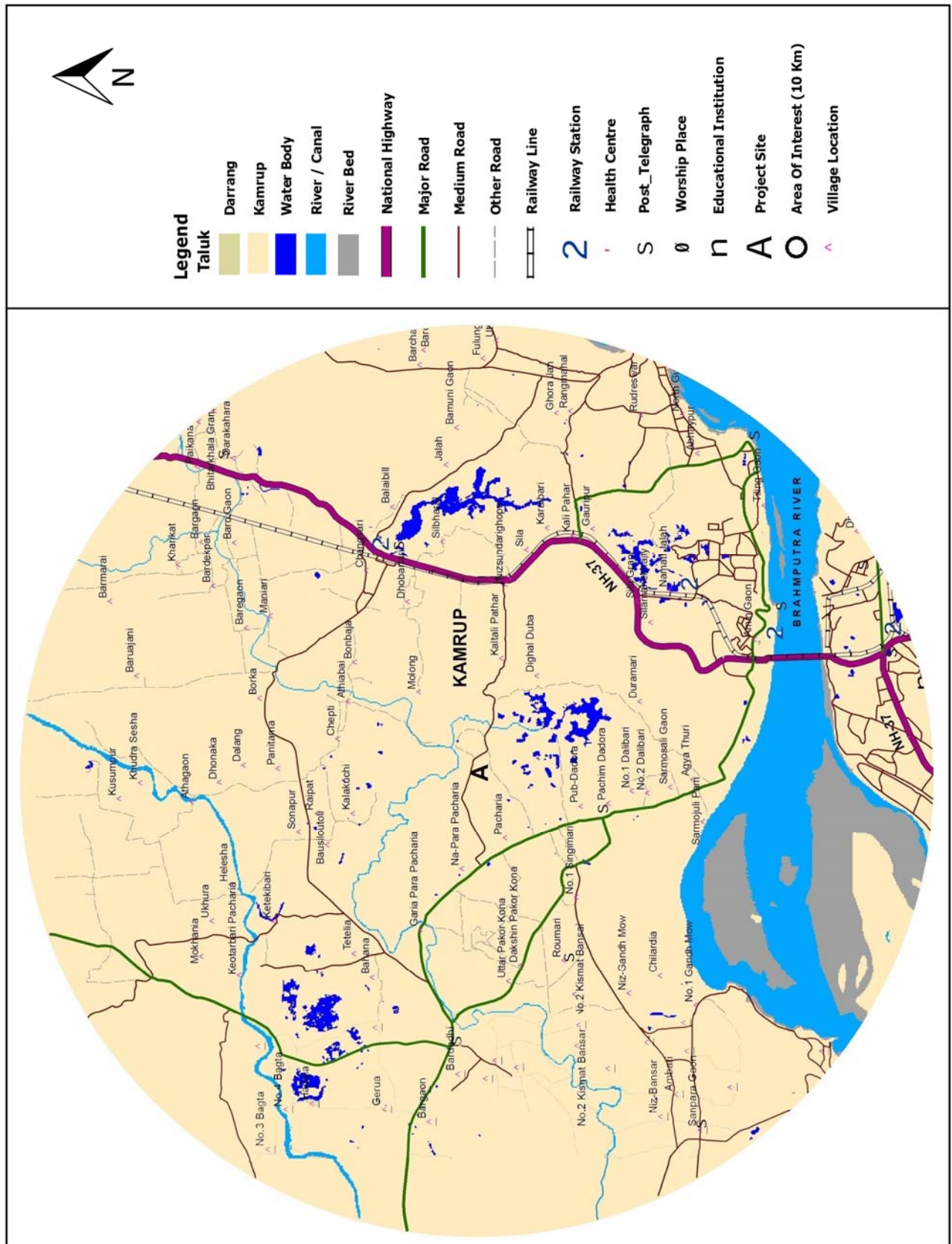


FIGURE-2.3 LAYOUT OF THE PLANT

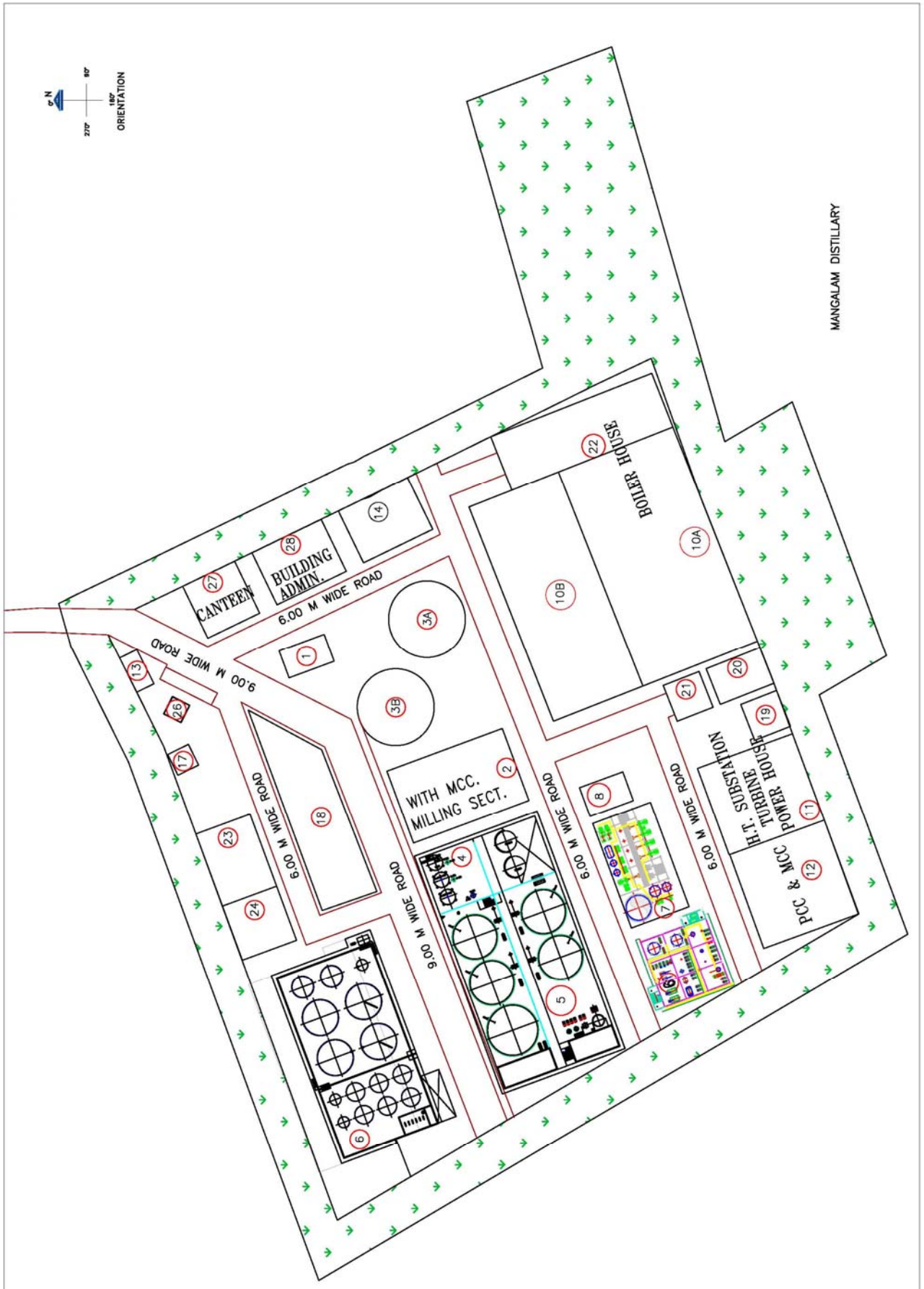


FIGURE-2.4 PHOTOGRAPHS OF THE PROJECT SITE

2.5 MAIN PHASES OF THE PROJECT

2.5.1 PRE CONSTRUCTION ACTIVITIES

Proposed project site is well connected with state and national highway and hence sufficient road communication is available, so there is no need to construct any approach road or site access. No significant pre-construction activities are anticipated.

2.5.2 CONSTRUCTION ACTIVITIES

Construction activities will take place within the open space of open plot. Construction of essential utilities shall be carried out. Erection of various machineries shall start simultaneously and is expected to be completed along side of construction activities which will consist of total 18 months after the construction is over. Construction materials, like steel, cement, crushed stones, sand, rubble, etc. shall be required for the project, will be procured from the local market of the region.

2.5.3 PRODUCTION ACTIVITIES

M/s. Manglam Distillers & Bottling Industries, Kamrup, Assam is going to produce following products.

TABLE-2.3 LIST OF PROPOSED PRODUCTS & PRODUCTION CAPACITIES

SR.NO.	NAME OF THE PRODUCT	PRODUCTION CAPACITY
1	ENA/RS/Industrial Alcohol	60 KLPD
2	Malt Spirit	6 KLPD
3	Cogeneration Power Plant	3 MW

2.5.3.1 RAW MATERIALS

2.5.3.1.1 RAW MATERIAL CONSUMPTION

Major raw materials used for manufacturing ENA (Extra Neutral Alcohol) is Broken Grains / damaged Grains / Flour with 65% w/w (Avg) Starch content, Yeast, Enzymes, Water, etc. After Alcohol concentration is used in Fermented wash 9.0% v/v (Average). Details of the raw materials, their source, mode of transportation and consumption for production are given in following table-2.4.

TABLE-2.4 RAW MATERIAL REQUIREMENT & THEIR SOURCE

SR. NO.	NAME OF THE RAW MATERIAL	CONSUMPTION MT/DAY	SOURCE & THEIR	MODE OF TRANSPORTATION
1.	Grains (Broken Rice / Maize/ Sorghum / Bajra / Wheat)	150 TPD	Assam, Bihar, West Bengal, Uttar Pradesh.	By Road
2.	Malt	15 TPD	Assam, Bihar, West Bengal, Uttar Pradesh.	By Road
3.	Alpha Amylase	30 Kg	Directly from the Chemical Companies	By Road
4.	Amyloglucosidase	30 Kg	Directly from the Chemical Companies	By Road
5.	Sulphuric Acid	50 Kg	Authorized Dealers	By Road
6.	Urea	60 Kg	Local Market	By Road
7.	Nutrients Ammonia	150 Kgs	Local Market	By Road
8.	Antifoam	0.6 kg per KL 36 kgs	Local Market	By Road
9.	Yeast	As per requirement	Authorized Dealers	By Road
10.	Biocides	30 kg	Local Market	By Road

2.5.3.1.2 RAW MATERIAL STORAGE AND TRANSPORTATION

Grain Storage:

Grains procured from various sources are unloaded into warehouse. From warehouse grains are transferred into large Storage Silos after Pre-Cleaning. Storage Silos are specially designed to keep the Grains in good condition for longer durations and also avoid its deterioration and theft, etc. It is being proposed to have 30 – 45 days of Grain Storage facility in the Distillery.

Alcohol (ENA & TA) daily receivers & bulk storage:

The Extra Neutral Alcohol/rectified Spirit & Absolute Alcohol is first taken to daily receiver storage tanks, which is based on the State Excise Laws, storage for three days considering the weekly holidays of two days. Thereafter, the alcohol is transferred to bulk storage tanks after taking the daily receiver Dip. This is transferred using flameproof pumps. Final dispatch of alcohol is metered and again is carried out using special flameproof pumps. The bulk spirit storage is proposed to be set up for 30 days. Details of alcohol storage tanks are given in chapter-6 of this report.

Scheme of mode of transportation:

The raw materials will be purchased from the external sources as mentioned above. All the raw material, waste and finished goods required for construction and operation phase shall be transported by Road/Rail. Total 85 trucks per day will be transported due to the proposed activity. The raw materials, waste & finished goods will be covered during transported through trucks to the site.

2.5.3.2 MANUFACTURING PROCESS

ENA Production:

ENA production involves the extraction and Saccharification of starches and their conversion into alcohol by fermentation process. To achieve the best results it has to be channeled through the following process:

- a) Grain Milling
- b) Cooking
- c) Fermentation
- d) Distillation

a) Grains Milling: - The process of converting grains to alcohol is by the single continuous fermentation process. This process offers benefits such as a very high yield of alcohol per MT of grain milled and a very low quantity of effluent generated from the plant.

- High efficiency of fermentation to the tune of 90%
- Savings in sugar due to yeast recycling
- Reduction in water consumption by stillage recycling
- Massive reduction in the spent wash generation to the tune of 3 liters per liter of ENA produced, without using any additional energy
- Distillation efficiency of 98.5 %
- Ultimately higher yields/recoveries to the tune of 380 liters/ton of grain mill

The incoming cereals are usually inspected upon receipt. The distiller will check the grain for bushel weight, moisture content, mold infestation and general appearance. If the cereal complies with the quality control standards, it will be unloaded into silos in preparation for milling. The purpose of milling is to break up the cereal grains to as small a particle size as possible in order to facilitate subsequent penetration of water in the cooking process. A wide variety of milling equipment is available to grind the whole cereal to a meal. Normally, most distilleries use hammer mills, although some may use roller mills, particularly for small cereal grains.

b) Cooking:- Cooking is the entire process beginning with mixing the grain meal with water through to delivery of a mash ready for fermentation. The key to cooking is to simply liquefy the starch so it can be pumped. The source of alcohol from cereal grains is the glucose polymer known as starch. The purpose of cooking and saccharification is to achieve hydrolysis of starch into fermentable sugars. In order for the α -amylase to bring about hydrolysis of the starch to dextrin's, the granular structure of the starch must first be broken down in the process known as gelatinization. When the slurry of meal and water are cooked, the starch granules start to absorb water and swell. They gradually lose their crystalline structure until they become large, gel-filled sacs that tend to fill all of the available space and break with agitation and abrasion. The peak of gelatinization is also the point of maximum viscosity of a mash. This mash contains 65% convertible sugar.

c) Fermentation:-The batch fermentation technology has many advantages like continuity of operation, higher efficiency and ease of operation.

Batch fermentation also results into consistent performance over a long period. Most modern ethanol production plants adopt fermentation technology. Considering all the above advantages, we have proposed to adopt the efficient fermentation in the distillery.

In fermentation, yeast consumes glucose and releases ethanol, carbon dioxide, and heat.

For each pound of glucose consumed, 0.489 lb of carbon dioxide, 0.511 lb of ethanol, and 170 Btu are generated. The process can be characterized by three phases:

1. The lag phase – the yeast cells become acclimated to their new environments
2. The exponential growth phase – the yeast cells propagate most rapidly
3. The death phase – the alcohol concentration is high, and the available sugar for yeast metabolism is low.

Most of the alcohol is produced during the exponential phase and decreases during the death phase. The following Figure shows approximate yeast and alcohol concentrations throughout the cycle:-

Figure Yeast Population and Alcohol Concentration throughout Fermentation:-

Typical fermentation processes convert about 90% of the fermentable sugars to ethanol. Yeasts consume about 5% of the fermentable sugars to produce new cells and minor products such as glycerol's, acetic acid, lactic acid, and fusel oils. The fermentation process employs a special yeast culture, which can withstand variations in the quality, temperature and other shock loads. Fermentation plant consists of five to six numbers Fermenters tanks connected in series with all the accessories like plate heat exchangers for cooling, spargers, broth mixers and air blowers etc. The yeast is immobilized using special media and it remains in the fermentation plant throughout and hence it gives tremendous advantages in maintaining the yeast population and in combating the bacterial infection. The Saccharified slurry from Saccharification section is pumped into Fermenters and is diluted to appropriate sugar concentration by adding water. It is, then inoculated with required quantity of suitable yeast. The assimilable nitrogen is added in the medium in the form of urea and dap. Temperature in the Fermenters is maintained with the help of plate heat exchanger. The fermented mash is reticulated continuously through PHE. Recirculation also helps in proper mixing of fermented mash. The rate of fermentation reaction gradually increases and after 50 to 55 hours, fermentation completes. After completion of reaction the fermented mash is delivered to mash holding tank. The fermented mash collected in the Clarified Wash Tank is then pumped to Mash or Primary column for distillation.

The CO₂, which is liberated, is scrubbed in water, with the help of CO₂ Scrubber. This CO₂ contains ethanol, which is recovered by collecting CO₂ Scrubber water into Sludge Trough. The diluted sludge is pumped into Sludge Settling clarifier. The traces of ethanol present in diluted sludge are separated at the supernatant, which is collected into BWT through overflow, and washed sludge from bottom is drained off. A closed loop cooling tower system with an induced draft-cooling tower with circulation pumps is also provided to ensure higher cooling efficiency and to minimize water wastages.

d) Hydro-Extractive Vacuum Distillation:- The vacuum distillation has many advantages over conventional distillation atmospheric distillation plants like lower energy requirement, very good quality alcohol and less scaling of the distillation trays due to sludge. The vacuum distillation produces ethanol of international quality standards and there is a lot of demand of ethanol from the vacuum distillation process. "The Extra Neutral Alcohol produced from this latest technology will meet most of the international quality standards for ethanol like US Pharmacopoeia, British Pharmacopoeia and Japanese standards." The vacuum distillation approximately requires 50 % less steam as compared with the conventional old distillation technologies. The vacuum distillation consists of distillation column with high efficiency column trays, condensers, Reboiler, vacuum pumps and reflux pumps. A closed loop cooling tower system with an induced draft-cooling tower with circulation pumps is also provided to ensure higher cooling efficiency and to minimize water wastages.

In this vacuum distillation ethanol is separated and concentrated using principle of fractional distillation. This is based on difference in boiling points of volatile compounds in mixture. There are six columns in the system Primary column also called Mash column, Rectifier column, Hydro extractive distillation column, Refining column, Aldehydes Column and Defuse Column.

The Primary or Mash column is operated under vacuum and it is heated using the vapors from the Rectifier column, which is operated under a slightly higher pressure. The vacuum operation of the Primary column will help in reducing the overall energy requirement and also improve the product quality. Due to vacuum operation of the Primary column the scaling of the column trays is minimized and plant can be operated without stoppage for a longer duration as compared with atmospheric plant.

The fermented mash is preheated using a beer heater at the top of the Primary column and followed by a plate heat exchanger and finally delivered to the top of Primary column. The pre heating of mash in two stages recovers energy and saves steam required for the distillation. The mash runs down the Primary column trays from tray to tray, while vapour goes up in the column contacting the mash at each tray. As a result of this contact and boiling, ethanol and other impurities along with some water are stripped in the form of vapors and remaining mash in the form of vinasse (effluent) is disposed off from the bottom of the Primary column for ETP. When the vapors of ethanol and other volatile compounds reach the top, they are separated out from the top of Primary column and are then condensed in beer heater and other Primary condensers. The heat is supplied by the Rectifier vapors from the Reboilers provided at the bottom of the Primary column. Two reboiler are provided at the bottom of the Primary column to facilitate the heat transfer from Rectifier column vapour to Primary column. The vapours from

Primary top condensed in the above condensers are collected and fed to the Hydro extractive distillation column for purification.

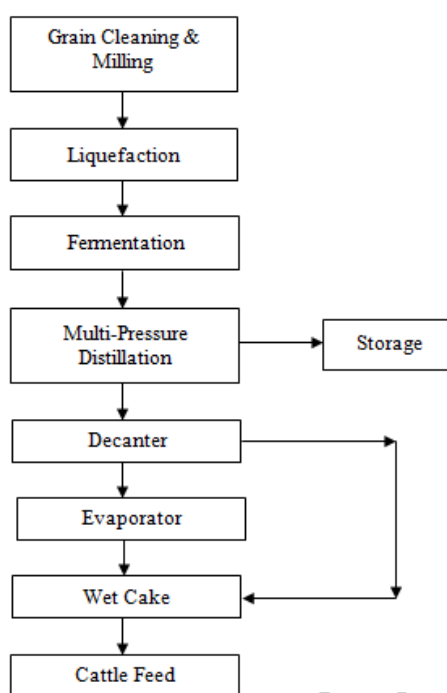
The ethanol streams from other columns are also diluted with soft water and are fed to Hydro extractive distillation column via a feed pre heater (plate heat exchanger). A Reboiler is installed at the bottom of the Hydro extractive distillation column. Impurities such as Aldehydes and Fusel oil are removed from the top of the Hydro extractive distillation column and are fed to Fusel oil concentration column, while dilute ethanol along with fewer impurities, are taken from the bottom of the Hydro extractive distillation column and fed to Rectifier column middle. Steam is fed to Hydroextractive distillation column through Reboiler. A Reboiler is installed at the bottom of the Rectifier column, which heats the process liquid i.e. alcohol and water received from the Hydro extractive distillation column, indirectly with the help of steam.

In the Rectifier column, the ethanol is concentrated to 96 % by refluxing the Rectifier reflux liquid. Extra neutral ethanol (ENA) is tapped from the top of Rectifier column, which is directly sent to Refining column for removal of other low boiling impurities. While the bottom product of the Rectifier column called spent lees is drained off. The higher alcohols also called light and heavy fusel oils are removed from the middle portion of the Rectifier column. Light and Heavy fusel oil from Rectifier column and top cut from Hydro extractive distillation column plus ester cut from Hydro extractive distillation column is fed to Fusel oil concentration column. The steam is delivered from the bottom of the Defusel Column to allow the desired separation. Fusel oil consisting of higher alcohols viz. amyl alcohol, Iso amyl alcohol, n-propenol etc. are concentrated near middle portion of Fusel oil concentration column and can be removed and separated in the Fusel Oil Decanter in sufficient higher concentration. While the bottom product called spent lees is drained off. The top product from the Defusel Column is cooled in the cooler and sent to storage as Technical Alcohol.

The Refining column is fed with the ENA from the Rectifier column, which is boiled off in the Refining column to remove the low boiling impurities like methanol and mercaptans. Extra Neutral Alcohol (ENA) is tapped from the bottom of the Refining column, which is cooled upto 30 °C, by passing through ENA cooler. The impure ethanol, which contains many impurities, is drawn from the top of the Refining column and cooled in the cooler and sent to storage as Technical Alcohol.

Alternatively diluting with soft water in Aldehydes Column as and when required can further purify some of these Technical Alcohol streams. Both fermentation and distillation are operated with PLC computer controls system. This will help in maintaining the parameters consistent and without any fluctuations. Most modern distillery plants use computer system for controlling their parameters. Process flow chart is shown in following figure.

FIGURE-2.5 PROCESS FLOW CHART OF DISTILLERY



Process flow chart of Distillery

Malt Spirit Production:

Production of malt spirit, Barley malt is used as raw material. It contains starch and enzyme. Their enzymes get activated under certain condition of temperature and pH. The following steps are involved in the manufacturing of Malt Spirit:

Malt Handling:- Malt received from near sugar factories will be stored in silos and taken to mill for crushing.

Malt Milling:- The weighed barley will be screened to remove stones, dust etc. The screened malt will be taken to malt mill with the help of bucket elevator system. Barley malt is then crushed with roller mill. The gap between two rollers will be adjusted to get uniform ratio of crushed malt (husk 20%. Coarse 70% and fine 10%). The crushed malt is called "Grist" and stored in tank called Grist Bin.

The grist will be mixed with hot water at predetermined temperature (64°C, 85°C and 95°C) rested for fixed duration. During which starch portion in the grist will be extracted by the water and simultaneously all the starch get converted in to fermentable sugar by the action of various enzymes present in the malt.

The extract liquid will be separated from the solid spent grain its called "wort" and it will be collected in wort receiver tank. Spent grain will be sold as cattle feed.

Wort Cooling:- There are four phases of the fermentation

Pitching: About 10 million cells per ml are added to the wort.

Yeast growth:- Yeast multiples resulting into a dense population of yeast biomass. The yeast ferments the sugar into alcohol, CO₂. After fermentation, the yeast floats to the top or settles to the bottom. Optimum temperature would be maintained by cooling water. The contents of the yeast activation vessel would then be transferred to fermentor. Yeast flocculates out to the bottom of the fermentor. During fermentation the yeast assimilates the available sugars and generates alcohol and CO₂. The wort after fermentation is called "wash". The wash will be pumped into the primary distillation pot (wash pot) made up of copper, provide with heating arrangement called calendria and condenser for cooling the vapour. Steam will be passed into calendria where alcohol portion from wash pot get evaporated. Alcohol vapour will pass through condenser gets condensed.

The distillate obtained from primary distillation is called "Low wine" and it's collected in Low wine tank. The primary distillation pot will be provided with sampling point to check the concentration of alcohol at regular intervals. Overall concentration of low wine will be checked.

The low wine will be pumped in secondary distillation pot made up of copper. Steam will be introduced into the pot by the coil heating arrangements. Alcohol vapour will get evaporated, condensed in condenser and concentrated fresh malt spirit will be obtained which will be collected in fresh malt spirit tank.

Impure spirit with lower strength will be collected in impure spirits tanks, which will be mixed with next batch of secondary dilution process.

Spent wash generated during primary distillation will contain high BOD, where as spent generated during secondary distillation contains less BOD.

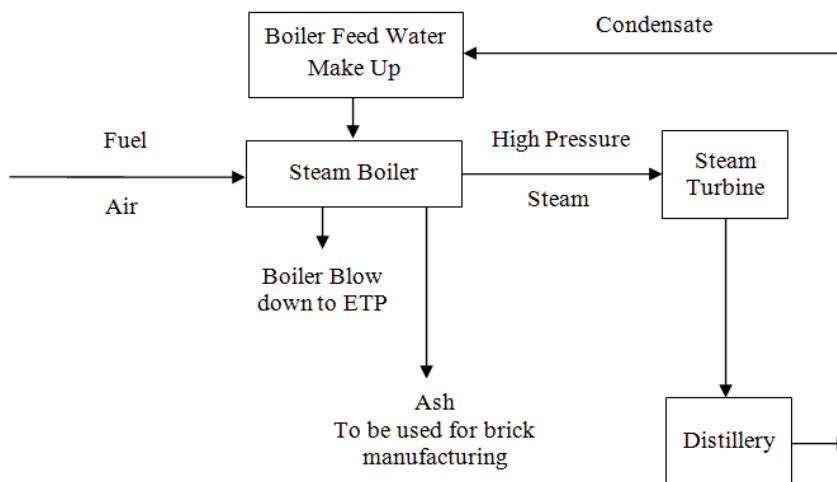
POWER: CO-GENERATION [3 MW]:

Proposed 3 MW co-generation plant consists of a high pressure water tube steam boiler and extraction cum condensing steam turbine. Fuel in the steam boiler will be burnt with the help of air in the boiler furnace. Water will be circulated in the boiler drum and tubes thus getting heated by the flame burning in the boiler furnace. Water comes out of the boiler drum located at the top of the boiler as steam. Flue gases rise in the boiler furnace and come in contact with the steam coming out of boiler drum. Steam after coming in contact with flue gases gets heated up further thus getting superheated. Super heated steam leaves the boiler in a pipe. Flue gases after super heating the steam pass through economizer where they pre-heat the boiler feed water before it enters the boiler drum. After economizer, flue gases pass through air pre-heaters where they heat the air which is fed to the boiler furnace for burning the fuel. After air pre heaters flue gases pass through an Electro Static Precipitator where the dust particles are collected on charged electrodes. The dust is collected from the bottom of the ESP/bag filter.

High pressure superheated steam from boiler is passed through a steam turbine and at the lower pressure goes to the condenser. The part of the steam is extracted from the extraction points provided on the turbine, which is used for distillery. The condensed steam returns to the steam boiler as condensate and is again boiled as steam. While passing through the turbine, the high pressure and temperature steam rotates the turbine rotor and an electric alternator mounted on the same shaft. Electric power is generated by the

alternator. This electric power generated is consumed in house i.e. for running the distillery and utilities like boilers auxiliaries etc. and surplus power will be exported to the state grid. Process flow chart is shown in following figure.

FIGURE-2.6 PROCESS FLOW CHART OF CPP



Process flow chart of CPP

2.6 INFRASTRUCTURE FACILITIES

2.6.1 LAND

Around 31,772.85 sq.m. (23 bigas, 3 Kattha and 15 Lacha) private land of Dag No. 160, 161, 154, 151, 155, 150, 156 and 157, comprised in KP. Patta No. 306, 248, 94, 75, 237, 317, 211 and 168 of Village Pachari, Dalarpathar, Mouza Pub Bongsor, District Kamrup, Assam is already acquired. Land allotment letter for the same is enclosed as annexure-II. Another 4,347.85 sq.m. private land is owned by the project proponent. Total land area of 36,120.7 sq.m. is earmark for the proposed project. Detailed Land use breakup of the land area is given in following table-2.5 and plant layout shown in figure-2.3 while photograph of the area is shown in figure-2.4.

TABLE-2.5 LAND BREAK-UP OF THE PLANT

NO.	PARTICULARS	AREA (sq. m.)
1	Grain Unloading Area	90
2	Grain Milling Section with MCC	640
3.A/B	Grain storage Silo	2514
4	Liquefaction & Fermentation Section	2048
5	Distillation, Evaporation & Decantation Section	870
6	Daily / Bulk Spirit Storage Section	1650
7.A/B	Boiler House	2005
8	Power house/Turbine/H.T Substation and PCC & MCC	1250
9	Security Cabin	9
10	WTP/ Water Storage	2700
11	Weigh Bridge	35
12	Administration Building	300
13	Excise Office	36
14	Parking	200
15	CT for Fermentation, Liquefaction & Distillation, Evaporation	350
16	Coal Yard/Coal Crusher	3000
17	MSEB Transformer	300

NO.	PARTICULARS	AREA (sq. m.)
18	DG Room	225
19	CT for Turbine	225
20	Canteen	300
21	Green belt	11920
22	Internal Road & Open area	5453.7
	TOTAL	36120.7

2.6.2 TRANSPORTATION FACILITIES

As project site is well connected through road and rail. Transportation of all the raw materials and products shall be primarily by road only.

2.6.3 WATER SOURCE AND UTILIZATION

Water requirement will be mainly for Process, DM water for RS dilution and boiler make up, soft water for flash tank and cooling towers, washing activities, domestic and miscellaneous. Entire water will be sourced from borewell within company premises. Permission for the drawl of water (720 KLPD) will be obtained. Waste water generated shall be recycled and reused in the process and other activities, thereby reducing load on fresh water demand. Details of water requirement are given in following table-2.6.

TABLE-2.6 WATER BALANCE (INPUT & OUTPUT): RECYCLE & NET CONSUMPTION

S.N.	TOTAL WATER INPUTS	KLPD	TOTAL WATER OUTPUTS	KLPD
1.	Process Water In Liquid & Fermentation	514	Steam Condensate	402
2.	DM Water For RS Dilution	576	Spent Lees Pr	100
3.	DM Water For Boiler Feed	499	Spent Lees Rectifer	620
4.	Soft Water For Analyser Flash Tank	104	Spent Wash (Grain Slops)	475
5.	Soft Water For Vacuum Pump & Others	30	Soft Water For Vacuum Pump & Others	30
6.	Soft Water Makeup For Cooling Tower	457	Water In Wet Cake (By-Product)	106
7.	Misc. Washing Water	20	Ct Evaporation & Drift Losses	457
8.	Other Domestic Usage	20	Misc. Washing Water	20
			Domestic Consumption	10
	TOTAL	2220	TOTAL	2220
RECYLCE & UTILIZATION STREAMS		KLPD		
1.	Lees Recycle For RS Dilution	468		
2.	Steam Condensate Recycle For Boiler	402		
3.	Spent Lees (Rect) - Cooling Tower Makeup	154		
4.	Thin Slops Recycle To Liquid Process	176		
5.	Process Condensate To Process & Ct	270		
6.	Vacuum Pump Recirculation	30		
Total Recycling /Re-Utilizations Of Water Per Day		1500		
Total Fresh Water Input		720		

2.6.4 POWER REQUIREMENTS

The estimated power requirement for the proposed project is 3 MW. The company proposes to set up a co-generation power plant to meet its steam and electrical energy requirement. For initial start up and emergency purpose, two D. G. Sets of 900 KVA capacity will be installed. Detailed breakup of power consumption is given in following table-2.7.

TABLE-2.7 ANTICIPATED POWER CONSUMPTION

SR. NO.	POWER CONSUMPTION (KW) (ESTIMATED)	CONNECTED LOAD (KW)
1.	Liquefaction Section	150
2.	Fermentation Section	300
3.	Distillation section	150
4.	Evaporation Section	100
5.	Auxiliaries (Liqn + Ferm + Dist + Evpn)	570
6.	Grain Loading & Unloading (SILO System)	75
7.	Grain Cleaning & Milling	380
8.	Centrifuge Decanters (2+1 nos.)	150
9.	Spirit Storage Section	30
10.	Secondary Treatment & Recycle	100
11.	Borewells, WTP & Transfer	110
12.	Boiler & Accessories	400
13.	Turbine & Accessories (Cooling Tower)	120
14.	OBL Plants & Yard Lighting	25
15.	Blending & Bottling (4 Lines)	150
16.	Administration Building	40
17.	Other Misc. Provisions/ Guest House	50
18.	DDGS Dryer (Estimated)	100
	TOTAL ESTIMATED ELECTRICAL LOAD	3000 KW

2.6.5 FUEL REQUIREMENTS

Coal shall be source from Assam and Meghalaya, MoU for the same will be made after execution of the project. The Fuel requirement, their source and distance and mode of transportation are given following table-2.8.

TABLE-2.8 FUEL REQUIREMENT

SR. NO.	NAME OF THE FUEL	CONSUMPTION	SOURCE & THEIR DISTANCE (KM)	MODE OF TRANSPORTATION
1.	Coal or Rice Husk for Boiler	70 TPD Coal	Coal from Assam/ Meghalaya & Biomass from nearby area	By Road
		100 TPD rice Husk	Nearby sources	By Road
2.	HSD for stand by D. G. set	300 LPH	Nearby sources	By Road

2.6.6 STEAM REQUIREMENT

The steam shall be generated using 30 TPH boilers and will be utilized in the generation of 3 MW power as well as used in the process. Break up of steam consumption is given in following table-2.9.

TABLE-2.9 STEAM CONSUMPTION DETAILS

SR. NO.	STEAM REQUIREMENTS	UNIT	NORMAL @ 100% CAPACITY CONTINUOUS	PEAK CONTINUOUS
1.	Cooking & Liquefaction	TPH	2.8	3.2
2.	Multi-Pressure Distillation	TPH	10.3	11.8
3.	Evaporation (Integrated)	TPH	2.8	3.2
4.	DWGS Drier (DDGS)	TPH	7.1	8.1
5.	Boiler Deaeration (Estimate)	TPH	1.1	1.2
6.	Misc. Requirements.	TPH	0.4	0.4
	Total Distillery Steam Requirement	TPH	24.5	28.0

2.6.7 BOILER DETAILS

A 30 TPH Atmospheric Fluidized Bed Combustion (AFBC) Boiler is proposed to be set up for the purpose of steam generation for process requirement & power generation.

- ❖ Boiler : Atmospheric Fluidized Bed Combustion
- ❖ Type of Fuel used : Rice Husk/ Coal
- ❖ Capacity of Boiler : 30 TPH
- ❖ Pollution Control Equipment Measures : Bag Filter/ESP

2.6.8 MANPOWER REQUIREMENTS

The proposed plant shall employ 60 personnel. During employment first preference will be given to local people.

2.7 SOURCE OF POLLUTION AND CONTROL MEASURES**2.7.1 WASTE WATER STREAMS**

The distillation industry is a water intensive industry and discharges considerable amount of Effluent. However, in Grain based Distilleries, most of the Effluent quantities comprise organics including fibres & proteins etc., which are separated by concentration in Multi-Effect Evaporators. The Fibres & Solids thus separated are utilized as Cattle Feed due to their rich fibre & protein content. The Process Condensates with very low volatiles are conveniently recycled back to process use in Liquefaction & Fermentation. The Steam Condensates are recycled back to the Boiler. The manufacturing of ENA generates effluent from the following sources:

1. Process wastewater (Spent Wash): After separation of Suspended Solids for use as Cattle Feed, it is partly recycled & partly evaporated. Thus this stream is not subject to any discharge.
2. Process wastewater (spent lees): This Stream is cooled & neutralized. It is then used for Cooling Tower Water Makeup. This stream is also not subject to any discharge.
3. Blow down from Boiler & Cooling tower: Proposed to be used on Internal Green Belt Development. (Refer table below)
4. Domestic waste water will be disposed through Soak Pit & Septic Tank.
5. Misc. Washings, etc. water stream is expected to evaporate on the floors during washings. & partly utilized on Green Belt Development. (Refer table below)

Wastewater characteristic is given in following table-2.10.

TABLE-2.10 DETAILS OF WASTE WATER: CHARACTERISTIC & UTILIZATION

S.N.	PARTICULARS	CHARACTERISTICS
1.	Boiler Blow Down (Boiler & Cooling Tower)	pH : Neutral BOD < 100 ppm TDS < 1000 ppm
2.	PR Lees	
3.	Misc. & washing	
	TOTAL	

2.7.1.1 WASTE WATER TREATMENT, RECYCLE & UTILIZATION

The effluent generated from the ENA production process is segregated as process effluent (spent wash and spent lees) and effluent from utilities like Boiler, Vacuum pump, washings. The company proposes to follow & set up a “Zero Effluent Discharge” scheme. The condensates from evaporation shall be recycled and reused in Process & Make up water streams.

Spent wash shall be decanted for separation of Suspended Solids and Multi-Effect Evaporation arrangement. Condensate shall be reused and spent lees shall be recycled back to Distillation.’

Wastewater from Boiler (Blow down) as well as miscellaneous Water shall be used in in-house Gardening and Green Belt development.

Domestic wastewater generated shall be discharged into septic tanks and disposed off using soak pit/well.

Treatment Philosophy:**Decantation:**

Decanter centrifuge are used to separate solid matter from spent wash stream. The Decanter consists of a bowl rotating at high speed and a screen conveyer running at different speed. The effluent/slops are fed into the Decanter. Segregation of solids from the slurry is actuated by centrifugal force. The segregated solids known as Wet cake (30-35% w/w solids) are removed from bottom of decanter and are directly loaded on the trolleys. The supernatant called thin slops coming out of Decanter are collected in a tank and transferred for part recycle & further for Evaporation.

Multiple Effect Evaporation:

The Thin Slop from Decantation section is first taken into a feed tank and then fed to the Evaporation system through Pre-heater in 1st effect mixed feed mode and it flows from first to second to third to fifth to fourth effects.

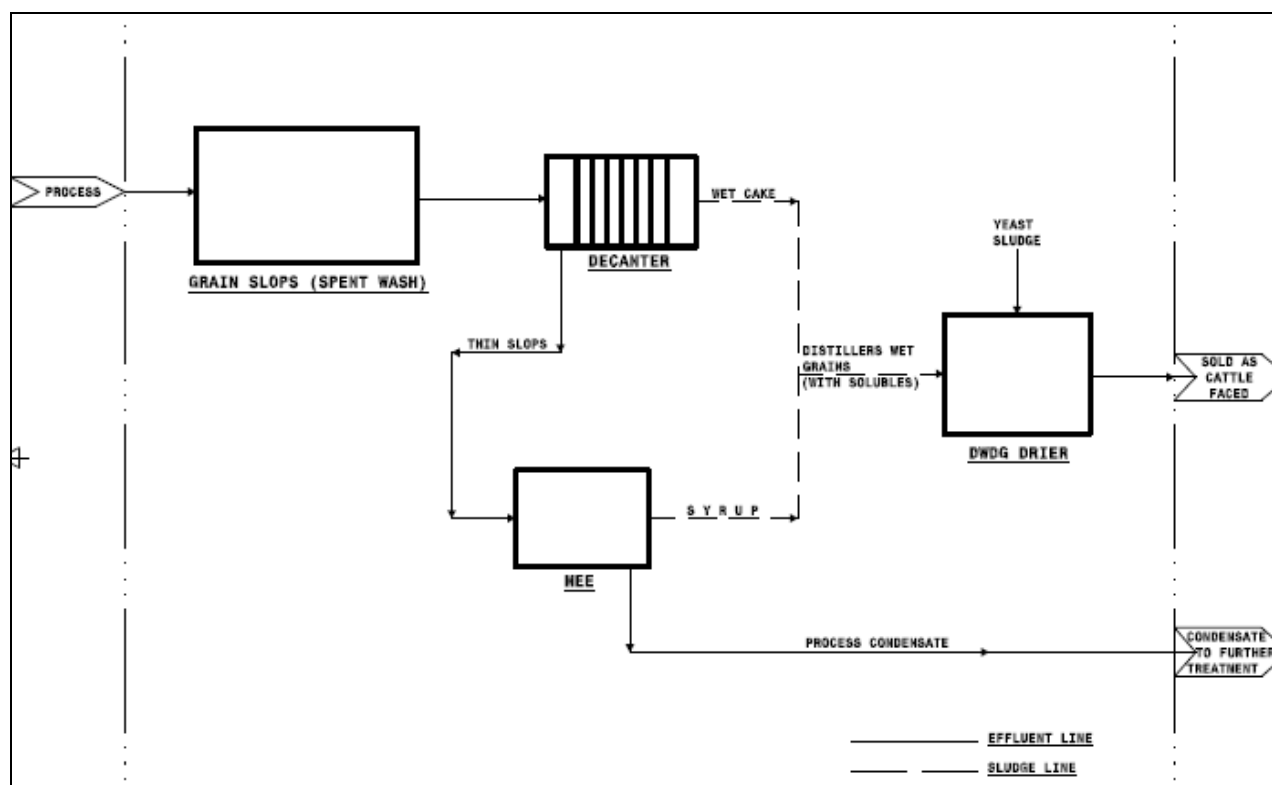
The concentrated Syrup with 35 % w/w total solids is taken out from the Second effect. The low-pressure steam shall be supplied to the First effect shell side. Vapours generated in the First effect are used as a heating medium in the second effect & vapours generated in the second effect are used as a heating medium in the 3rd effect vapours generated in third effect are used as heating medium in fourth effect. Vapours generated in fourth effect are used as heating medium in fifth effect.

The Thin slop feed shall be concentrated from the initial concentration of 5 – 6 % w/w TS to 35 %w/w TS as it travels through the multi-stage evaporation.

The concentrated syrup shall be mixed with Wet Cake from decanter forming Distillers’ Wet Grains with Solubles (DWGS) and then dried through DWDS Drier.

The used steam shall be condensed using surface condenser. The condensate from Second, Third, fourth, Fifth effect and surface condensers condensate is collected in a condensate tank.

FIGURE-2.7 SCHEMATIC FLOW DIAGRAM OF SPENT WASH TREATMENT



2.7.1.1.1 CONDENSATE TREATMENT

The condensate from the process shall be treated and reused back in to the alcohol manufacturing process as process water or cooling water make-up thereby reducing the requirement of fresh water.

Treatment Philosophy:

Collection cum Neutralization Tank:

The process condensate shall be collected in the collection tank. Caustic (Sodium Hydroxide) is added for neutralization. Continuous mixing with the help of agitator is provided in the tank.

Filtration:

The neutralized condensate passes through micron cartridge filter for the removal of residual suspended solids. The filtrate (permeate) shall be collected in the treated water tank to be reused in process.

2.7.1.1.2 DOMESTIC WASTEWATER

The domestic waster shall be disposed in septic tank and discharged off through soak pit/well.

2.7.2 AIR POLLUTION

Air in the plant area and beyond its boundaries gets polluted with gases, fumes and dust particles emanating from the point source. Point sources are the stacks attached to Boiler and D.G. Set, which emits Particulate Matter, SO₂ and NO_x. Details of proposed stacks with pollution control measures are given in following table-2.11.

Air Pollution Control Measures:

The unit will install Bag Filters / ESP to control air emissions. Adequate Stack height shall be provided to control and disperse the air pollutants within the satisfactory levels.

Proposed stacks and Pollution control equipments are presented in the following table-2.11.

TABLE-2.11 PROPOSED STACKS AND AIR POLLUTION CONTROL MEASURE

NO. OF STACK	STACK ATTACHED TO	NAME & QUANTITY OF FUEL	POLLUTION CONTROL EQUIPMENT	HEIGHT & DIAMETER (MTR)	POLLUTANT AS PER SPCB LIMIT
1.	30 TPH Boiler	Coal 70 TPD or Rice Husk 100 TPD	Bag Filter / ESP	Ht. 45 m & dia. - 2 m	PM – 150 mg/Nm ³ SO ₂ – 100 ppm NO _x – 50 ppm
2.	D. G. Set of 900 KVA (Standby facility)	Diesel 300 Lit./Hr	Industrial Grade Resistive Mufflers and RCC room with proper ventilation	Ht. - 9 m & dia. - 0.4 m	PM – 150 mg/Nm ³ SO ₂ – 100 ppm NO _x – 50 ppm

2.7.2.1 FUGITIVE EMISSION

Fugitive emission from distilleries includes evaporation of wastewater, volatilization of alcohol from process & storage tanks, dust from stock piles, Spills and material handling and open vessel. Bag filters shall be installed at unloading section to minimize the PM emission at the site.

2.7.3 NOISE POLLUTION AND CONTROL SYSTEM

The noise levels are primarily generated due to industrial activities like mechanical movement and material handling in unit. Noise may generate from loading unloading, motors, vehicular movement, generators, etc. general noise levels within plant are expected to remain below 75 dB(A). In order to mitigate the noise levels during the operational phase, a green belt will be developed around the periphery of the plant. However, at places where noise levels may exceed the permissible limit, acoustic enclosure shall be provided.

2.7.4 LAND/SOIL POLLUTION AND CONTROL MEASURES

Grain Residue (DDGS/DWGS) and fly ash from the boiler as a solid waste are generated. The whole grain residue will be sold for cattle feed. Fly ash shall be sold to nearby Cement plant or brick manufacturers. Proper care shall be taken to reduce the waste generation. The sources of solid wastes, generation and its management are as given in the following table-2.12.

TABLE-2.12 DETAILS SOLID WASTE GENERATION AND DISPOSAL METHOD

SR. NO.	PARTICULAR	SOURCE	QUANTITY (PER DAY)	METHOD OF STORAGE & DISPOSAL
1.	Grain Residue (DDGS/DWGS)	Process	Approx 120 MT as DWGS or approx 42 MT as DDGS	Dried and sold for cattle feed
2.	Fly ash	Boiler	Approx 10 MT	Sold to Cement or brick manufacturers.

CHAPTER – 3

BASELINE ENVIRONMENTAL STATUS

The baseline status of environmental quality in the vicinity of project site serves as the basis for identification, prediction and evaluation of impacts. The baseline environmental quality is assessed through field studies within the impact zone for various components of the environment, viz. air, noise, water, land and socio-economic. The baseline environmental quality has been assessed in the Winter Season (November, 2014 to January, 2015) in a study area of 10 km radial distance from the project site. Location map of the project site with study area is given in figure-3.1.

Knowledge of baseline environmental status of the study area is useful for Impact Assessment Process of assessing and predicting the environmental consequences of the significant actions. Significant action depicts direct adverse changes caused by the action and its effect on the health of the biota including flora, fauna and human being, socio-economic conditions, current use of land and resources, physical and cultural heritage properties and biophysical surroundings. Baseline data generation of the following environmental attributes is essential in EIA studies.

1. Meteorology
2. Ambient Air Quality
3. Ambient Noise Quality
4. Surface and Ground water Quality
5. Soil Quality & Geological Features
6. Land use pattern
7. Biological Information
8. Socio-economic status survey

3.1 ESTABLISHMENT OF IMPACT ZONE

Deciding whether a proposed action is likely to cause significant adverse environmental effects is central to the concept and practice of EIA. Before proceeding for baseline data generation, it is important to know the boundary limits and framework, so that the data generated can be effectively utilized for impact assessment. In this context, delineate of impact zone plays an important role. Generally the impact zone for industrial actions is classified into three parts; Core Zone, buffer Zone and Unaffected Zone, as illustrated below. The area of impact zone invariably changes from project to project and depends on the nature and magnitude of activities.

✦ Core Zone (Host and Proximate Area where the proposed activities is completed)- This area is closest to the activity where the background quality of environmental and human health is always at high risk. This involves risks due to steady state, transient and accidental release of pollutants, noise, increased traffic congestion and social stress. The immediate vicinity of the plant that is around 3 km radius is factual core zone in this case.

✦ Buffer zone (Moderately affected area)- Being a little away from the activity, the discharge pollutants need time lag to be transported to this area and gets attenuated/diluted to a considerable extent. However, the associated risk shall be real during brake-down, failure or upset conditions, and simultaneously with adverse meteorological and hydrological factors. Distance from 3 km to 7 km around the project site in the factual buffer zone in this case. This is based on the mathematical modeling study and air pollution dispersion pattern.

✦ Unaffected Zone- This area shall not be at risk of serious damage to life, health and property. Here the impact becomes small enough to become imperceptible and/or inconsequential and/or insignificant and normal life activities shall prevail without any disturbances due to the activity. Distance away from the 7 km buffer zone is the factually unaffected zone in this case.

While generating the baseline status of physical and biological environmental of the study area, the concept of impact zone has been considered. The Impact zone selection is based on preliminary screening and modeling studies. For demography and socio-economics, block wise data has been collected and used for the assessment of impacts.

3.2 CLIMATE

The climate of the study area is humid and tropical. A hot and humid pre-monsoon from March to mid May, a prolonged southwest monsoon or rainy season from mid May to September, a pleasant post-monsoon or retreating monsoon from October to November and a cold pleasant winter from December to February are the characteristics of the general climate. Summer runs concurrently with the later part of the pre-monsoon season and continues throughout the monsoon season.

In Assam Sometimes, the monsoon commences in mid-May and ends in mid-October. Therefore, the boundaries between the seasons are not very rigid. Considering the monsoon pattern of the study area November December and January are considered to be representative study period.

3.3 METEOROLOGY

Air borne pollutants is dispersed by atmospheric motion. Knowledge of these motions, which range is scale from turbulent diffusion to long-range transport by weather systems. It is essential to simulate such dispersion and quality of impacts of air pollution on the environment. The purpose of EIA is to determine whether average concentrations are likely to encounter at fixed locations (Known as the receptor), due to the given sources (locations and rates of emission known), under idealized atmospheric conditions. It is imperative that one should work with idealized condition and all analysis pertaining to air turbulence and ambient air or noise pollution should be done with meteorological conditions, which can be best expected to occur.

Meteorology data has been extracted from the Indian Meteorological Department (IMD), Long Term Climatological Tables, 1961-1990 of Guwahati (Bhorjar) station which is presented in following sections. A copy of the long-term Climatological data is enclosed as Annexure-III.

3.3.1 TEMPERATURE DETAILS

Mean daily maximum temperature is recorded in the month of August at 32.1°C. Highest mean temperature in the month, recorded in April, is 36.1°C.

From October to January, both day and night temperatures begin to decrease rapidly. January is generally the coldest month, with mean morning temperatures of 15.3°C. Mean daily minimum temperature of about 10.2 °C is recorded in January.

During the post-monsoon months of October to November, day temperatures remain between 21.4-25.8 °C. In winters, i.e. December to February, day temperatures remain between 15.3-17.7 °C.

3.3.2 RELATIVE HUMIDITY (RH)

Most humid conditions are found in the monsoons, followed by post-monsoons, winter and summer in that order. Mornings are more humid than evenings and humidity ranges from a high of 83-85% in monsoon mornings to a low of 47-70% in summer evenings. During post-monsoon season, in morning humidity remains between 83-84 % and in the evening it remains between 79-80%.

3.3.3 RAINFALL

The total rainfall in year is observed to be 1680.1 mm. Distribution of rainfall by season is 34.0 mm in winter (December to February), 325.3 mm in summer (March, April, May), 1232.2 mm in monsoons (mid May to September) and 106.1 mm in post-monsoons (October to November).

3.3.4 PREDOMINANT WIND DIRECTION

Pre dominant wind direction is shown as following table-3.1.

TABLE-3.1 PREDOMINANT WIND DIRECTION

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
FIRST HIGHEST												
Morning	CALM	CALM	CALM	NE	NE	CALM	CALM	CALM	CALM	CALM	CALM	CALM
Evening	CALM	CALM	CALM	NE	NE	CALM	CALM	CALM	CALM	CALM	CALM	CALM
SECOND HIGHEST												
Morning	NE	NE	NE	E	CALM	NE	NE	NE	NE	NE	NE	NE
Evening	NE	NE	NE	CALM	CALM	NE	W	W	W	NE	NE	NE, E
THIRD HIGHEST												
Morning	E	E	E	CALM	E	E	E	E	E	E	E	E
Evening	E	W	W	E	E	W	NE, NW	SW	SW	E	E	S

As per Indian Meteorological Department (IMD), Long Term Climatological Tables, 1951-1980 the predominant wind direction during the study period in winter season is observed to be from NE direction.

3.3.5 CLOUD COVER

The area remains cloudy between June - September, which is the active period of the monsoon season. Generally cloud cover ranges from 4 to 7 Oktas during this monsoon season.

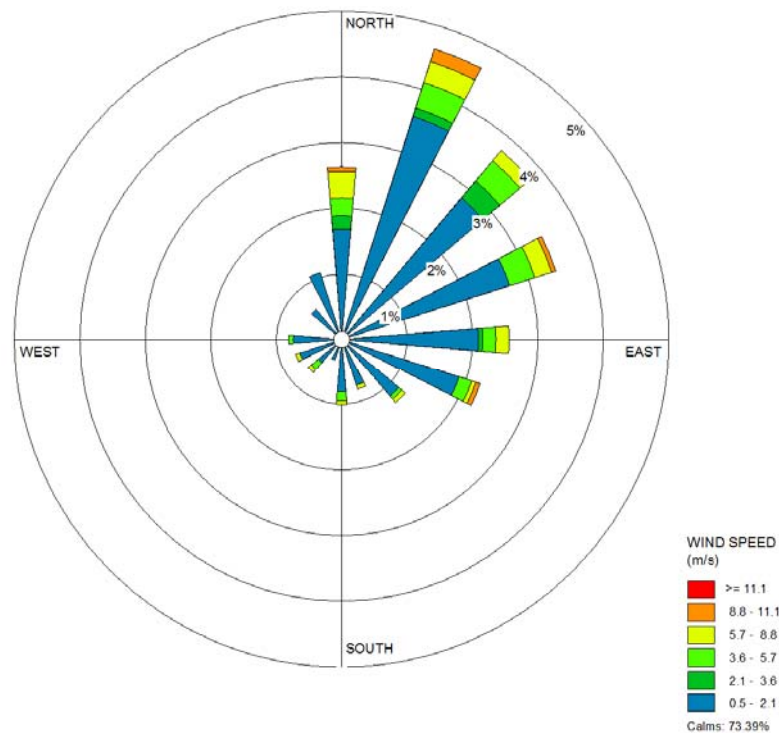
3.4 SITE SPECIFIC MICRO-METEOROLOGY DATA

Weather station was installed at the project site to record micrometeorological parameters on hourly basis during study period to understand the wind pattern, temperature variation, relative humidity variation, etc. Site-specific mean meteorological data is given in table-3.2 and the wind rose diagram processed by ISCST3 software from data collected at site is shown in figure-3.2.

TABLE - 3.2 SITE SPECIFIC METEOROLOGICAL DATA (NOV-2014 TO JAN-2015)

METEOROLOGICAL PARAMETER	MONTH OF YEAR 2014-2015		
	NOVEMBER	DECEMBER	JANUARY
Temperature (°C)			
Min.	21.1	15.4	14.2
Max.	39.3	36.2	33.1
Avg.	29.5	23.1	21.1
Relative Humidity (%)			
Min.	42.0	32.0	34.0
Max.	96.0	96.0	90.0
Avg.	71.9	72.8	70.1
Wind Speed (m/s)			
Min.	0.0	0.0	0.0
Max.	3.0	3.4	11.0
Avg.	0.5	0.4	0.7

FIGURE - 3.2 WIND ROSE DIAGRAM



3.5 DRAINAGE PATTERN OF THE AREA

The entire area of the District Kamrup is situated at the plains of the Brahmaputra Valley. The district Kamrup is well drained by River Brahmaputra. A number of seasonal streams ordinate from the study area and merge with larger streams and rivers as tributaries of the river Brahmaputra, viz. Puthimari, Bornoï, Kulsi, Pagladiya, Kalajal, and Nona. The tributaries of the Brahmaputra in the District originate from the foothills of the Himalayan range.

3.6 AIR ENVIRONMENT

3.6.1 DESIGN OF NETWORK FOR AMBIENT AIR QUALITY MONITORING LOCATIONS

The air quality status in the impact zone is assessed through a network of ambient air quality monitoring locations. The tropical climatic conditions mainly control the transport and dispersion of air pollutant during various seasons.

The baseline studies for air environment include identification of specific air pollutants prior to implementation of the project. The Environmental Impact Assessment (EIA) study requires monitoring of baseline air quality during one season. Accordingly, air quality monitoring was carried out during November 1st, 2014 to January 31st, 2015. The baseline status of the air environment is assessed through a systematic air quality surveillance programme, which is planned based on the following criteria:

- Topography / terrain of the study area
- Regional synoptic scale climatologically normal
- Densely populated areas within the region
- Location of surrounding industries
- Representation of regional background
- Representation of valid cross-sectional distribution in downwind direction

3.6.2 RECONNAISSANCE

Reconnaissance was undertaken to establish the baseline status of air environment in the study region. Eight Ambient Air Quality Monitoring (AAQM) locations were selected based on guidelines of network sitting criteria. All AAQM locations were selected within the study area of 10 km radial distance from the project site.

3.6.3 METHODOLOGY FOR AMBIENT AIR QUALITY MONITORING

The ambient air quality monitoring was carried out in accordance with guidelines of Central Pollution Control Board (CPCB) of June 1998 and National Ambient Air Quality Standards (NAAQS) of CPCB of December 2009. Ambient Air Quality Monitoring (AAQM) was carried out at Eight locations during November, 2014 to January, 2015 for parameters such as Particulate Matter (PM₁₀ and PM_{2.5}), Sulphur Dioxide (SO₂), Oxides of Nitrogen (NO_x), Carbon Monoxide (CO), Hydrocarbon (HC). Sampling locations were selected from the study area of 10 km radial distance around the plant site. The monitoring was carried out 24 hours a day twice a week per location in the study area was carried out. Twenty Six numbers of observations were taken at each monitoring location. The locations of the different stations with respect to its distance and direction from project site are shown in table-3.3 and figure-3.3 respectively.

The values for mentioned concentrations of various pollutants at all the monitoring locations were processed for different statistical parameters like arithmetic mean, minimum concentration, and maximum concentration and percentile values. The existing baseline levels of PM₁₀, PM_{2.5}, SO₂, NO_x, CO, Hydro Carbon (HC) are expressed in terms of various statistical parameters as given in tables-3.3. Prevailing air environment quality standards are enclosed as an annexure-IV.

TABLE - 3.3 DETAILS OF AMBIENT AIR QUALITY MONITORING LOCATIONS

SR. NO.	NAME OF VILLAGE	APPROXIMATE RADIAL DISTANCE FROM PROJECT SITE (KM)	BEARING W.R.T. PROJECT SITE	TYPE OF AREA
1.	Project Site (A1)	-	-	Industrial
2.	Industrial Unit in Vill. Changsari (A2)	4.7	E	Industrial
3.	Dolibari (A3)	3.10	SWS	Residential
4.	Namati jalah (A4)	6.77	SSE	Residential
5.	Barijanni Pathar Pacharia (A5)	3.99	NNW	Residential
6.	Kalakuchi (A6)	3.45	NNE	Residential
7.	Sesa (A7)	5.80	W	Residential
8.	No. 1 Gandh Mow (A8)	4.68	WSW	Residential

TABLE - 3.4 AMBIENT AIR QUALITY STATUS

SR. NO.	SAMPLING LOCATION	-	PARAMETERS					
			PM ₁₀ ($\mu\text{g}/\text{m}^3$)	PM _{2.5} ($\mu\text{g}/\text{m}^3$)	SO ₂ ($\mu\text{g}/\text{m}^3$)	NO ₂ ($\mu\text{g}/\text{m}^3$)	CO ($\mu\text{g}/\text{m}^3$)	HC (mg/m^3)
1.	Project Site (A1)	Min.	61.8	30.9	7.1	18.6	408	BDL
		Max.	73.8	37.5	8	20.3	460	BDL
		Ave.	68.5	34.8	7.6	19.5	433	BDL
		98 th Per.	73.6	37.4	8.0	20.3	459	BDL
2.	Industrial Unit in Vill. Changsari (A2)	Min.	76.2	38.6	8.1	20.9	458	BDL
		Max.	89.3	45.3	9.3	24.6	510	BDL
		Ave.	83.6	42.5	8.7	23.0	484	BDL
		98 th Per.	89.2	45.2	9.3	24.5	509	BDL
3.	Dolibari (A3)	Min.	53.1	26.5	5.5	16.2	318	BDL
		Max.	64.1	32.8	6.5	17.5	386	BDL
		Ave.	59.2	29.8	6.0	16.9	344	BDL
		98 th Per.	63.7	32.6	6.5	17.5	383	BDL
4.	Namati jalah (A4)	Min.	66.1	33.6	7.2	17.6	430	BDL
		Max.	81.2	41.2	8.2	19.1	494	BDL
		Ave.	73.6	37.3	7.7	18.4	465	BDL
		98 th Per.	80.8	41.0	8.2	19.1	493	BDL
5.	Barijanni Pathar Pacharia (A5)	Min.	47.3	24.5	4.8	14.4	276	BDL
		Max.	58.6	29.6	5.9	16.4	318	BDL
		Ave.	52.4	26.6	5.3	15.3	295	BDL
		98 th Per.	58.3	29.5	5.9	16.3	317	BDL
6.	Kalakuchi (A6)	Min.	36.2	18.9	4.5	12.6	184	BDL
		Max.	49.1	25.6	5.8	14	252	BDL
		Ave.	42.1	21.5	5.0	13.3	214	BDL
		98 th Per.	48.6	25.2	5.7	14.0	251	BDL
7.	Sesa (A7)	Min.	33.5	17.1	4.4	12.5	162	BDL
		Max.	42.8	21.9	5.4	14.6	198	BDL
		Ave.	38.3	19.7	4.9	13.5	178	BDL
		98 th Per.	42.6	21.9	5.4	14.6	197	BDL
8.	No. 1 Gandh Mow (A8)	Min.	51.8	25.6	5.4	17.3	228	BDL
		Max.	63	32.6	6.8	19.5	283	BDL
		Ave.	57.7	29.1	6.0	18.6	252	BDL
		98 th Per.	63.0	32.4	6.7	19.4	281	BDL

Note: BDL is $< 0.1 \text{ mg}/\text{m}^3$

3.6.4 RESULT AND DISCUSSION

The existing baseline levels in winter season with respect to PM₁₀, PM_{2.5}, SO₂, NO_x, CO and HC expressed in terms of various statistical parameters are presented in tables-3.4.

During the monitoring period, the arithmetic mean values of PM₁₀ varied between 33.5-89.3 $\mu\text{g}/\text{m}^3$ while the 98th percentile values of PM₁₀ concentrations ranged between 42.6-89.2 $\mu\text{g}/\text{m}^3$. The arithmetic mean values of PM_{2.5} varied between 17.1-45.3 $\mu\text{g}/\text{m}^3$ during winter season and the 98th percentile values of PM_{2.5} concentrations were observed to vary from 21.9-45.2 $\mu\text{g}/\text{m}^3$.

The arithmetic mean values for SO₂ was 4.4-9.3 $\mu\text{g}/\text{m}^3$ for winter season and the 98th percentile concentrations of SO₂ was also 5.4-9.3 $\mu\text{g}/\text{m}^3$. The arithmetic mean values of NO_x varied between 12.5-24.6 $\mu\text{g}/\text{m}^3$ while the 98th percentile concentrations of NO_x also ranged from 14.0-24.5 $\mu\text{g}/\text{m}^3$.

During winter season the arithmetic mean values of CO varied between 162 - 510 $\mu\text{g}/\text{m}^3$ while the 98th percentile concentrations of CO also ranged from 197-509 $\mu\text{g}/\text{m}^3$.

The values of Hydrocarbon (HC) are given in table-3.4 during the study period was found below the detectable limit.

From the above mentioned studies it was observed that SO_2 , NO_x and CO concentrations during the study period are found well within the stipulated standards of CPCB.

3.7 WATER ENVIRONMENT

3.7.1 SOURCE OF WATER OF THE STUDY AREA

Source of water of the study area are ground water. Ground water table of the area is not expected to be encountered at shallower depths of the order of at least 8-10m from the average ground level.

3.7.2 METHODOLOGY FOR WATER QUALITY MONITORING

Physico-chemical parameters have been analyzed to ascertain the baseline status existing surface water and ground water bodies. Samples were collected once during the study period. The details of surface and ground water sampling locations are given in table-3.5 and sampling locations of water quality monitoring are shown in figure-3.4. The Indian standard specification for drinking water is enclosed as Annexure-V and CPCB standards of classification of inland surface water as Annexure-VI. The physico-chemical characteristics of the different ground water samples and surface water samples are presented in the tables-3.6 and table 3.7 respectively.

TABLE - 3.5 DETAILS OF GROUND AND SURFACE WATER MONITORING LACATIONS

SR. NO.	SAMPLING LOCATIONS	APPROXIMATE RADIAL DISTANCE FROM PROJECT SITE (KM)	BEARING W. R.T. PROJECT SITE
1.	Project Site (GW1)	-	-
2.	Industrial Unit in Vill. Changsari (GW2)	4.7	E
3.	Dolibari (GW3)	3.10	SWS
4.	Namati Jalah (GW4)	6.77	SSE
5.	Barijanni Pathar Pacharia (GW5)	3.99	NNW
6.	Kalakuchi (GW6)	3.45	NNE
7.	Sesa (GW7)	5.80	W
8.	No. 1 Gandh Mow (GW8)	4.68	WSW
9.	Project Site (SW1)	-	-
10.	Dolibari (SW2)	3.10	SWS
11.	Namati Jalah (SW3)	6.77	SSE
12.	Sesa (SW4)	5.80	W
13.	No. 1 Gandh Mow (SW5)	4.68	WSW
14.	Borka River Water (SW6)	6.04	NNE
15.	Brahmputra river water near sarmojuli Pam (SW7)	4.51	SSW
16.	Brahmputra River water near Amin Gaon (SW8)	6.72	SSE

GW= Ground water, SW= Surface water

FIGURE - 3.4 LOCATIONS OF WATER SAMPLING STATIONS

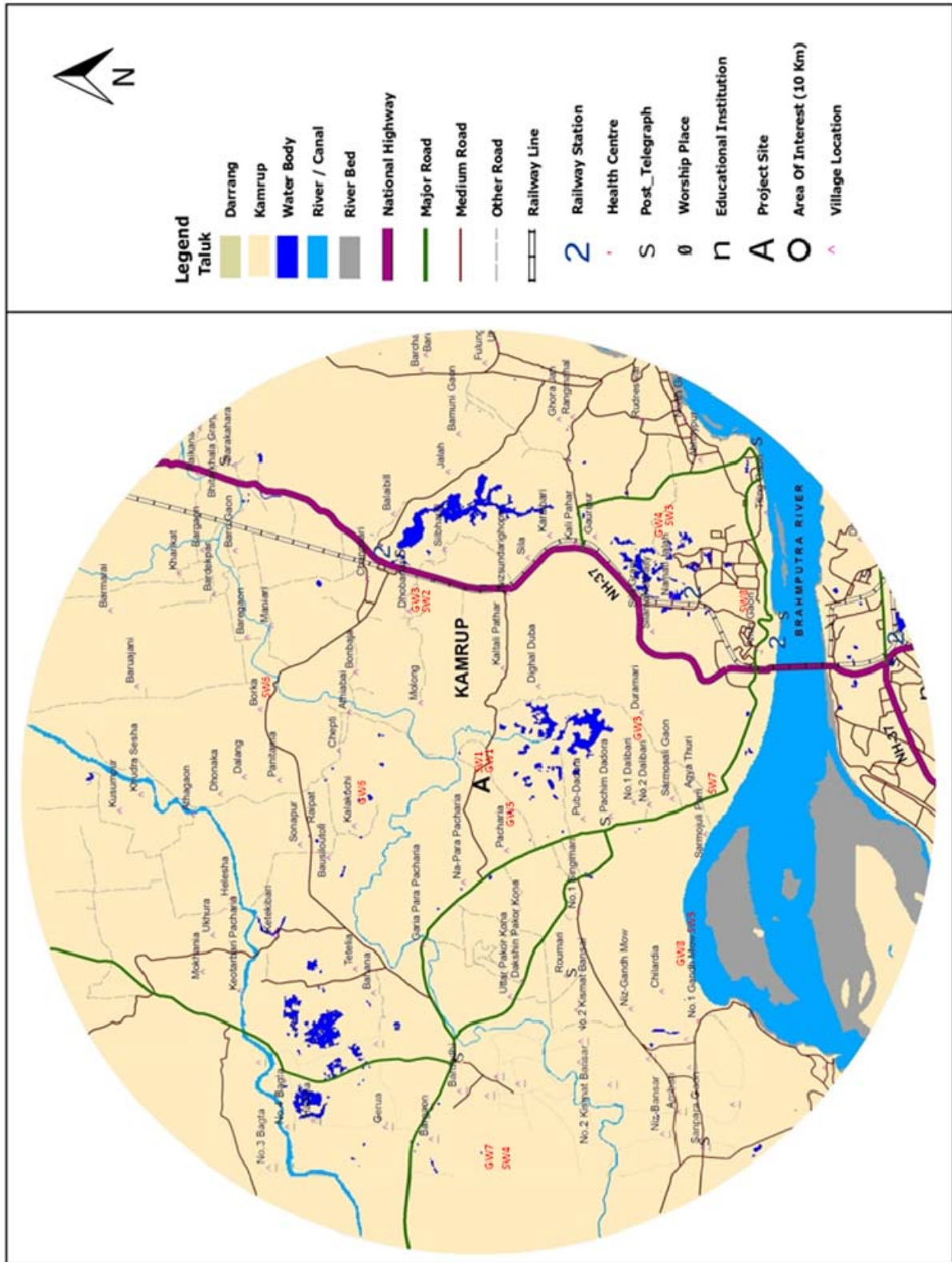


TABLE - 3.6 BASELINES GROUND WATER QUALITY

SR. NO.	PARAMETERS	UNIT	LOCATIONS							
			PROJECT SITE (GW1)	INDUSTRIAL UNIT IN VILL. CHANGSARI (GW2)	DOLIBARI (GW3)	NAMATI JALAH (GW4)	BARJANNI PATHAR PACHARIA (GW5)	KALAKUCHI (GW6)	SESA (GW7)	NO. 1 GANDH MOW (GW8)
1.	pH	--	6.99	7.52	7.26	7.32	7.26	7.26	7.32	7.52
2.	Color	Hazen	< 01	< 01	< 01	< 01	< 01	< 01	< 01	< 01
3.	Taste	--	Agreeable							
4.	Odor	--	Unobjectionable							
5.	Conductivity at 25 ^o C	µs/cm	968	460	584	718	600	868	718	924
6.	Turbidity	NTU	0.6	0.8	0.6	0.6	0.6	0.7	0.6	1.2
7.	Total dissolved solid	mg/l	624	288	368	462	396	868	456	598
8.	Total suspended Solids	mg/l	0.5	0.4	0.4	0.4	0.6	0.5	0.6	0.8
9.	Total Hardness as CaCO ₃	mg/l	320	160	160	230	240	320	280	320
10.	Total Alkalinity as CaCO ₃	mg/l	240	100	130	190	150	160	160	230
11.	Calcium as Ca	mg/l	80.0	40.0	40.0	56.0	52.0	76.0	64.0	72.0
12.	Magnesium as Mg	mg/l	28.8	14.4	14.4	21.6	26.4	31.2	28.8	33.6
13.	Boron as B	mg/l	0.022	0.011	0.006	0.011	0.061	0.072	0.062	0.086
14.	Chloride as Cl	mg/l	120.0	55.0	80.0	85.0	80.0	100.0	90.0	120.0
15.	Sulphate as SO ₄	mg/l	60.4	43.7	40.6	38.6	37.7	51.9	61.6	50.8
16.	Fluoride as F ⁻	mg/l	0.5	0.3	0.4	0.6	0.5	0.6	0.5	0.6
17.	Nitrates as NO ₃	mg/l	6.9	3.7	3.7	5.0	3.7	5.0	4.4	5.6
18.	Aluminum as Al	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

SR. NO.	PARAMETERS	UNIT	LOCATIONS							
			PROJECT SITE (GW1)	INDUSTRIAL UNIT IN VILL. CHANGSARI (GW2)	DOLBARI (GW3)	NAMATI JALAH (GW4)	BARJANNI PATHAR PACHARIA (GW5)	KALAKUCHI (GW6)	SESA (GW7)	NO. 1 GANDH MOW (GW8)
19.	Manganese as Mn	mg/l	< 0.001	0.006	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
20.	Phenolic Compounds	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
21.	Cyanides as CN	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
22.	Mineral oil	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
23.	Cadmium as Cd	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
24.	Arsenic AS	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
25.	Copper as Cu	mg/l	0.026	0.018	0.031	0.029	0.026	0.031	0.029	0.032
26.	Lead as Pb	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
27.	Iron as Fe	mg/l	0.09	0.06	0.06	0.09	0.05	0.03	0.02	0.06
28.	Chromium as Cr ⁺⁶	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
29.	Zinc as Zn	mg/l	0.058	0.056	0.067	0.094	0.039	0.047	0.029	0.041
30.	Mercury as Hg	mg/l	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
31.	Selenium as Se	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

TABLE - 3.7 BASELINE SURFACE WATER QUALITIES

SR. NO.	PARAMETERS	UNIT	LOCATIONS							
			PROJECT SITE (SW1)	DOLIBARI (SW2)	NAMATI JALAH (SW3)	SESA (SW4)	NO. 1 GANDH MOW (SW5)	BORKA RIVER WATER (SW6)	BRAHMPUTRA RIVER WATER NEAR SARMOJULI PAM (SW7)	BRAHMPUTRA RIVER WATER NEAR AMIN GAON (SW8)
1.	pH	--	6.94	6.98	7.23	7.56	7.37	6.62	7.35	7.39
2.	Taste	--	Agreeable							
3.	Colour	Hazen	04	05	03	06	02	04	05	02
4.	Odor	--	Unobjectionable							
5.	Conductivity at 25 ⁰ C	µs/cm	328	280	260	218	296	468	342	512
6.	Dissolved oxygen	mg/l	5.1	4.3	5.1	5.1	4.6	4.9	5.2	4.6
7.	BOD (3days at 27 ⁰ C)	mg/l	08	11	05	08	08	05	05	08
8.	Total dissolved solid	mg/l	210	181	162	138	189	302	216	328
9..	Total Hardness	mg/l	110	100	100	60	100	160	110	180
10.	Chloride as Cl	mg/l	45.0	40.0	25.0	25.0	40.0	65.0	35.0	75.0
11.	Fluoride as F ⁻	mg/l	0.5	0.3	0.2	0.1	0.1	0.3	0.2	0.3
12.	Sulphate as SO ₄	mg/l	45.0	16.0	16.1	19.0	25.6	32.1	21.8	36.8
13	Turbidity	(NTU)	3.6	2.5	1.9	2.2	1.9	2.9	3.1	2.3
14	Total alkalinity as CaCO ₃	mg/l	90	60	70	50	60	100	90	100
15	Total Suspended Solids	mg/l	12	08	05	08	02	09	08	07
16	Boron as B	mg/l	0.008	0.006	< 0.001	0.008	< 0.001	0.032	0.06	0.08
17	Nitrate as NO ₃	mg/l	3.1	3.7	4.4	1.8	2.5	2.9	5.0	6.9
18	Cyanides as CN	mg/l	<0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

SR. NO.	PARAMETERS	UNIT	LOCATIONS							
			PROJECT SITE (SW1)	DOLIBARI (SW2)	NAMATI JALAH (SW3)	SESA (SW4)	NO. 1 GANDH MOW (SW5)	BORKA RIVER WATER (SW6)	BRAHMPUTRA RIVER WATER NEAR SARMOJULI PAM (SW7)	BRAHMPUTRA RIVER WATER NEAR AMIN GAON (SW8)
19	Calcium as Ca	mg/l	28.0	24.0	24.0	16.0	24.0	40.0	24.0	40.0
20	Magnesium as Mg	mg/l	9.6	9.6	9.6	4.8	9.6	14.4	12.0	19.2
21	Free Ammonia	mg/l	3.9	2.1	0.84	1.08	1.34	3.52	3.24	1.9
22	Iron as Fe	mg/l	0.22	0.16	0.22	0.16	0.14	0.21	0.22	0.21
23	Cadmium as Cd	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
24	Lead as Pb	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
25	Copper as Cu	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	0.003	< 0.001	< 0.001	< 0.001
26	Arsenic as As	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
27	Phenolic as C ₆ H ₅ OH	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
28	Zinc as Zn	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
29	Mercury as Hg	mg/l	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
30	Manganese as Mn	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
31	Chromium (Cr ⁺⁶)	mg/l	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
32	Mineral oil	mg/l	0.062	0.027	< 0.001	< 0.001	0.004	0.031	<0.001	0.011
33	Aluminum as Al	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
34	Total Coli form	cfu/100ml	3250	1450	1900	2250	1200	1600	1300	1020
35	Selenium as Se	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

3.7.3 GROUND WATER

Groundwater samples from different villages in the project area were collected and analyzed during the study period. The physico-chemical characteristics of the groundwater are presented in the table-3.6. The pH varied in the range of 6.99-7.52, turbidity 0.6-1.2 NTU, total hardness 160-320 mg/l, total alkalinity 100-240 mg/l, total dissolved solids 288-868 mg/l, Conductivity 460-968 $\mu\text{S}/\text{cm}$, Chloride 55.0-120.0 mg/l, Sulphate 37.7-60.4 mg/l, and nitrate was found in the range 3.7-6.9 mg/l.

3.7.4 SURFACE WATER

The Physico-chemical characteristics of surface water during the study period are summarized in table-3.7. The pH varied is from 6.62 - 7.56, the turbidity varied from 1.9 - 3.6 NTU, the total dissolved solids varied from 138 - 328 mg/l, Conductivity varied from 218 - 512 $\mu\text{S}/\text{cm}$, The total alkalinity varied from 50 -100 mg/l the total hardness varied from 60-180 mg/l, calcium varied from 16.0-40.0 mg/l, chloride varied from 25 - 75 mg/l and the sulphate varied from 16.0 - 45.0 mg/l.

The results indicate that the nutrient values in the form of nitrate were found to be varied from 1.8 - 6.9 mg/l. The values for demands parameters like DO and BOD varied from 4.3 - 5.2 mg/l and 05 - 11 mg/l respectively. The levels of heavy metals viz. Chromium, Cadmium, Copper, Lead, Iron, Manganese and Zinc were found to be within permissible limits.

The overall surface water was found to be average and the water should be treated before using it for drinking purpose. Indian Standards/Specifications for Drinking Water (IS: 10500 – 1991) are given in Annexure-V and CPCB standards classification of inland surface water is enclosed as an annexure-VI.

3.8 NOISE ENVIRONMENT

The objective of noise pollution survey around the project site was to identify existing noise sources and to measure background noise levels. The study was carried out in the following steps:

- Reconnaissance
- Identification of noise sources and measurement of noise levels
- Measurement of noise levels due to transportation
- Community noise levels

3.8.1 RECONNAISSANCE

The details of location of background noise monitoring station are given in table-3.8 while the results of noise monitoring are given in table-3.9.

3.8.2 EQUIVALENT SOUND LEVELS OR EQUIVALENT CONTINUOUS EQUAL ENERGY LEVEL (L_{eq})

There is large number of noise scales and rating methods based on some sort of average of weighted average quantities derived from the detailed noise characteristics. Equivalent sound levels or Equivalent continuous equal energy level (L_{eq}) is a statistical value of sound pressure level that can be equated to any fluctuating noise level and forms a useful measure of noise exposure and forms basis of several of the noise indices used presently.

L_{eq} is defined as the constant noise level, which over a given time, expands the same amount of energy, as is expanded by the fluctuating level over the same time. This value is expressed by the equation:

$$L_{eq} = 10 \log \sum_{i=1}^{i=n} (10)^{L_i/10} \times t_i$$

Where, n = Total number of sound samples,

L_i = The noise level of any i^{th} sample

t_i = Time duration of i^{th} sample,

Expressed as fraction of total sample time

L_{eq} has gained wide spread acceptance as a scale for the measurement of long term noise exposure. Hourly equipment noise levels in the identified impact zone are monitored for day and time separately using sound level meter. All the values are reported in L_{eq} and in case of equipment noise, Sound pressure level are monitored 1.5 m away from the machine and assessed with respect to standard prescribed in factory Act.

3.8.3 METHODOLOGY FOR NOISE MONITORING

Noise standards have been designated for different types of area, i.e. residential, commercial, industrial and silence zones, as per 'The Noise Pollution (Regulation and Control) Rules, 2000, Notified by Ministry of Environment and Forests, New Delhi, February 14, 2000. Different standards have been stipulated for day time (6 am to 10 pm) and night time (10 pm to 6 am).

Ambient noise level monitoring was done at same locations where ambient air monitoring was carried out within a study area. The locations are away from the major roads and major noise sources so as to measure ambient noise levels. One day monitoring was carried out at all the locations. The frequency of monitoring was set at an interval of 15 seconds over a period of 10 minutes per hour for 24-hours. The observed Equivalent sound levels (L_{eq}) values in dBA are given in table-3.9 for each monitoring location in distinguished form of day time (6 am to 10 pm) and night time (10 pm to 6 am).

All measurements were carried out when the ambient conditions were unlikely to adversely affect the results.

TABLE - 3.8 DETAILS OF LOCATION OF BACKGROUND NOISE MONITORING STATIONS

SR. NO.	NAME OF VILLAGE	APPROXIMATE RADIAL DISTANCE FROM PROJECT SITE (KM)	BEARING W.R.T. PROJECT SITE
1.	Project Site (N1)	-	-
2.	Industrial Unit in Vill. Changsari (N2)	4.7	E
3.	Dolibari (N3)	3.10	SWS
4.	Namati jalah (N4)	6.77	SSE
5.	Barijanni Pathar Pacharia (N6)	3.99	NNW
6.	Kalakuchi (N7)	3.45	NNE
7.	Sesa (N8)	5.80	W
8.	No. 1 Gandh Mow (N9)	4.68	WSW

TABLE - 3.9 BACKGROUND NOISE LEVELS

SR. NO.	LOCATION	CATEGORY OF AREA	NOISE LEVEL (LEQ) IN DBA (DAY TIME) (0600 TO 2100 HRS.)	NOISE LEVEL (LEQ) IN DBA (NIGHT TIME) (2100 TO 0600 HRS.)
1.	Project Site (N1)	Industrial	52.2 - 64.8	44.3 - 54.8
2.	Industrial unit in Vill. Changsari (N2)	Industrial	54.3 - 71.2	51.3 - 60.3
3.	Dolibari (N3)	Residential	46.3 - 58.3	37.5 - 45.2
4.	Namati jalah (N4)	Residential	52.3 - 62.4	47.5 - 58.3
5.	Barijanni Pathar Pacharia (N5)	Residential	48.3 - 58.4	40.5 - 47.5
6.	Kalakuchi (N6)	Residential	40.3 - 53.6	37.3 - 41.3
7.	Sesa (N7)	Residential	45.4 - 54.3	38.5 - 44.5
8.	No. 1 Gandh Mow (N8)	Residential	52.1 - 61.6	44.3 - 50.6

3.8.4 BASELINE NOISE LEVELS

The noise level measured in study area at different locations is given in table-3.9. The Project site and Industrial unit in Vill. Changsari is only pertaining in category of industrial area and the noise level was found 52.2 - 71.2 dBA in daytime and 44.3 - 60.3 dBA in night time. The noise levels varied in the residential area of the study area during day time [night time] in the range of 40.3 - 62.4 [37.3 - 58.3] dBA. The noise sources identified in industrial zone are vehicular traffic, industrial and commercial activities. CPCB recommendation for community noise exposure in different category of area (i.e. residential, commercial, industrial and silence zone) is enclosed as annexure-VII, while Damage risk criteria for hearing loss given by occupational safety & health administration (OSHA) is enclosed as annexure-VIII. The observed noise levels were below the stipulated standards of CPCB.

3.8.5 COMMUNITY NOISE LEVELS

The communities close to the project site are not exposed to major noise sources. The commercial activities and transport apart from natural sources contribute to community noise levels. The noise levels close to project site were low and within the stipulated standards of CPCB for the respective designated areas.

3.9 LAND ENVIRONMENT

3.9.1 METHODOLOGY FOR SOIL MONITORING

Soil samples were collected from eight different locations within the study area during study period. The locations selected for collection of soil samples are presented in table-3.10 and shown in figure-3.5. The analysis results of soil samples collected from the study area given in table-3.11.

TABLE - 3.10 DETAILS OF SOIL QUALITY SAMPLING LOCATIONS

SR. NO.	NAME OF VILLAGE	APPROXIMATE RADIAL DISTANCE FROM PROJECT SITE	BEARING W.R.T. PROJECT SITE
1.	Project Site (S1)	-	-
2.	Industrial unit in Vill. Changsari (S2)	4.7	E
3.	Dolibari (S3)	3.10	SWS
4.	Namati jalah (S4)	6.77	SSE
5.	Barijanni Pathar Pacharia (S5)	3.99	NNW
6.	Kalakuchi (S6)	3.45	NNE
7.	Sesa (S7)	5.80	W
8.	No. 1 Gandh Mow (S8)	4.68	WSW

FIGURE - 3.5 LOCATIONS OF SOIL SAMPLING STATIONS

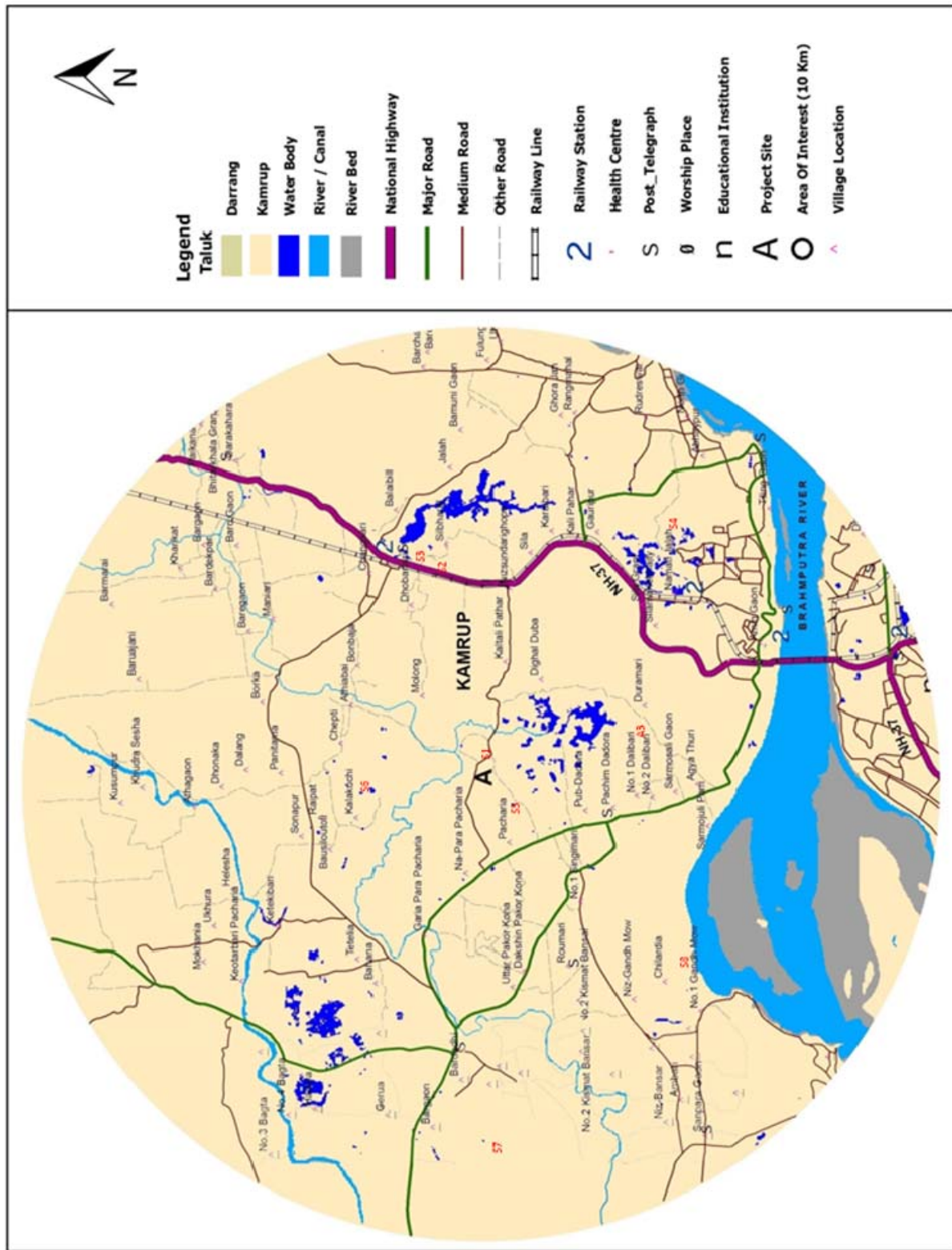


TABLE - 3.11 PHYSICO-CHEMICALS CHARACTERISTICS OF SOIL

SR. NO.	PARAMETERS	UNIT	PROJECT SITE (S1)	INDUSTRIAL UNIT IN VILL. CHANGSARI (N2)	DOLIBARI (N3)	NAMATI JALAH (N4)	BARJANNI PATHAR PACHARIA (N5)	KALAKUCHI (S6)	SESA (S7)	NO. 1 GANDH MOW (S8)
1.	Texture	%	Clay	Silty Clay	Clay	Silt clay	Clay	Silty Clay	Clay	Silt Clay
	Sand	%	20	18	22	18	22	16	16	20
	Silt	%	22	42	26	26	26	42	36	46
	Clay	%	58	40	48	56	52	42	48	34
2.	Porosity	%	32	28	24	29	38	36	30	38
3.	Water holding capacity	%	13.2	13.5	14.8	10.6	12.6	15.8	16.4	17.4
4.	Permeability	cm/h	4.9	4.6	5.7	4.5	4.5	4.8	5.1	4.9
5.	Moisture	%	12.3	8.9	10.5	11.3	11.5	6.5	5.8	4.8
6.	Cation exchange Capacity	--	1.32	1.26	1.06	1.46	1.32	1.46	1.28	1.83
7.	Phosphorous as P ₂ O ₅	--	0.04	0.04	0.06	0.03	0.06	0.05	0.04	0.06
8.	pH at 25 ^o C	--	7.26	7.56	7.23	7.89	7.38	7.68	6.94	6.48
9.	EC	µs/cm	114	126	137	142	154	143	134	146
10.	Bulk Density	g/cc	1.28	1.42	1.32	1.3	1.36	1.28	1.32	1.3
11.	Sodium Absorption Ratio	--	2.05	2.49	2.11	1.84	1.96	2.55	2.37	2.76
12.	Available Nitrogen	kg/ha	262	286	278	264	274	263	215	249
13.	Available P as PO ₄	kg/ha	72	72	89	92	58	78	64	72
14.	Available K	kg/ha	168	162	188	182	140	149	152	134
15.	Exchangeable Ca	Meq/100gr	2.12	1.62	2.26	2.12	1.94	1.54	1.69	1.48
16.	Exchangeable Mg	Meq/100gr	1.54	1.24	1.56	1.24	1.24	1.26	1.12	1.34
17.	Exchangeable Na	Meq/100gr	3.8	3.6	4.1	3.2	3.2	3.6	3.4	3.9
18.	Organic Carbon	%	1.12	0.88	1.22	0.98	1.74	0.89	1.24	1.10

3.10 LAND USE PATTERN

Land use, in general, reflects the human beings activities on land, whereas the word land cover indicates the vegetation, agricultural and artificial manmade structures covering the land surfaces. Identification and periodic surveillance of land uses and vegetation covers, in the vicinity of any developmental activity is one of the most important components for an environmental impact assessment, which would help determine the impact of the project development activity on the land use pattern.

3.10.1 LAND USE PATTERN BASED ON SATELLITE IMAGERY

3.10.1.1 METHOD OF DATA PREPARATION

The land use / land cover has been presented in the form of a map prepared by using IRS P6 LISS-IV FX and procured from the National Remote Sensing Agency (NRSA), Hyderabad.

The land use / land cover map is prepared by adopting the interpretation techniques of the image in conjunction with collateral data such as Survey of India topographical maps and census records. Image classification can be done by using visual interpretation techniques and digital classification using any of the image processing software. For the present study, remote sensing and GIS technology is used for preprocessing, rectification, enhancements and classifying the satellite data for preparation of land use land cover map for assessing and monitoring the temporal changes in land use land cover and land developmental activities.

The imagery is interpreted and ground checked for corrections. The final map is prepared after field check. Flow chart showing the methodology adopted is given in the different land use / land cover categories in the study area has been carried out based on the NRSC land use / land cover classification system.

3.10.1.2 AREA UNDER DIFFERENT LANDUSE

The land use classification within a distance of 10 kilometers from the project location and the areas falling under the respective classifications are as given in the following table-3.12 and land use land cover map of the study area is shown in figure-3.7.

TABLE - 3.12 AREAS STATISTICS OF LANDUSE/LAND COVER MAP

S.NO.	LAND USE	AREA (SQ. KM)	%
1.	<u>BUILT UP LAND</u>		
	a. Settlements/IIT	27.004	8.6
	b. Industrial area	13.188	4.2
2.	<u>WATERBODIES</u>		
	a. Tank / River etc.	41.134	13.1
	<u>FORSET</u>		
	a. Scrub forest	22.294	7.1
4.	<u>CROP LAND</u>		
	a. Single crop	103.934	33.1
	b. Double crop	41.134	13.1
	c. Plantation	18.212	5.8
5.	<u>WASTELANDS</u>		
	a. Land with scrub	23.864	7.6
	b. Land without scrub	3.454	1.1
	c. Water logged area	19.782	6.3
	TOTAL	314.000	100.0

FIGURE-3.6 GRAPHICAL PRESENTATION OF LANDUSE/LAND COVER

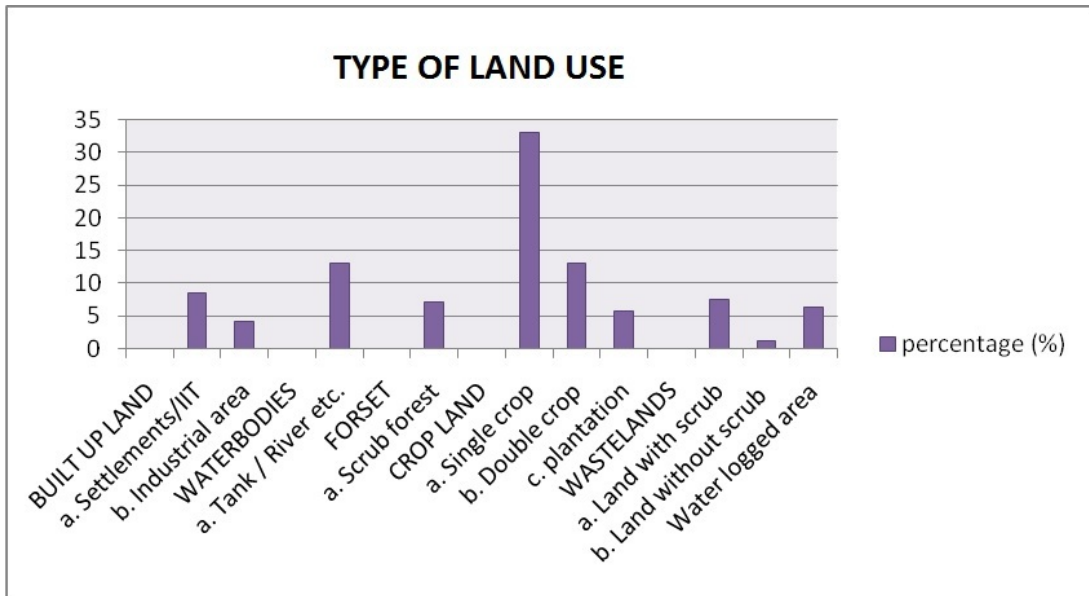


FIGURE - 3.7 LANDUSE AND LANDCOVER MAP WITH VILLAGE LOCATION

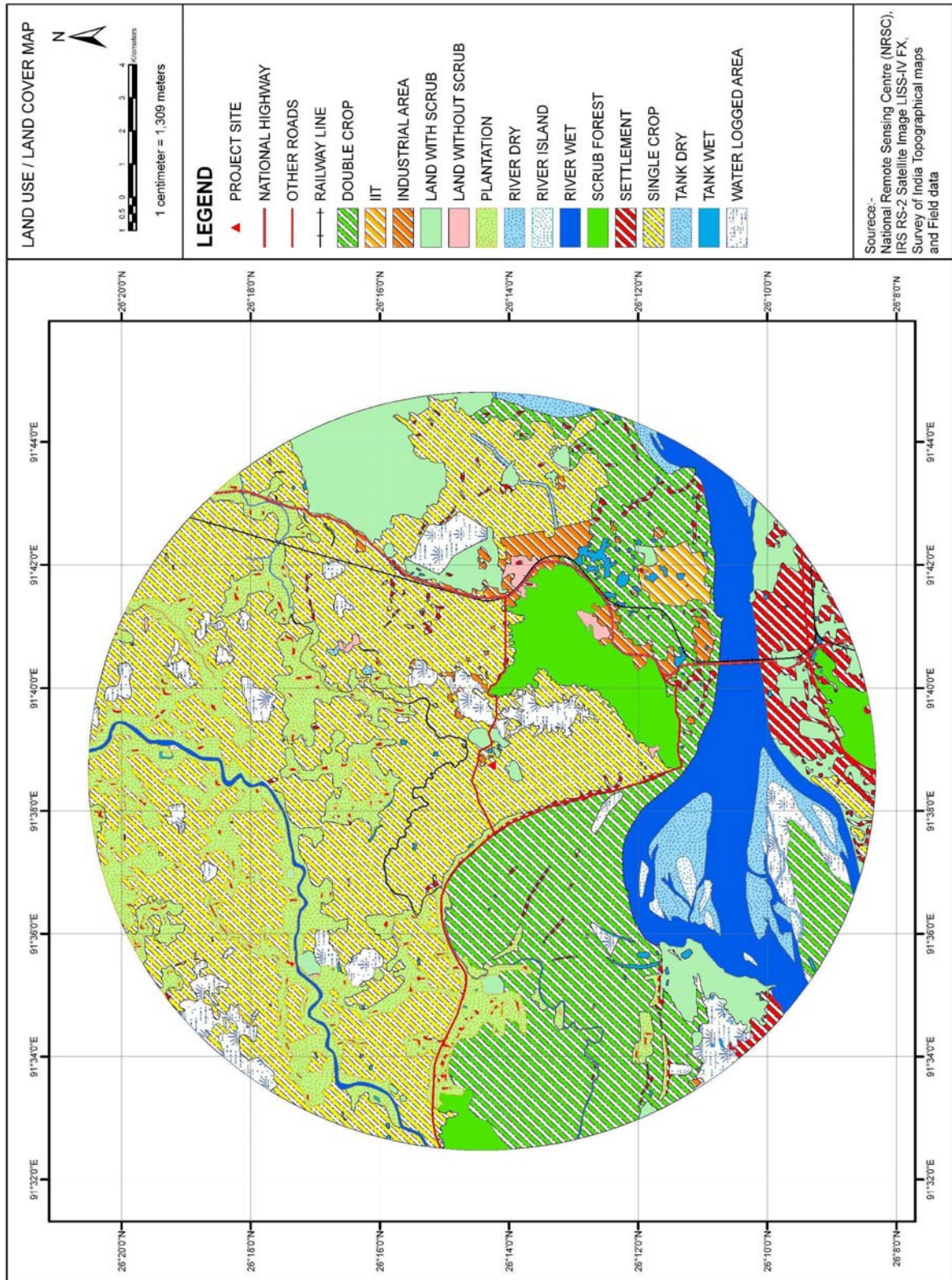
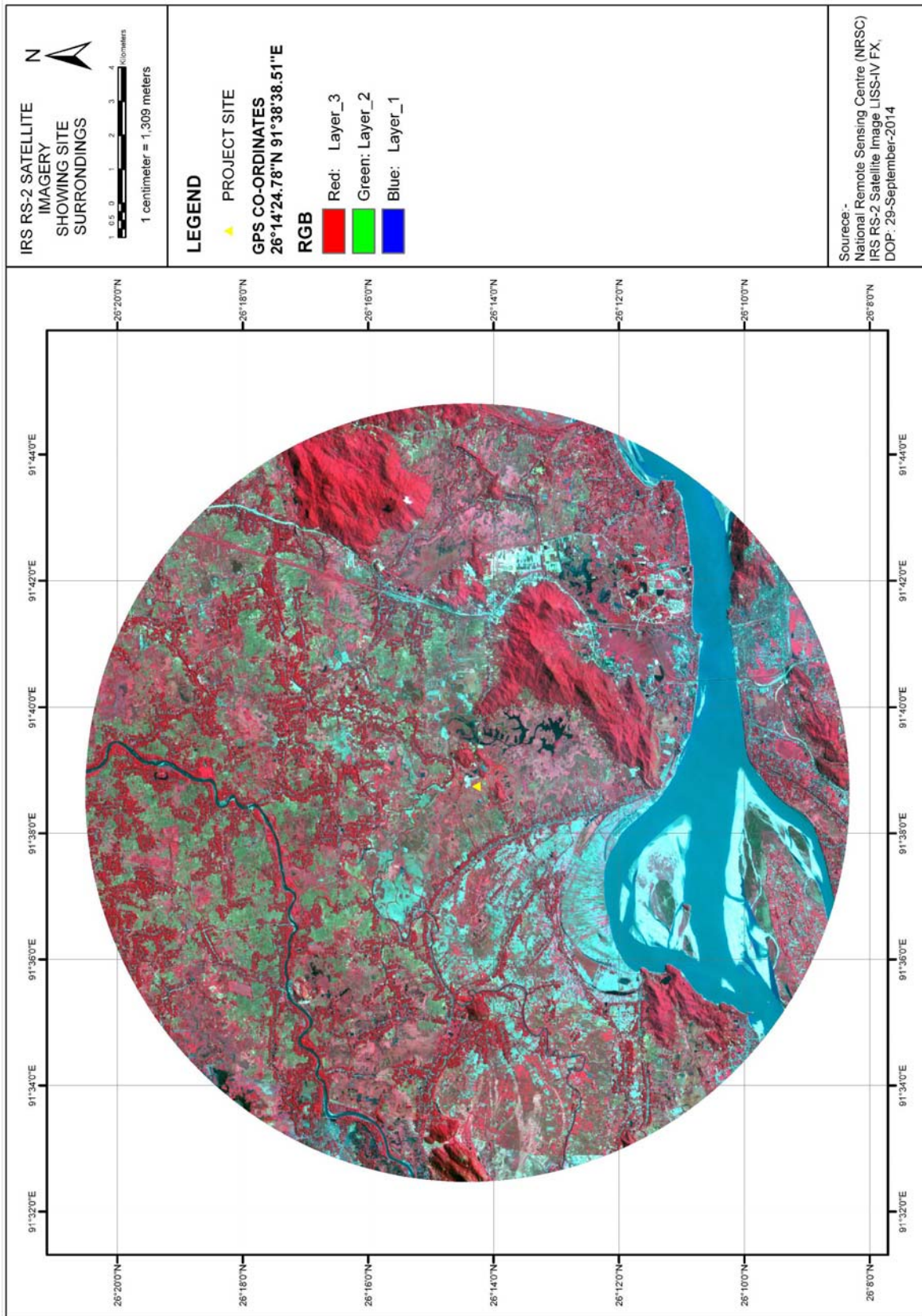


FIGURE-3.8 LAYOUT OF RAW SATELLITE IMAGERY (10 KM RADIUS)



3.11 ECOLOGICAL INFORMATION

Studies of flora and fauna of the study area had been carried out both for the core zone and buffer zone. Details of the studies were carried out for assessing the diversity pattern of the floral species. Faunistic pattern of the area was studied based on inquiries from the local population, personal observation and forest officials.

3.11.1 ECOLOGICAL IMPACT ASSESSMENT

Ecological impact assessment (EcIA) is used to predict and evaluate the impacts of development activities on ecosystems and their components, thereby providing the information needed to ensure that ecological issues are given full and proper consideration in development planning. Environmental impact assessment (EIA) has emerged as a key to sustainable development by integrating social, economic and environmental issues in many countries. EcIA has a major part to play as a component of EIA but also has other potential applications in environmental planning and management. Ecological Impact Assessment provides a comprehensive review of the EcIA process and summarizes the ecological theories and tools that can be used to understand, explain and evaluate the ecological consequences of development proposals.

Environmental impact assessments have become an integral part of development projects in India to formulate policies and guidelines for environmentally sound economic development. Proper assessment of biological environment and compilation of its taxonomical data is essential for the impact prediction.

Consistent and regularly updated data on regional and local taxonomy and floristic and faunal diversity of the areas are almost non-existent in country as diverse as India. Instant information on biodiversity profiles of the area, where the proposed project is setting up, is an essential part of the baseline studies of EIA. In such a situation, good primary baseline biodiversity survey is a pre-requisite for the collection of reliable data. The professional ethic of the EIA practitioners should be their will and skill to conduct scientific field surveys. These contributions towards biodiversity surveys may sometimes recognized as the actual value additions in terms of new records or a new data base but are more often recognized in the validation and updating of the existing information base

3.11.2 PERIOD OF THE STUDY AND STUDY AREA

The baseline study, for the evaluation of the floral and faunal biodiversity of the terrestrial environment of the study area, with in 10 km radius from the proposed Distillers & Bottling Industries near Village: Pacharia (Chansari), Tehsil: Hajo, District: Kamrup, Assam, has been conducted during January, 2015.

3.11.3 METHODOLOGY

The primary objective of survey was to describe the floral and faunal communities within the study area. The sampling plots for floral inventory were selected randomly in the suitable habitats within the 10km radius from the project site. The methodology adopted for faunal survey involve; Random survey, Opportunistic observations, Diurnal bird observation, active search for reptiles, faunal habitat assessment, active search for scats and foot prints and review of previous studies. The aim was to set baselines in order to monitor and identify trends after the commissioning of the project. Emphasis has been placed on presence of endemic species, threatened species if any present in the study area. Desktop literature review was conducted to indentify the representative spectrum of threatened species, population and ecological communities listed by IUCN, WCMC, ZSI, BSI and Indian wild Life Protection act, 1972. The status of individual species was assessed using the revised IUCN/SSC category system.

3.11.4 TERRESTRIAL FLORAL AND FAUNAL COMPONENTS OF THE STUDY AREA

Habitats description of the project site and surrounding:

The project site is located in the well developed area of Kamrup district. The project site topography is almost flat. The project site is surrounded by the wasteland in the west direction. The project site is non agricultural land and on the only few type of vegetation which need to be cleared during the construction activity.

Habitats description of the study area:

The study area is north part of the District Kamrup. In North West part of the study area of Kamrup district is agricultural land (Single crop land). Villages are scattered along the road side in the small patches. The most agriculture lands especially for paddy due to heavy rainfall for six month. The tree species, herbs and shrubs and major crops, were documented during this base line study. The list of floral species documented

in the study area is enlisted in the annexure- IX. In the study area five reserve forests are present. Details of reserve forest are given below and the map showing location of each is presented in figure-3.9.

- | | | |
|-------------------------------|---|------------------------|
| 1) Sila Reserve Forest | - | 1.5 km in E direction |
| 2) Agyathuri Reserve Forest | - | 3.5 km in SE direction |
| 3) Diregheswar Reserve Forest | - | 6.5 km in NE direction |
| 4) Sildar Reserve Forest | - | 8.6 km in W direction |
| 5) Hajo Reserve Forest | - | 9.2 km in W direction |



[HAJO RESERVE FOREST]



[AGAYATHURI RESERVE FOREST]



[DIREGHESWAR RESERVE FOREST]

3.11.5 FLORAL DIVERSITY OF THE STUDY AREA

3.11.5.1 TERRESTRIAL BIODIVERSITY

The objective this floral inventory of the study area, was to provide necessary information on floristic structure in the study area for formulating effective management and conservation measures. The climatic and biotic variations with their complex interrelationship and composition of species, which were adapted to these variations, have resulted in different vegetation cover, characteristic of each region. The following account of floral inventory has been, based on the field survey conducted for a short duration in the March, 2015, not very comprehensive data and was aimed only to give a general pattern of vegetation of this region during the study period as a baseline data in absence of available secondary data. These type of floristic study is an inventory for such purpose and hence a necessity. The tree species, herbs, shrubs, climbers and major crops, were documented during the base line study which is listed in the annexure-IX.

3.11.5.2 WETLANDS AND AQUATIC PLANT DIVERSITY

The study area has fresh water wetlands. The major drainage system is the Brahmaputra and in the flood plains of river system exist patches of marshy depressions and swamps as well as perennial water bodies of varying shape, size and depth called locally as beels, jalah etc.

The aquatic plants species belongs to diverse habits and have distinctive characteristics. More than 9 aquatic species have been identified and they can be described into following broad categories.

- Free floating hydrophytes: *Eichhornia crassipes*, *Lemna mino*.
- Suspended submersed hydrophytes: *Ceratophyllum demersum*, *Utricularia gibba*.
- Anchored submersed hydrophytes: *Hydrilla verticillata*, *Potamogeton crispus*, *P. pectinatus*.
- Anchored hydrophytes with floating shoots: *Ludwigia aquarium*, *Ipomea aquatica*.
- Emergent amphibious hydrophytes: *Sagittaria latifolia*.

3.11.5.3 CULTIVATED PLANTS IN THE STUDY AREA

Agriculture is the predominant activity in Kamrup district. The Rice, Mustard and wheat are cultivated as major crops in this area. The prevalent cropping systems of this area are the cumulative results of past and present decisions by individuals; these decisions are usually based on experience, tradition, expected profit, personal preferences and resources, and so on.

3.11.5.3.1 MAJOR CROPS

Major crops in the study area are Rice, Mustard and Wheat.

3.11.5.3.2 MINOR CROPS

The minor crops of this region were Corn (*Zea mays*),

3.11.5.4 HORTICULTURAL PRACTICES AND FRUITS GROWN

Horticulture activity was found to be restricted to very few pockets. The major horticultural crops in study area are Banana (*Musa Paradisiaca* L.), Papaya (*Carica papaya* L.), Pineapple (*A. comosus*), Coconut (*Cocos nucifera* L.), Orange (*Citrus sinensis*.) and Mango (*Mangifera indica* L.).

3.11.5.5 RARE AND ENDANGERED FLORA IN THE STUDY AREA

The IUCN Red List is the world's most comprehensive inventory of the global conservation status of plant and animal species. It uses a set of criteria to evaluate the extinction risk of thousands of species and subspecies. These criteria are relevant to all species and all regions of the world. With its strong scientific base, the IUCN Red List is recognized as the most authoritative guide to the status of biological diversity.

Out of 17000 species of higher plants known to occur in India, nearly 614 higher plant species were evaluated by IUCN. Among them 247 species are under threatened category (IUCN, 2007). Among the enumerated flora in the study area, none of them were assigned any threat category, by RED data book of Indian Plants. (Nayar and Sastry ,1990) and Red list of threatened Vascular plants (IUCN,2010, BSI, 2003)

3.11.5.6 ENDEMIC FLORA

De Candolle (1855) first used the concept of “Endemic”, which is defined as an area of a taxonomic unit, especially a species which has a restricted distribution or habitat, isolated from its surrounding region through geographical, ecological or temporal barriers.

Out of 17000 species of known flowering plants of India nearly 5000 species are said to be endemic. Nearly

58 genera and 1932 taxa are found to be endemic to peninsular India (Ahmedulla & Nayar, 1987). Among recorded plant species none of them can be assigned endemic status of this region.

3.11.6 FAUNAL BIODIVERSITY OF THE STUDY AREA

For the documentation of the faunal biodiversity of the study area with respect to birds, reptiles, amphibians, and butterfly species, a baseline survey had been conducted. The study area falls under Kamrup District of Assam state.

3.11.6.1 AVIAN FAUNA

The sighting of bird species was less during the study period during March 2015. The most commonly spotted bird species of this area were; Common Myna, Sparrow, House crow, Sibia, Cattle Egret Intermediate Egret, Rock Pigeon, Eurasian Collared-Dove, Spotted Dove, Bank Myna and Common Myna, Sparrow, House crow, Sibia etc. Systematic account of the birds in the study area with the status of occurrence is given in the annexure-X

3.11.6.2 BUTTERFLIES OF THE STUDY AREA

Butterflies observed during the present study are documented in annexure-X.

3.11.6.3 HERPETOFAUNA OF THE STUDY AREA

The amphibian and reptile document in the region is given in annexure-X.

3.11.6.4 MAMMALS OF THE STUDY AREA

The wild mammals observed other than the domesticated ones in the study area are given in annexure-X.

3.11.6.5 RARE AND ENDANGERED FAUNA OF THE STUDY AREA

The IUCN Red List is the world's most comprehensive inventory of the global conservation status of plant and animal species. It uses a set of criteria to evaluate the extinction risk of thousands of species and subspecies. These criteria are relevant to all species and all regions of the world. With its strong scientific base, the IUCN Red List is recognized as the most authoritative guide to the status of biological diversity. IUCN, (2007) has evaluated 1976 animal species from India, among them 313 have in recognized as threatened species. Among them one species is considered as extinct ,while 44 species are in critically endangered (CR) category, 88 is in endangered category(EN), while 181 is considered as vulnerable (VU). Wild Life (Protection) Act, 1972, amended on 17th January 2003, is an Act to provide for the protection of wild animals, birds and plants and for matters connected therewith or ancillary or incidental thereto with a view to ensuring the ecological and environmental security of the country.

Among the birds, all birds are included in schedule IV of Wild Life (Protection) Act, 1972.

Among the reptiles, Indian Cobra (*Naja naja*), and Common rat snake (*Ptyas mucosus*) were provided protection as per Schedule-II of Wild life protection act, (1972).

Among mammals; Jackal (*Canis aureus* (Linnaeus) is schedule –II animals and Hares and five striped squirrels are included in schedule IV of Wild Life Protection act 1972.

3.11.6.6 ENDEMIC FAUNA OF THE STUDY AREA

None of the sighted animal species can be assigned endemic species category of the study area.

3.12 SOCIO - ECONOMIC ENVIRONMENT

An assessment of socio - economic environment forms an integral part of an EIA study. Therefore, baseline information for the same was collected during the study period. The baseline socio - economic data collected for the study region, has been identified for the four major indicators viz. demography, civic amenities, economy and social culture. The baseline status of the above indicators is compiled in forthcoming sections.

3.12.1 OBJECTIVE OF SOCIAL IMPACT ASSESSMENT

A Social Impact Assessment (SIA) has been carried out for the proposed Project in the Project Influence Area (PIA) as a part of the Environmental Impact Assessment (ESIA). Any such project usually benefits the local people in various ways, like i) local availability of the products, ii) job opportunity in the project, iii) scope for improving quality of life. However, the project may also have some adverse social impacts

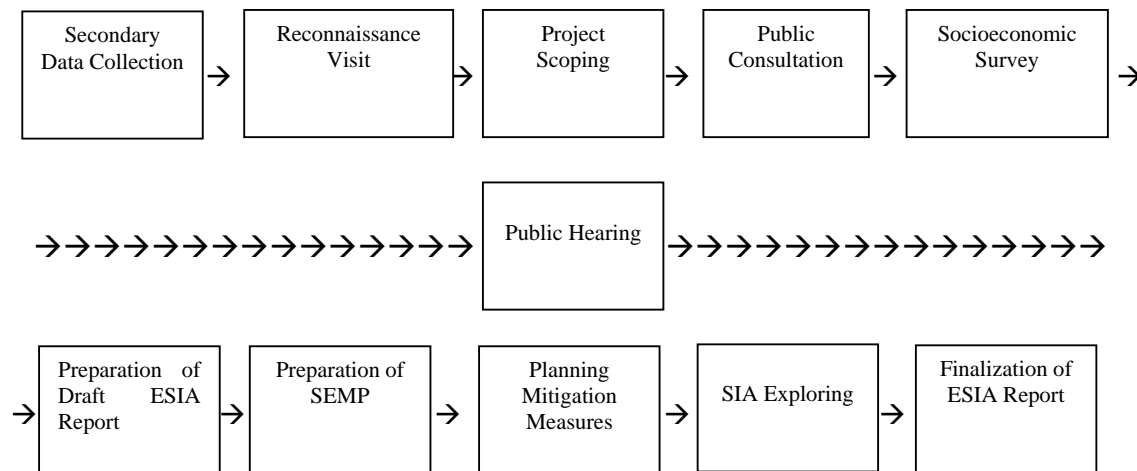
involving land acquisition, resettlement and rehabilitation (R&R) and certain other social implications relating to gender issues, and child labour etc. So an attempt to mitigate those negative impacts needs to be taken by the Project authority. This social study, therefore, was undertaken in order to better understand the current situation and socioeconomic impact of the proposed Project as well. The information collected will serve as baseline data and will also be useful for future environmental monitoring and evaluations. Explicit consideration of social aspects of development has been undertaken with issues such as people’s perception, poverty reduction, and enhancing role of women in development as priorities.

3.12.2 APPROACH METHODOLOGY

The approach and methodology of preparing this report included the followings:

- i. First, a detailed desk review of reports and secondary data related to the socio-economic context of the Project was undertaken for assessing the overall existing situation.
- ii. Reconnaissance visits to the project site were then made and screening of potential social impacts in the project influence area was carried out. During the reconnaissance visit, public consultations were conducted to gather feedback from the local people on the proposed development and perceived socio-economic impacts.
- iii. Two zones were demarcated- a) Core Zone- within 5 km from the proposed Project site, b) Buffer Zone- beyond 5 km from the proposed Project site.
- iv. It was planned to do zone wise sampling- 5 percent and 2 percent households from core and buffer zones respectively, for the SIA survey. But it was found that the proposed Project is quite small in size and the impact will be very much localized.

Keeping this situation in view it was decided to only undertake public consultations through Focus Group Discussions (FGDs) with local residents in the PIA (prospective Project beneficiaries and Project affected people). Social analysis is to be undertaken covering economic profile of the proposed sites, assessment of likely socioeconomic impact and benefits in the project influence areas. The process is as follow:



The area of socioeconomic influence of the Project will be determined on the basis of collected data. The tools for data collection are as follows:

3.12.3 TOOLS AND TECHNIQUES

For the purpose of this study a checklist was prepared which is shown in annexure-XI for personal discussion as well as focus group discussion (FGD). This assessment takes into consideration the beneficial socioeconomic impact that the production facility may have on the community. It also assesses community's perception and their awareness regarding polluting components of the environment.

This assessment takes into consideration the impact of the proposed distillery unit on the socio-economic status of the surrounding area and their perception regarding this Project, it also assess the awareness in the community regarding polluting components of the environment. The study was conducted during 05th March, 2015.

3.12.4 STAKEHOLDERS' IDENTIFICATION

Any project usually has some negative impact on the local population. Displacement and/or health/socioeconomic hazard are traumatic experience in spite of compensation paid and mitigation measures adopted. Therefore proper identification of stakeholders and appropriate consultation on the implementation plan and participation of affected people in decision making are of utmost importance. This helps the stakeholders in understanding the project objectives and needs; and in communicating their willingness, views and preferences. Thus it ensures increased participation of people through better acceptance of the project. Stakeholders' consultation was done during social impact assessment at the project locations and nearby villages within 10 km radius area of the proposed project, the result of this presented later in the Peoples' Perception section. Planned compensation and mitigation measures are based on findings of this social impact assessment report.

3.12.5 PROJECT LOCATION

The project site is located near to Guwahati city of Assam State. The project site falls in Changsari of Kamrup District. The proposed project is around 13 km away from the Brahmaputra River bridge on path way while around 6.5 km on radial distance in North-East district. Near the project site there are industries like Distillery and bottling, talcum powder and plastic waste management center, brick manufacturing unit, Gauripur Industrial Area etc. Nearest city from the project site is Guwahati around 14 km in south-east direction. The state Assam has a population of 3,11,69,272 as per census 2011 with sex ratio of 946 and total literacy rate was 72.81%.

Assam ranks thirds in the rate of progress in Human Development Index (HDI) among all the major states in the country achieving 32.1 per cent progress for the period 1999-2008. India Human Development Report 2011 brought out by the Institute of Applied Manpower Research, Planning Commission, Government of India based on the data of 1999-2008 reflecting the three main components of human development vis-a-vis education, health and per-capita income.

Assam maintains the current rate of progress in HDI for another decade there is strong possibility that the overall human development will be ahead of the other states of the country. The report further states that among the three components used for HDI parameter, Assam has shown the highest rate of progress in Income Index and third highest rate of progress in Health Index. Assam was, however, lagging behind the national average in Education Index, it has shown marked improvement. With a Hunger Index of 19.83 per cent (as in 2008) and ranked fourth in so far as reducing hunger is concerned, Assam is 'doing better than the so-called developed States with high per capita income namely, Tamil Nadu, Maharashtra, Karnataka and Gujarat', as per HDI Report 2011.

Assam tea is produced here along with petroleum and Assam silk. The state has conserved the one-horned Indian rhinoceros from near extinction, along with the pygmy hog, tiger and various species of birds. It provides one of the last wild habitats for the Asian elephant. The economy is aided by wildlife tourism while the Kaziranga and the Manas National Parks are designated as World Heritage Sites. Sal tree forests are found in the state, which as a result of rainfall looks green all year round. This rain feeds the Brahmaputra River, whose tributaries and oxbow lakes provide the region with a hydro-geomorphic and aesthetic environment.

The government in the 12th Plan would be to sustain the growth trajectory of the 11th Plan. According to the government, Assam will achieve a growth rate of at least 9.38 per cent in the 12th Plan. The Gross State Domestic Product (GSDP) of Assam had shown steady rise in the first three years of the 11th Plan. The GSDP growth (at 2004-05 prices) has been 4.81 per cent in 2007-08, improved to 6.82 per cent in 2008-09 and in 2009-10 it touched 8.08 per cent.

As per the government, in the backdrop of the multiplier effects and the present acceleration trend in the economy of the state, Assam would be able to achieve a growth of around 9.38 per cent during the 12th Five

Year Plan period. In case of sectoral growth, 5.01 per cent was expected under agriculture, 12.50 per cent under services and 4.65 per cent under industry.

Finalizing the Annual Plan for the year 2012-13 for Assam, deputy chairman of Planning Commission, said the performance of agriculture and allied sector had shown considerable improvement in last few years in Assam. The overall achievement of agriculture and allied sector during the 10th Plan was 1.16 per cent. Against this, the annual growth in first three years of the 11th Plan had been 2.8 per cent, 6.3 per cent and 4.2 per cent. “This is quite encouraging against the target of 2 per cent for the 11th Plan period. The state needs to focus on further improving infrastructure and particularly road connectivity,” deputy chairman of Planning Commission said. He added that land erosion due to floods also needed priority attention of the government.

The Annual Plan for the year 2012-13 for Assam has been pegged at Rs 10,500 crore. The services sector performance too had been good in the first three years of the 11th Plan, which was 7.8 per cent in 2007-08, 8.6 per cent in 2008-09 and 12.2 per cent in 2009-10 against the overall target of 8 per cent for this sector. Ahluwalia said he expected that this trend would continue for the whole 11th Plan period. However, there was a fluctuating trend in the industry sector in the first three years of the 11th Plan. The growth of industry sector, which was 0.7 per cent in 2007-08, improved to 3.3 per cent in 2008-09, but declined to 2.5 per cent in 2009-10.

3.10.6 THE PROJECT INFLUENCE AREA

The PIA for the concerned industry comprises 83 villages and urban areas in 10 km radius around the proposed Plant. All the demographic details of the study area is given in table-3.13.

TABLE-3.13 LIST OF VILLAGES IN PIA WITH DEMOGRAPHICAL DETAILS

Sr. NO.	NAME	SUB-DISTRICT	POPULATION 2001				POPULATION 2011							
			HH* 2001	Total Population	Male	Female	HH* 2011	Total Population	Male	Female	Literacy rate (%)	Total Workers		
												Total	Male	Female
1	Athiabai	N. Guwahati	277	1651	849	802	367	1789	933	856	88.83	858	546	312
2	Bonbaja	N. Guwahati	248	1506	807	699	336	1714	921	793	89.02	1049	603	446
3	Changsari	N. Guwahati	945	4999	2549	2450	1181	5354	2688	2666	88.92	1934	1487	447
4	Balaibill	N. Guwahati	118	603	290	313	252	567	353	214	94.90	290	277	13
5	Barchandra	N. Guwahati	178	893	447	446	218	994	493	501	92.87	550	290	260
6	Barchandra Grant	N. Guwahati	35	212	109	103	58	291	148	143	74.32	92	71	21
7	Manik Nagar	N. Guwahati	28	161	90	71	35	216	118	98	85.86	100	61	39
8	Dakhin Lenga	N. Guwahati	133	761	382	379	185	865	437	428	82.57	477	273	204
9	Barbaka	N. Guwahati	105	641	328	313	113	680	348	332	90.00	285	186	99
10	Sarubaka	N. Guwahati	50	324	157	167	97	537	277	260	69.70	193	146	47
11	Dhirgheswri	N. Guwahati	37	177	87	90	52	222	109	113	87.44	112	63	49
12	Fulung	N. Guwahati	71	389	191	198	103	500	250	250	91.24	138	124	14
13	Bamuni Gaon	N. Guwahati	176	949	446	503	210	985	480	505	81.62	419	288	131
14	Jalah	N. Guwahati	1024	5547	2820	2727	1379	6468	3283	3185	72.19	2926	1940	986
15	Sila	N. Guwahati	298	1605	822	783	636	2450	1330	1120	84.29	1067	815	252
16	Dhobartari	N. Guwahati	430	2251	1124	1127	510	2513	1254	1259	89.17	871	670	201
17	Silbharal	N. Guwahati	375	1973	1047	926	484	2275	1197	1078	81.53	701	628	73
18	Molong	N. Guwahati	92	560	299	261	120	572	297	275	85.35	220	179	41
19	Nizsundarighopa	N. Guwahati	317	1584	817	767	423	1899	954	945	85.82	1085	606	479
20	Karaibari	N. Guwahati	164	829	474	355	185	859	439	420	80.03	291	206	85
21	Kali Pahar	N. Guwahati	182	791	397	394	127	496	253	243	76.93	217	151	66
22	Agya Thuri	N. Guwahati	36	168	89	79	68	315	166	149	76.60	87	65	22
23	Silamahekhaity	N. Guwahati	164	803	408	395	203	819	409	410	83.29	277	227	50
24	Ghora Jan	N. Guwahati	28	121	63	58	76	286	149	137	63.56	101	83	18
25	Gauripur	N. Guwahati	114	619	319	300	175	792	403	389	83.07	321	214	107

Sr. NO.	NAME	SUB-DISTRICT	POPULATION 2001				POPULATION 2011							
			HH* 2001	Total Population	Male	Female	HH* 2011	Total Population	Male	Female	Literacy rate (%)	Total Workers		
												Total	Male	Female
26	Rangmahal	N. Guwahati	483	2799	1410	1389	631	2929	1463	1466	90.59	994	770	224
27	Uttarfulung	N. Guwahati	10	49	23	26	33	162	83	79	80.00	57	45	12
28	Rudreswar	N. Guwahati	369	1949	991	958	580	2524	1279	1245	92.52	894	704	190
29	North Guwahati	N. Guwahati	41	220	103	117	83	393	203	190	91.55	138	110	28
30	Abhaypur	N. Guwahati	528	2840	1445	1395	768	3568	1864	1704	92.33	1754	1135	619
31	Tiling Gaon	N. Guwahati	41	189	97	92	142	610	302	308	93.31	278	181	97
32	Sila Grant	N. Guwahati	7	43	23	20	1478	6504	3271	3233	82.32	2689	1797	892
33	Namati Jalah	N. Guwahati	320	1588	839	749	380	1395	746	649	74.66	716	492	224
34	Amin Gaon	N. Guwahati	1268	6512	3477	3035	2037	8855	4561	4294	80.33	3586	2678	908
TOTAL (A)			8692	46306	23819	22487	13725	61398	31461	29937	84.02	25767	18111	7656
35	Ukhura	Hajo	481	2848	1496	1352	639	3409	1808	1601	82.36	1572	1007	565
36	Mokhania	Hajo	314	1901	1012	889	442	2381	1264	1117	79.30	706	85.95	111
37	No.1 Bagta	Hajo	780	4460	2398	2062	992	4926	2592	2334	81.58	2282	1447	835
38	Gerua	Hajo	199	1099	576	523	233	1060	567	493	88.54	358	290	68
39	Nanah Kuchi	Hajo	1008	5772	2998	2774	1333	6290	3206	3084	79.94	2383	1620	763
40	Tetelia	Hajo	159	942	503	439	212	1024	536	488	89.65	323	257	66
41	Ketekibari	Hajo	391	2316	1226	1090	529	2526	1299	1227	83.74	1307	729	578
42	Bausiloutoli	Hajo	154	811	433	378	169	824	430	394	89.21	503	302	201
43	Bahana	Hajo	687	4079	2186	1893	898	4501	2372	2129	88.84	2402	1419	983
44	Bardadhi	Hajo	469	2767	1410	1357	614	2994	1522	1472	91.85	1271	907	364
45	Abhoypur	Hajo	489	2761	1393	1368	623	2987	1490	1497	87.78	1295	829	466
46	No.1 Kulhati	Hajo	975	5653	2877	2776	1228	5927	2951	2976	88.37	2334	1622	712
47	No.2 Kulhati	Hajo	74	313	167	146	81	373	193	180	83.58	142	114	28
48	Bansar	Hajo	59	345	177	168	136	688	360	328	65.04	139	120	19
49	No.2 Gondh Mow	Hajo	90	499	264	235	183	844	437	407	87.43	443	253	190
50	Ambari	Hajo	420	2364	1186	1178	614	2830	1440	1390	87.06	1509	832	677
51	Niz-Bansar	Hajo	187	1104	568	536	308	1421	724	697	86.12	658	403	255

Sr. NO.	NAME	SUB-DISTRICT	POPULATION 2001				POPULATION 2011							
			HH* 2001	Total Population	Male	Female	HH* 2011	Total Population	Male	Female	Literacy rate (%)	Total Workers		
												Total	Male	Female
53	No.2 Kismat Bansar	Hajo	13	76	44	32	23	101	56	45	87.23	44	37	7
54	No.1 Kismat Bansar	Hajo	119	661	376	285	159	773	429	344	90.60	342	230	112
55	No.1 Gandh Mow	Hajo	527	2973	1538	1435	664	3193	1572	1621	79.43	1488	885	603
56	Roumari	Hajo	218	1392	758	634	252	1322	706	616	83.52	495	330	165
57	Dakshin Pakor Kona	Hajo	88	524	280	244	191	897	482	415	85.41	336	243	93
58	Uttar Pakor Kona	Hajo	18	98	56	42	32	148	85	63	93.38	36	36	0
59	Khudra Kulhati Pacharia	Hajo	33	176	80	96	72	351	170	181	73.72	130	96	34
60	Barijani Pathar Pacharia	Hajo	240	1398	714	684	331	1672	860	812	74.50	783	457	326
61	Keotarbari Pacharia	Hajo	258	1587	832	755	312	1573	816	757	86.97	676	460	216
62	Pacharia	Hajo	351	1956	1033	923	430	1943	1037	906	92.91	1357	730	627
63	Na-Para Pacharia	Hajo	382	2259	1178	1081	487	2397	1216	1181	88.61	1289	759	530
64	Garia Para Pacharia	Hajo	62	339	179	160	107	478	259	219	90.95	288	166	122
TOTAL (B)			9245	53473	27938	25535	12294	59853	30879	28974	85.09	26891	16666	9716
65	Baruajani	Kamalpur	404	2239	1184	1055	566	2503	1264	1239	87.39	772	678	94
66	Dhonaka	Kamalpur	55	287	143	144	92	410	203	207	88.92	143	104	39
67	Raipat	Kamalpur	291	1541	814	727	342	1627	863	764	84.56	512	461	51
68	Sonapur	Kamalpur	285	1600	801	799	347	1701	851	850	83.99	553	476	77
69	Panitama	Kamalpur	378	2220	1167	1053	535	2522	1317	1205	88.35	643	592	51
70	Dalang	Kamalpur	252	1440	735	705	327	1610	849	761	91.68	418	367	51
71	Borka	Kamalpur	487	2967	1518	1449	641	3050	1544	1506	87.52	795	732	63
72	Chepti	Kamalpur	139	803	421	382	168	864	446	418	88.14	233	213	20
73	Kalakuchi	Kamalpur	203	1234	613	621	279	1423	736	687	86.65	470	425	45
74	Bhitarkhola	Kamalpur	271	1384	745	639	334	1487	765	722	83.75	574	422	152
75	Mainasundari	Kamalpur	183	927	450	477	249	1140	574	566	83.11	350	304	46
76	Paikana	Kamalpur	186	1002	524	478	249	1120	569	551	87.79	346	315	31

Sr. NO.	NAME	SUB-DISTRICT	POPULATION 2001				POPULATION 2011							
			HH* 2001	Total Population	Male	Female	HH* 2011	Total Population	Male	Female	Literacy rate (%)	Total Workers		
												Total	Male	Female
77	Bargaon	Kamalpur	339	2026	1085	941	453	2227	1172	1055	88.12	663	596	67
78	Baregaon	Kamalpur	276	1629	832	797	405	1912	997	915	87.05	755	535	220
79	Maniari	Kamalpur	239	1611	839	772	326	1486	734	752	90.70	546	445	101
80	Baro Gaon	Kamalpur	311	1793	926	867	254	1223	635	588	91.64	434	302	132
81	Darakahara	Kamalpur	354	2056	1041	1015	447	2164	1088	1076	89.02	681	592	89
82	Natuanacha	Kamalpur	42	58	48	10	2393	2503	2422	81	98.34	1223	1213	10
83	Bhitarkhala Grant	Kamalpur	183	1651	1381	270	29	121	65	56	65.00	56	40	16
TOTAL (C)			4878	28468	15267	13201	8436	31093	17094	13999	86.93	10167	8812	1355
TOTAL (A+B+C)			22,815	128247	67024	61223	34455	152344	79434	72910	85.07	62825	43589	18727

* HH – Household

In 2011, Kamrup district had population of 15,17,542. Decadal growth rate of Kamrup is 15.69% during 2001-2011. As per 2011 census, 90.62% of total population live in rural area while 9.38% of total Kamrup population live in urban area comparing to 2001 census. With regards to sex ratio in Kamrup, it stood at 949 female per 1000 male in 2011 census, compared to 2001 census this figure was 934. The initial provisional data released by the Census of India 2011, shows that density of population in Kamrup district is 489 people per sq. km. Average literacy rate of Kamrup district in 2011 census were 75.55 compared to 67.73 of 2001. Male and female literacy were 81.30 and 75.89 respectively in 2011 census.

3.12.7 SOCIO-ECONOMIC STATUS IN PROJECT INFLUENCE AREAS

The findings of the quick socioeconomic survey and various consultations at community level are presented below.

Demography- Demographical data of the study area are shown in the above table while during the study, the study area consist three tehsils namely North Guwahati, Hajo, Kamalpur, population in villages in all tehsils in the study area were 46,306 (61,398), 53,473 (59,853), 28,468 (31,093) respectively as per census 2001 (2011). Total population in the study area was 1,28,247 (1,52,344) as per census 2001 (2011).

Literacy- As informed by the respondents, literacy level in the PIA is comparatively good which is reflected in census data. Average literacy rate of the study area was 85.07% as per census 2011 which is 75.55% of the Kamrup district.

Economic Profile- It has been observed that private job is the major occupation in the project influence area while through cultivation and business people are getting employment. Economic profile is good of the area comparing to South Assam.

Livelihood opportunities- In the study area it is observed that the main source of the livelihood was farming but due to flood and heavy rain new generation of the area does not prefer to do cultivation. People of the area are getting livelihood from masonry work, driving, private jobs, carpentry work, industrial work, government work, small business, other labour work, etc.

Infrastructure Facilities- Infrastructure facilities in the study area is having in a good condition, road facilities – National Highway, State Highway and major roads, railways, bus facility is also available as the study area, the study area is near to notified industrial area so infrastructural facilities are in a good conditions.

Education Facility- The residents in the area have access to education facilities from their villages at primary levels, middle school, high school and colleges even vocational training centres are in the study area, even Guwahati city is near to the study area which is a capital of the state.

Water Supply- During the assessment of the study area it is found that all villages in study area are having proper facility of drinking water there is no complain for drinking water problem.

Sanitation- There are many villages observed during the study, where sanitation facility is in poor condition. Drainage facility is not in proper ways which need to be improved.

Electric Supply- During the assessment of the study area there is no complain found for the electricity problems.

Health care facility- Health facility in the study area is good, there is no complain for the health related problem and Primary Health Centres also working in the study area.

3.12.8 PEOPLE'S PERCEPTION

In the process of Social Impact Assessment study focus group discussion and personal interviews were made with local people, it is observed that people perceive this project positively. Through this project they are expecting employment generation with improvement in basic infrastructures, also it will boost the development of the area and develop the quality of life. People will get employment through this project directly and indirectly. People are not against the development only it should not creating pollution.

It is observed in the study area that all villages are having almost all infrastructural facilities like, drinking water, roads, primary health care centre, educational facility up to 12th standard and electricity, veterinary care centre, bank, post office, street light facility, etc. Though these facilities in the villages, drainage facility is not in proper condition.

3.12.9 PUBLIC CONSULTATIONS

Consultation 1

Date: 05/03/2015

Time: 9:40 am

Village: Milanpur

During public consultation in the Milanpur village, it came to know that this village is having full facility of all infrastructures like school, anganwadi, electricity, road, drinking water facility, primary health care facility, etc. New generation of the village is not doing agricultural activities as flood and heavy rain destroy all grew crops in the field, new generation has made their major occupations are like service in industries, private jobs, driving, government services, small business, masonry work, carpentry work, etc. Milanpur village is also having educational facility up to 12th Std. According to the respondents, surrounding industries are giving occupational benefit to them but they also added that by these industries indirect employment opportunity is generated.



Consultation with youth in Milanpur



Consultation at Milanpur with Carpentry workers

Consultation 2

Date: 05/04/2015

Time: 10:35 am

Village: Masto



Consultation with teacher at Pacharia school



Road facility in the study village

Public consultation was made at Masto area which is part of Milanpur village with School teacher. According to him, education level of students is high as they get educated up to graduation level and this school is having facility of vocation education like computer classes. There is no complaint for child labour or school dropout cases. Moreover, respondent admitted that nearby industries are being helpful for students who got technical education to get job.

Other group of people, according to them each industry generates employment and brings development which can be beneficial for the people who get that opportunity, which can help to get employment at residing area and reduce the rate of migration from the villages.

Consultation 3

Date: 05/03/2015

Time: 11:50 am

Village: Athiabo

During the survey it is found that Athiabo (Hathiabo) is the villages from where many women got employment in nearby industries. This village is having all infrastructural facilities like, road, water, electricity, school, etc. People do not prefer cultivation of crops because of flood, instead of this they prefer horticulture activities which includes potato, brinjal, lauki etc.



Correspondence with farmer

Consultation 4

Date: 05/03/2015

Time: 01:00 pm

Village:

Bongla Ghar

Survey team met to the group of young boys and workers at Bongla Ghar village. According to them, this village is having almost all facilities related to infrastructure of the village like roads, banks, drinking water facility, primary educational facility, drainage facility, they also mentioned that in surrounding area there are many industries like distillery, cement, plastic waste management industry, bricks, etc. Some men and women are getting job as per their skills and ability.

Another consultation was done with teaching staff at primary school of Bonagla Ghar village. In this school only children of poor families are getting education while for elite groups, there other facility of school in village. According to them this village is having major population of schedule castes like, das, hira, etc.



Young group at Bongla Ghar village



Workers at Bongla Ghar Village

Consultation 5

Date: 05/03/2015

Time: 2:30 pm

Village: Sindur Ghupa

In Sindur Ghupa village, survey team met to group of people, according to them village is having primary infrastructure like road, drinking water facility, education facility and other facilities. They were saying that through industries development and employment will generate.

Consultation 6

Date: 05/03/2015

Time: 3:15 pm

Village: Barogaon

In Barogaon village survey team met to village villagers, it came out through meeting that village is having primary infrastructural facilities and respondents who know or not know the project, express their views about the impact of project, according to them this project will bring extra opportunity of employment, increase population, increase percentage of development etc.

3.12.10 CONCLUSIONS

All the respondents across all socio-economic groups, age, gender and locations felt that the concerned industry will be beneficial for them and it will improve their quality of life by increasing their employment opportunities and also by bringing about a positive change. People's willingness and ability to be employed in the production activities need to be given importance. The actions that the residents have suggested need to be taken up for taking people in confidence. The Company needs to undertake some Corporate Social Responsibility (CSR).

3.13 LIST OF INDUSTRIES PRESENT WITHIN 10 KM RADIUS OF THE PROJECT SITE

List of industries present within 10 km radius of the project site is shown as below.

1. LPG Bottling Plant of M/s. Indian Oil Corporation
2. Steel Re-rolling Mill of M/s. Saiji Ispat
3. Coke Oven Plant of M/s. Makamakhiya Coke Industry.
4. Sodium Silicate unit
5. M/s. Royal fasteners Pvt. Ltd.
6. Brahmaputra Industrial Park
7. EPIP Zone having Detergent manufacturing units, formulation unit and Mosquito repellent coil manufacturing unit.
8. 200 TPD Cement plant of M/s. River Valley Cement
9. 100 TPD Cement Plant of M/s. Barak Industry
10. 500 TPD Cement Grinding unit of M/s. Yaswi Commercial
11. M/s. Assam Dyeing Plant
12. M/s. Sanjeria Woolen Mill
13. M/s. Brahmaputra Galvochem.
14. M/s. Triveni Metalloids
15. M/s. Master (India) Breweries Pvt. Ltd.
16. 50,000 TPA Asbestos corrugated sheet manufacturing Unit of M/s. Jumbo Roofings and Tiles
17. M/s. G. L. Coke Pvt. Ltd.
18. M/s. Assam Tubes

CHAPTER – 4

ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

4.1 IDENTIFICATION OF IMPACTS

Various sources of pollution with respect to wastewater, the flue gas / process emission, hazardous waste and noise generation along with their qualitative and quantitative analysis as well as measures taken to control them are discussed herein with details.

4.2 PREDICTIONS AND EVALUATION OF IMPACTS

Evaluation is an absolute term used for assessment and prediction by means of numerical expression or value. Assessment is the process of identifying and interpreting the environmental consequences of the **significant actions**. Prediction is a way of mapping the environmental consequences of the significant actions.

Significant action depicts direct adverse changes caused by the action and its effects on health of biota including flora, fauna and man, socio-economic conditions, landforms and resources, physical and cultural heritage properties and quality of bio-physics surrounds.

Prediction requires scientific skill drawn from many disciplines. Prediction of ecological components is often uncertain, because their response to environmental stress cannot be predicted in absolute terms. The assessor (one who does the assessment) and decision maker (one who take the decision after adequate analysis of assessment report) is expected to be aware of the degree of uncertainty. The assessor generally uses the following methods and resources for impact assessment.

- ◆ Field surveys and monitoring
- ◆ Guideline and modeling
- ◆ Literature surveys and interviews
- ◆ Qualification and experience

An impact can be defined as any change in physical, chemical and biological, cultural and or socioeconomic environment that can be attributed to activities related to alternatives under study for meeting the project needs. Impact methodology provides an organized approach for prediction and assessing these impacts.

Impact assessment is based on conceptual notions on how the universe acts that is intuitive and/or explicit assumption concerning the nature of environmental process. In most of cases the predictions consists of indicating merely whether there will be degradation, no change or enhancement of environment quality. In other cases, quantitative ranking scales are used. The selection of indicator is crucial in assessment because impacts are identifies and interpreted based on impact indicator. An impact indicator is a parameter that provides a measure (in atleast some qualitative or numerical sense) of the significance and magnitude of the impact. In India indicator is developed by the Central Pollution Control Board (CPCB) in the form of primary water quality criteria, biological water quality criteria, and national ambient quality criteria for air and noise.

The impact of the proposed project on the environment has been considered based on the information provided by the proponents and data collected at the site. The environmental impacts have been categorized as long or short term and reversible or irreversible. Primary impacts are those, which are attributed directly by the project while secondary impacts are those, which are indirectly induced. These typically include the associated investment and changed pattern of social and economical activities by the proposed action. The operational phase of the proposed project comprises several of which have been considered to assess the impact on one or another environmental parameters.

Scientific techniques and methodologies based on mathematical modeling are available for studying impacts of various project activities on environmental parameters.

The nature of the impacts due to said project activities are discussed here in detail. Each parameter identified in proceeding chapters, is singularly considered for the anticipated impact due to various activities listed. The impact is quantified using numerical scores 0, 1, 2, 3, 4 and 5 in increasing order of

activity. In order to assess the impact accurately, each parameter is discussed in detail covering the following:

- 1) Project activities like to generate impact
- 2) Quantification and prediction of impact

Minor and temporary impacts are expected due to the construction activities. all the impacts of construction phase will be short term only and it is very limited as minor construction work is anticipated for requirement of project.

Operation of the project may potential to affect quality of life, air, noise, water, land and flora, fauna and human by increase in air, noise and water pollution, by increase in hazardous waste generation, by pollution from spillage/surface run-off, by disturbance to flora and fauna, by loss of trees resulting from increased assess, by increase in land values threatening agriculture, etc.

During the operation phase, the following activities are considered significant.

- Air emission (Significant)
- Noise generation (Minor)
- Hazardous waste generation (Significant)
- Water use and waste water discharge (Significant)
- Employment Generation (Significant)

The operation of the project will involve discharge of pollutants. There will be wastewater generation, air emissions, hazardous waste generation and mechanical noise. An assessment of the quantitative changes in the various environmental components is therefore essential for predicting the impact. Operational phase activities will have impacts, either short terms or long term and reversible or irreversible on ambient air and noise, surface and ground water, land, socio-economics and cultural environment.

4.3 AIR ENVIRONMENT

4.3.1 CONSTRUCTION PHASE IMPACTS AND MITIGATION MEASURES

Dust will be the main pollutant affecting the ambient air quality of the surrounding area during the construction phase. Motor vehicle transportation (to, from and around the site) particularly the traffic of trucks at the site, material movement into the site will introduce particulates and other exhaust gases into the local ambient air and there is some likelihood that during the construction period local air quality may be temporarily affected by these emissions. To reduce air pollution during this phase following mitigation measures shall be implemented.

- Suitable surface treatment to ease the traffic flow and regular sprinkling of water shall be carried out to control dust/fugitive emission.
- Construction material shall be stored in covered shed.
- Condition of all vehicles, generators and compressors shall be maintained and regularly serviced.

4.3.2 OPERATION PHASE IMPACTS AND MITIGATION MEASURES

The dispersion of pollutants in the atmosphere is a function of several meteorological parameters viz. temperature, wind speed and direction, mixing depths, inversion level, etc. A number of models have been developed for the prediction of pollutant concentration at any point from an emitting source. The Industrial Source Complex – Short Term (ISCST3) dispersion model is a steady-state Gaussian plume model. It is most widely accepted for its interpretability. It gives reasonably correct values because this obeys the equation of continuity and it also takes care of diffusion, which is a random process. For the present study, this model is used for the prediction of maximum ground level concentration (GLC).

With respect to operation phase impact, Proposed Air emission from M/s. Manglam Distillers & Bottling Industries includes only utility emissions which will generate Particulates Matter, Sulphur dioxide and Nitrogen Oxide. Adequate measures will be taken to minimize air pollution from process by providing air pollution control equipment. D. G. set will be installed as standby to be used during emergency. Flue gases are discharged from stacks at adequate height (as per SPCB norms). The site specific and monitored details considered for input data for the software “ISC-AERMOD View” by Lakes Environmental, Canada for prediction of impact on air environment.

The air pollution caused by the gaseous emissions from a single or small group of stacks is a local phenomenon. Its impacts will occur at a distance ranging from within the immediate vicinity of the stack to several kilometers away from the stack. Maximum ground level concentration will occur within this range. All plumes at more downwind distances from the source by stack emission become so diluted by diffusion in the ambient atmosphere, that concentrations of pollutants become negligible. The maximum ground level concentration (24 hourly) for different parameters is given in table-4.2. Equal concentration contour plots for the SPM, SO₂, and NO_x are given in figure-4.1.

TABLE - 4.1 DETAILS OF EMISSION FROM STACKS

SR. NO.	OPERATING PARAMETER	UNIT	SOURCE OF EMISSION (STACK)
			BOILER
1.	Stack height	meter	45
2.	Stack diameter at top	meter	2
3.	Flue gas exit velocity	m/s	12
4.	Fuel used	-----	Coal
5.	Emission concentration PM SO ₂ NO _x	mg/Nm ³ ppm ppm	150* 100* 50*
6.	Flue gas temp.	K	433

FIGURE - 4.1A EQUAL CONCENTRATION CONTOUR PLOT FOR PM

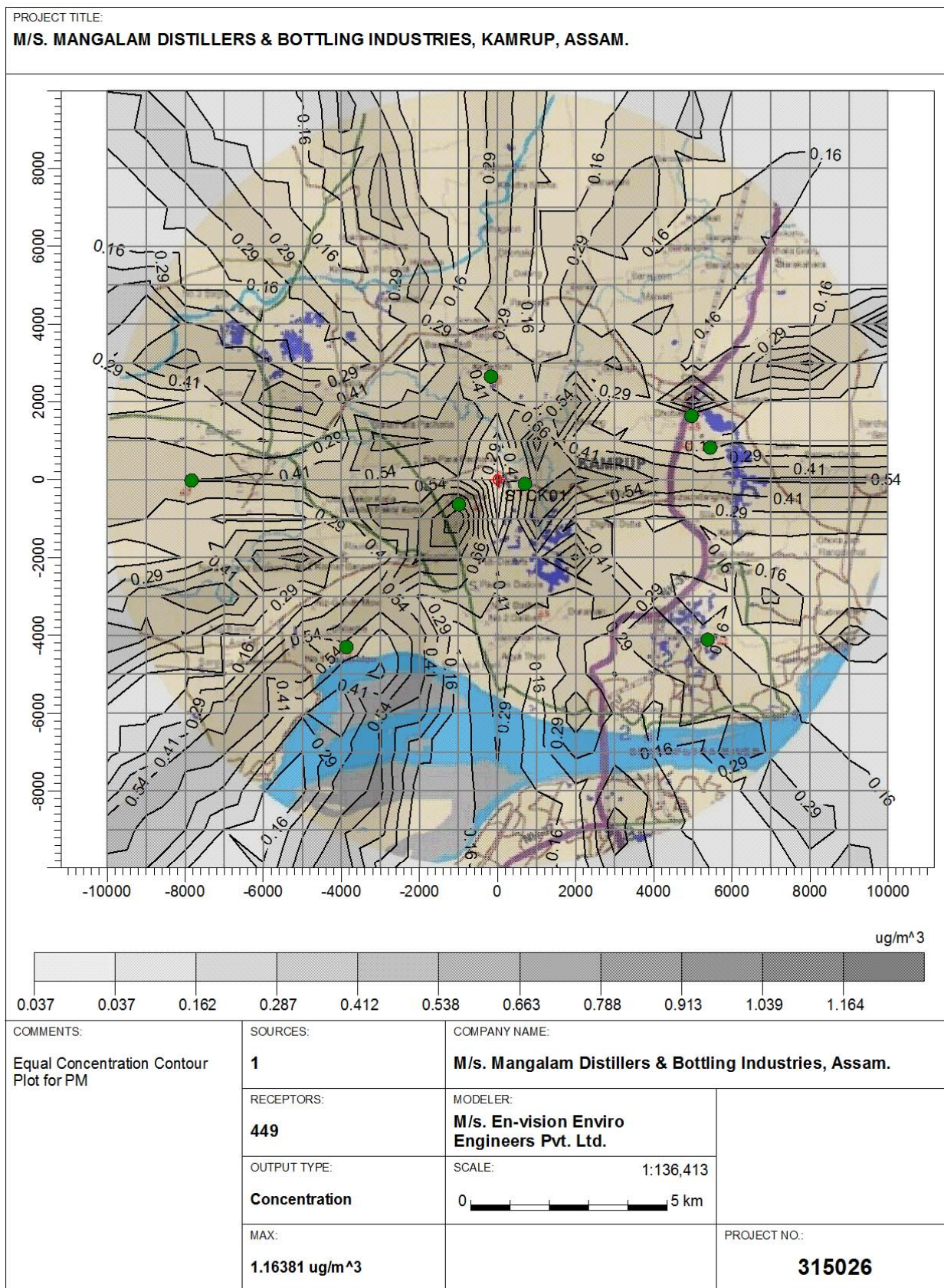


FIGURE - 4.1B EQUAL CONCENTRATION CONTOUR PLOT FOR SO₂

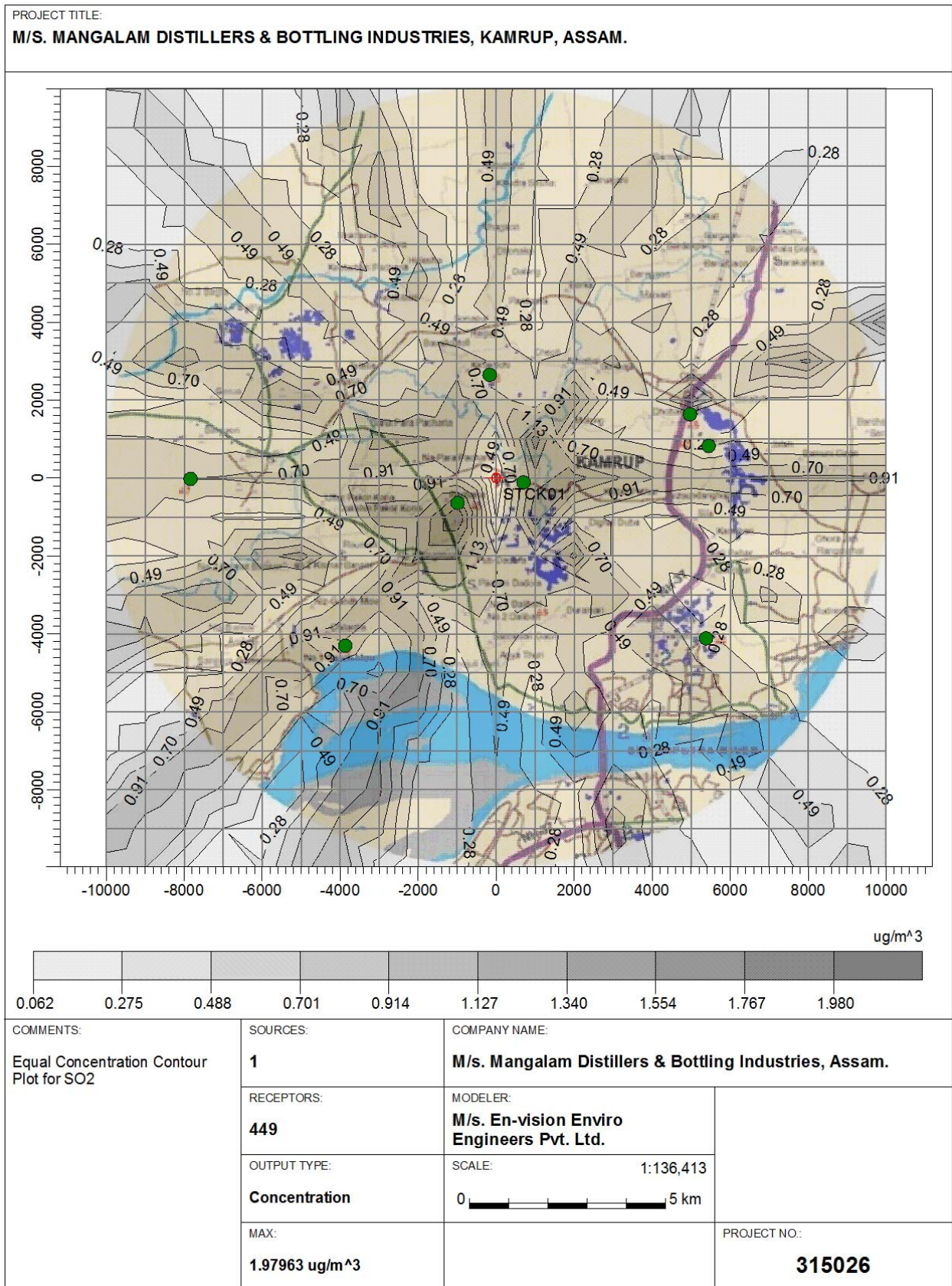


FIGURE - 4.1C EQUAL CONCENTRATION CONTOUR PLOT FOR NO_x

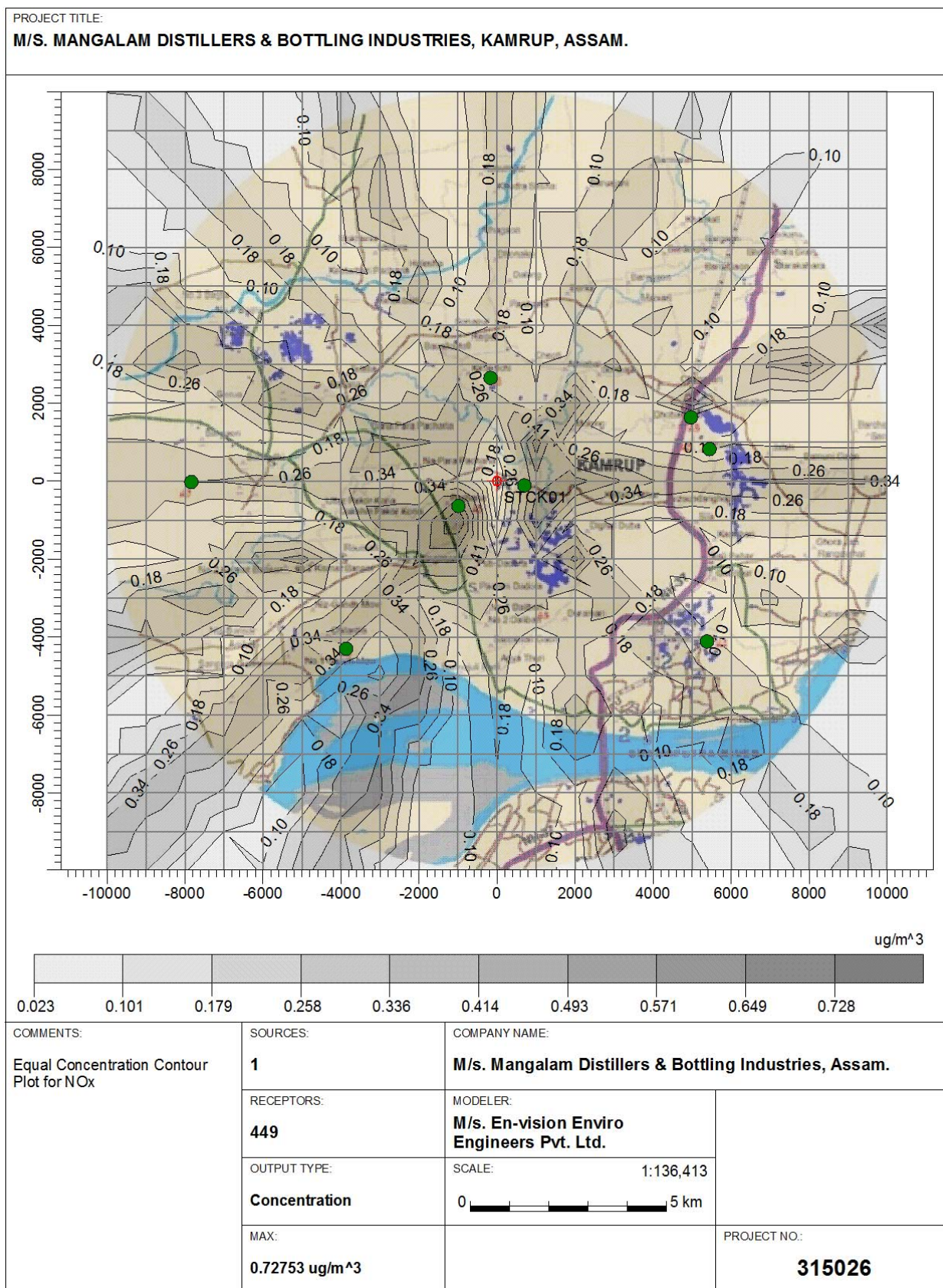


TABLE - 4.2 SUMMARY OF ISCST3 MODEL OUTPUT FOR PM, SO₂ AND NO_x

SR. NO.	LOCATIONS	CO-ORDINATES (X, Y)	MAXIMUM CONCENTRATION		
			PM (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
1.	Project Site (A1)	(700.84 , -114.20)	0.57647	0.98058	0.36037
2.	Industrial Unit in Vill. Changsari (A2)	(5445.00 , 819.31)	0.15175	0.25813	0.09486
3.	Dolibari (A3)	(4972.02 , 1641.87)	0.23931	0.40706	0.14960
4.	Namati jalah (A4)	(5383.31 , -4116.08)	0.19686	0.33485	0.12306
5.	Barijanni Pathar Pacharia (A5)	(-991.58 , -640.75)	0.99271	1.68859	0.62056
6.	Kalakuchi (A6)	(-169.00 , 2649.52)	0.33628	0.57202	0.21022
7.	Sesa (A7)	(-7839.43 , -23.82)	0.41591	0.70746	0.25999
8.	No. 1 Gandh Mow (A8)	(-3870.56 , -4301.16)	0.48687	0.82816	0.30435

TABLE - 4.3 MAXIMUM GROUND LEVEL CONCENTRATION OF PM, SO₂ AND NO_x

SR. NO.	X, Y CO-ORDINATES	MAXIMUM CONCENTRATION		
		PM (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)
1.	(-1000 , -1000)	1.16381	-	-
2.	(-1000 , -1000)	-	1.97963	-
3.	(-1000 , -1000)	-	-	0.72753

Mitigation measures:

- Effective stack height with proper air pollution control equipment shall be provided to stack.
- Regular maintenance of APCE shall be done and recorded.
- Green belt shall be developed on 33% are of the total plant area.

4.4 CONTROL OF FUGITIVE EMISSION

Fugitive emission is Air pollutants released to the air other than those from stacks or vents; typically small releases from leaks in plant equipment such as valves, pump seals, flanges, sampling connections, etc. Looking to nature of the proposed project it may generate fugitive emissions during usage, handling and transportation of raw materials & finish product, following mitigation measures shall be taken to control or prevent fugitive emission.

- All treatment vessels, distillation vessel agitator and process pumps shall be mechanically sealed.
- All process pumps shall be provided trays to collect probable leakage.
- More weightage on selection of MOC of piping shall be given to avoid leakage/spillage.
- Vent of all hazardous chemicals storage tanks shall be connected to condenser.
- De-dusting system will be provided
- Tanker shall be used instead of drums for hazardous chemicals.
- Proper system shall be provided for decontamination and effective cleaning of drums.

4.5 WATER ENVIRONMENT

With respect to water environment three aspects are generally considered in EIA, the raw water availability, consumption and wastewater generation that will be disposed. The first priority in water quality assessment is to maintain and restore the desirable level of water quality in general.

4.5.1 CONSTRUCTION PHASE IMPACTS AND MITIGATION MEASURES

During the construction phase of the project, water requirement will be mainly for construction activities, growing plants and developing lawns as well as for domestic water requirement for the construction work force. The daily water requirement will vary based on the project activities.

All the domestic wastewater generated from the construction site will be sent to septic tank followed by soak pit, so that it shall not contaminate the ground water or surface water in the nearby areas. Thus, there would not be any significant effect on surface water quality and quantity during construction phase.

4.5.2 OPERATION PHASE IMPACTS AND MITIGATION MEASURES

During operation phase daily water requirement of M/s. Manglam Distillers & Bottling Industries shall be 720 KL/Day and shall be met through ground water using bore wells located within premises.

The company will follow zero discharge effluent concept wherein waste water from Boiler Blow down, bottle washing etc. shall be utilize for ash quenching and green belt development after suitable treatment confirming norms prescribed by Pollution Control Board. Hence, no significant impact on water environment due to the proposed activities is envisaged.

4.5.3 GROUND WATER ABSTRACTION AND ITS IMPACT ON WATER SOURCE

The region has adequate ground water resource. The company intends to recycle and reuse the process effluent to reduce fresh water demand. Furthermore, ground water recharging through rain water harvesting shall be adopted.

4.6 SOIL ENVIRONMENT

The main source of impact on land and soil environment will be due to solid waste generated during construction and operation activities. In addition to this accidental spillage of chemicals and effluent can also degrade the soil environment.

4.6.1 CONSTRUCTION PHASE IMPACT AND MITIGATION MEASURES

The proposed project activity will be located on flat terrain no significant topographical change is expected due to construction activities. The construction of building will help in fixation of soil, thereby reducing the soil erosion. Some construction operations shall disturb the soil profile, but the impact will be insignificant. The plant site is suitably located considering availability of transportation, communication, residence and manpower. The project did not involve displacement of any population. Electricity, water, roads, all basic amenities and infrastructure are available at the site.

4.6.2 OPERATION PHASE IMPACT AND MITIGATION MEASURES

All the solid waste will be stored separately in the isolated storage area within premises. Solid waste generated in the form of DDGS/DWGS (approximately 120/42 MT/day) will be sold for cattle feeding and fly ash approximately 10 MT per day shall be trapped and sold to brick manufacturers.

4.7 NOISE ENVIRONMENT

4.7.1 CONSTRUCTION PHASE IMPACT AND MITIGATION MEASURES

Noise level in and around the plant site was measured. These values represent status of Noise levels. Adequate noise control measures such as mufflers, silencers at the air inlet/outlet, anti vibration pad for equipment with high vibration, earmuff and earplugs to the operators etc. would be provided. Housing / casing shall be provided for all noise generating machines. Pump operators are generally exposed to higher noise level for short duration. The noise level within plant would be kept less than 75 dBA. Transport and communication requirement increases due to operation of a plant.

4.7.2 OPERATION PHASE IMPACT AND MITIGATION MEASURES

The main sources of noise pollution in the plant would be boiler, air blower, cooling system, diesel generator and other noise generating units. Vehicular movements during operation phase for loading/unloading of raw and finished materials and other transportation activity may increase noise level. Adequate noise control measures such as mufflers, silencers at the air inlet/outlet, anti vibration pad for equipment with high vibration, earmuff and earplugs to the operators etc. will be provided. Housing / casing will be provided for all noise generating machines. Pump operators are generally exposed to higher noise

level for short duration. The noise level within plant is kept less than 75 dBA. Transportation and communication requirement increases due to operation of plant.

However, the proposed green belt will help to reduce noise. The adverse impact on occupationally exposed workers will not envisaged, as noise protection devices will be provided.

4.8 INFRASTRUCTURE AND SERVICES

As a result of development of industry, the neighbouring areas shall be developed for commercial use. The infrastructure services e.g. roads, state transport, post and telegraph, communication, education and medical facilities, housing, etc. shall be improved in the surrounding areas.

4.9 ENVIRONMENTAL HAZARD

Raw material and finish product shall be transported by road and shall be stored in the plant premises. On site emergency plan shall be prepared for storage and handling of Ethanol and submitted to Government. This report shall be prepared with the consideration of hazards associated with the Ethanol and care should be taken for all aspects of environmental hazards. The project proponent shall consider all the safety aspects in planning, designing and operation of the plant as per standard practices. Hence, no adverse impact on this account is anticipated. Potential impacts and mitigation measures are given in following table-4.4.

TABLE - 4.4 POTENTIAL IMPACTS & MITIGATIVE MEASURES

ENVIRONMENTAL COMPONENTS	POTENTIAL IMPACTS	SOURCES OF IMPACT	MITIGATIVE MEASURE	REMARKS
Water Quality	Deterioration of water quality Decrease in ground water table	Construction activity & abstraction of water for construction requirement and sanitation in housing for workers. Ground water abstraction for process	Proper management of surface water runoff shall be made Effluent treatment plant (ETP) Rain water harvesting	No waste water shall be discharge outside the premises. Insignificant adverse impact
Air Quality	Increase in SO ₂ , NO _x , & SPM concentrations in ambient air	Process emissions, Fugitive emissions, Utility stack emissions	Adequate stack height with APC equipment and use of Lime stone for blending Control of fugitive emissions	Regular monitoring of stack will be carried out Minor adverse impacts on ambient air quality
Socio-Economic	Overall growth & development of area, increased employment, improvement in infrastructure and growth of downstream industries	Project activities	-	Beneficial Impact
Terrestrial Ecology	Minor loss of habitat-flora & fauna, Aquatic life	Project activities	Green belt, Proper, management of air emission, solid waste and liquid effluent	Insignificant impact

ENVIRONMENTAL COMPONENTS	POTENTIAL IMPACTS	SOURCES OF IMPACT	MITIGATIVE MEASURE	REMARKS
Noise	Increased noise level	Project operation	Noise abatement at generation point & green belt before receptor	Marginal impact
Infrastructure & Services	Improved communication, transport, housing, educational & medical facilities	Social activities of company	Development has been gradual	Beneficial impact
Environmental Hazards	Risk to environment & neighboring population	Handling and storage of chemicals, Ethanol & fuels	On site & off site Disaster management plan & Safe practices	Insignificant adverse impact

4.10 ECOLOGY

The impact due to construction phase and operation phase of the project and its activities on the ecological parameters like natural vegetation, cropping pattern, fisheries and aquatic life, forests and species diversity.

Ecological Impact Assessment considered the following stages:

- Identification of the likely **zone of influence** arising from the whole lifespan of the project;
- **assessment of the ecological impacts** of the project and definition of the significance of these impacts;
- Identification and evaluation of **ecological resources and features** likely to be affected
- Identification of the **biophysical changes** likely to affect **valued ecological resources and features**;
- Assessment of whether these biophysical changes are likely to give rise to a significant ecological impact, defined as an impact on the **integrity of a defined site or ecosystem**
- The **conservation status of habitats or species within a given geographical area**, including cumulative impacts;
- Refinement of the project to incorporate **ecological enhancement** measures, **mitigation measures** to avoid or reduce negative impacts, and **compensation measures** for any residual significant negative impacts;
- Provision for **monitoring** and following up the implementation and success of mitigation measures and **ecological outcomes**, including feedback in relation to predicted outcomes. (Already covered in Post Project monitoring section)

When describing changes/activities and impacts on ecosystem structure and function, reference have been made to the following parameters and presented in following table,

- Magnitude of Impact;
- Extent;
- Duration;
- Reversibility; and
- Timing and frequency.

A detail of ecological impact assessment is discussed below:

ECOLOGICAL CRITERIA	IDENTIFIED IMPACTS	ECOLOGICAL SIGNIFICANCE OF IMPACT	MAGNITUDE	DURATION /TIMING/ FREQUENCY	REVER-SIBILITY	MITI-GATION	CUMULATIVE IMPACT
Construction Phase							
Zone of Influence	Project site habitat Due to Site clearance	As the site is already occupied for the industrial purpose and privately owned, no ecological impact associated with vegetation clearing or disturbances to the existing vegetation is anticipated from this project	No impact	-	-	-	No impact
Zone of Influence	Ecological Impact Surrounding habitat due to fugitive emission	Not much impact on the surrounding habitat is envisaged due to the construction activity except some fugitive emission. The Reserve Forest located nearby may have some impact due to the fugitive emission. Dust emission during monsoon period will be very less.	In significant impact	Only during the construction activity	Reversible	As given in EMP chapter	No impact
Accessibility	Ecological Impact due to road construction	Approach road of around 50 m from nearest road will be construction to assess the project site.	In significant impact	-	-	-	No Impact
Operation Phase							
Zone of Influence	Ecological Impact on Surrounding Eco sensitive habitat due to emission from process and utility emission Major Pollutants are PM, SO ₂ , NO _x , and HC. The increase in GLC of PM, SO ₂ and NO _x during the operation phase.	There is no habitat within 500 m radius from the project site. The predicted pollution load after the incremental increase is within the stipulated standard limit prescribed by CPCB for the concerned parameters.	In significant impact	-	-	Green belt development in the premises considering the predominant wind direction will further reduce the impact emission with respect to the magnitude and distance. Adequate EMP measures will be provided to the	No impact

ECOLOGICAL CRITERIA	IDENTIFIED IMPACTS	ECOLOGICAL SIGNIFICANCE OF IMPACT	MAGNITUDE	DURATION /TIMING/ FREQUENCY	REVER-SIBILITY	MITI-GATION	CUMULATIVE IMPACT
						stack attached boiler will reduce the pollution load.	
Zone of Influence	Ecological Impact on Surrounding Eco sensitive habitat due to waste water generated from the project activity. The generated waste water will be reused & recycled utilized for process, ash quenching and gardening after treatment.	No impact on the surrounding habitat are envisaged due the waste water generated from the project activity as it is utilized for process, ash quenching and gardening in the premises itself. No waste water will be disposed outside the premises. This will also reduce the ground water withdrawal meant for gardening.	No impact	-	-	ETP design and Efficiency as given in the EMP chapter	No impact
Zone of Influence	Ecological Impact on Surrounding Eco sensitive habitat due to Noise generated from the project activity	The impact on ambient noise level will be restricted only on the factory premises and may not have any significance increase in the surroundings due to the project activity	No Impact	-	-	As given in The EMP section	No impact
Conservation status of Habitat and species encountered	Impact due to the emission from the project activity	Two aquatic water bodies with ecological importance and reserve forests were observed in the study area. As the location of most of the reserve forests far away from the zone of influence of the project activity, no impact on this species is envisaged.	In significant Impact	-	-	-	-

4.11 DEMOGRAPHY, ECONOMICS, SOCIOLOGY AND HUMAN SETTLEMENT

Proposed project will give direct employment to about 60 employees. In addition to direct employment, indirect employment shall generate ancillary business to some extent for the local population. There is a positive effect due to improved communication and health services, which have lead to economic prosperity, better educational opportunities and access to better health and family welfare facilities. There has been a beneficial effect on human settlement due to direct and indirect employment opportunities from various industries in addition to employment generated by proposed project.

Local quality of life shall be improved. This factor combined with all other mitigation measures like proper treatment and disposal of solid and hazardous waste, liquid effluent and gaseous emission has minimized the adverse impact on ecology and has a beneficial impact on human settlement and employment opportunities. There has been a beneficial impact on the local socio-economic environment. There shall be no displacement of any population in plant area. Hence, there is no permanent impact on this account. The increasing industrial activity will boost the commercial and economical status of the locality up to some extent.

4.12 PLACES OF ARCHAEOLOGICAL/HISTORICAL/RELIGIOUS/TOURIST INTEREST

There is no place of archaeological, historical, religious or tourist interest within the study area i.e.10 km radius of plant site. Hence, there shall be no impact on places of interest.

4.13 MATRIX REPRESENTATION

The parameters discussed are presented in the form of a matrix in table-4.5. The impact matrix relating to the activities during operation phase is presented.

The quantification of impact is done using numerical scores 0 to 5 as per the following criteria.

Score	Severity criteria
0	No impact
1	No damage
2	Slight/ Short-term effect
3	Occasional reversible effect
4	Irreversible/ Long-term effect
5	Permanent damage

The scores for various parameters and activities are presented in table 4.6.

4.13.1 CUMULATIVE IMPACT CHART

The total negative impact of various activities on any one parameter is represented as a cumulative score and the cumulative scores of various parameters are given in the form of a cumulative impact chart presented in table-4.7. Any particular parameter having an individual score greater than 4 or cumulative score of 20 implies serious effects due to the project and calls for suitable mitigation measures.

It is evident from the matrices that the resultant impact is beneficial to the local population and due to export (and import substitution) the resultant impact is beneficial to our country.

TABLE - 4.5 IMPACT IDENTIFICATION MATRIX (OPERATION PHASE)

ACTIVITIES	Air Quality	Noise & Odor	Water Quality	Land Requirement	Infra-structure	Env. Hazards	Terrestrial Ecology Land-use	Socio-Economic Status	Aquatic Ecology	Resource Depletion
Water Requirement	-	-	✓	-	✓	-	-	-	✓	✓
Raw material Storage/Transport	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Raw Material Handling	✓	✓	✓	✓	✓	✓	✓	-	✓	✓
Utilities	✓	✓	-	✓	-	-	✓	-	-	✓
Effluent Discharge	✓	✓	✓	-	-	✓	-	-	✓	-
Gaseous Emissions	✓	✓	-	-	-	✓	✓	-	-	-
Fugitive Emissions	✓	✓	-	-	-	✓	✓	-	-	-
Solid & Hazardous Waste Disposal	-	-	-	-	✓	-	-	-	-	-
Product Storage/ Handling	✓	✓	✓	✓	✓	✓	✓	-	-	✓
Spills & Leaks	✓	✓	✓	-	-	✓	✓	-	✓	-
Shutdown/ Startup	✓	✓	✓	-	✓	✓	-	-	-	✓
Equipment Failures	✓	✓	✓	-	✓	✓	✓	-	-	✓
Plant Operations	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Transport of Workers	✓	✓	-	-	✓	-	-	-	-	✓
Movement of Vehicles	✓	✓	-	-	✓	-	✓	-	-	✓
Housing Needs	-	-	-	✓	✓	-	✓	-	-	-
Medical & Other Needs	-	-	-	✓	✓	-	-	-	-	-
Resource Consumption	✓	✓	✓	✓	✓	✓	✓	-	✓	✓

TABLE - 4.6 ENVIRONMENTAL IMPACT MATRIX (OPERATION PHASE)

ACTIVITIES	Air Quality	Noise & Odor	Water Quality	Land Requirement	Infra-structure	Env. Hazards	Terrestrial Ecology Landuse	Socio-Economic Status	Aquatic Ecology	Resource Depletion
Water Requirement	0	0	2	0	1	0	0	0	1	2
Raw material Storage & Handling	2	1	1	1	1	2	1	1	1	2
Utilities	2	2	0	1	0	0	1	0	0	2
Effluent Discharge	0	1	2	0	0	2	0	0	2	0
Gaseous/ Fugitive Emissions	2	1	0	0	0	1	1	0	0	0
Solid & Hazardous Waste Disposal	0	0	0	0	1	0	0	0	0	0
Product Storage/ Handling	1	2	1	1	1	1	1	0	0	1
Spills & Leaks	2	2	1	0	0	1	1	0	1	0
Shutdown/ Startup	2	2	1	0	1	1	0	0	0	1
Equipment Failures	2	2	2	0	1	1	1	0	0	1
Plant Operations	2	2	2	2	1	2	2	1	2	2
Movement of Vehicles	2	2	0	0	1	0	1	0	0	2
Medical & Other Needs	0	0	0	1	1	0	0	0	0	0
Resource Consumption	2	1	1	1	1	1	1	0	2	3

TABLE - 4.7 CUMULATIVE IMPACT CHART

ENVIRONMENTAL PARAMETER	TOTAL CUMULATIVE SCORE
Air Quality	19
Noise and Odour	18
Water Quality	13
Land Requirement	7
Infrastructure	10
Environmental Hazards	12
Terrestrial Ecology / Land use	10
Socio Economic Status	2
Aquatic Ecology	9
Resource Depletion	16

CHAPTER – 5

ENVIRONMENTAL MONITORING PROGRAMME

5.1 INTRODUCTION

Environmental monitoring provides feedback about the actual environmental impacts of a project. Monitoring results help judge the success of mitigation measures in protecting the environment. They are also used to ensure compliance with environmental standards, and to facilitate any needed project design or operational changes. An environmental monitoring program is important as it provides useful information and helps to:

- Assist in detecting the development of any unwanted environmental situation, and thus, provides opportunities for adopting appropriate control measures, and
- Define the responsibilities of the project proponents, contractors and environmental monitors and provides means of effectively communicating environmental issues among them.
- Define monitoring mechanism and identify monitoring parameters.
- Evaluate the performance and effectiveness of mitigation measures proposed in the Environment Management Plan (EMP) and suggest improvements in management plan, if required,

5.2 PROPOSED SCHEDULE OF ENVIRONMENTAL MONITORING

Environmental monitoring programme is a vital process of any management plan of the development project. This helps in assessing the potential problems that result from the proposed project, changes in environmental conditions and effectiveness of implemented mitigation measures. Proposed schedule of environmental monitoring for the proposed project is given in following table-5.1.

TABLE - 5.1 PROPOSED SCHEDULE OF ENVIRONMENTAL MONITORING

SR. NO.	AREA OF MONITORING	SAMPLING LOCATIONS	PARAMETERS TO BE ANALYSED	FREQUENCY OF SAMPLING
AIR POLLUTION MONITORING				
1.	Stack Emission	Each utility stack	As per consent of PCB	Once in a month
2.	Ambient Air Quality	Three samples	As per consent of PCB	Once in a six months
3.	Work Zone Environment	All plant	HC, VOC	Once in a six months
WATER POLLUTION MONITORING				
4.	Liquid effluent	Inlet of treatment plant	As per consent of PCB	Once in a month
5.	Ground and surface water	Two sampling locations	As per IS Standards	Once in a year
SOIL POLLUTION MONITORING				
6.	Soil	Two sampling locations of Impact Area	As per consent of PCB	Once in a year
NOISE POLLUTION MONITORING				
7.	Noise	Noise generating units	Sound Pressure Levels (L_{eq})	Once in a six months
		Four sampling locations within Plant	Sound Pressure Levels (L_{eq})	Once in a month

CHAPTER – 6

ADDITIONAL STUDIES

6.1 PUBLIC HEARING

Public hearing is applicable for the proposed project as per Para 7(i) III (b) of EIA Notification, 14th September, 2006 as the project is located outside the notified industrial area. Details of the Public hearing will be incorporated after completion of public hearing.

6.2 INTRODUCTION

Industrial activities including process, production, storage, handling, transportation and operational practices presents levels of hazards to workforce, population and environment at large due to accidents, spills, leaks etc. These accidents results in personal and financial loss. The assessment of the threat posed, its control and prevention through good design, management and operational controls is of primal importance.

Events like the Bhopal tragedy have emphasized the need to address both on-site and off-site safety. It is against this background that the various Section and Rules under the Environment Protection Act, 1986, the Factories Act, 1948 and other Acts specify the requirements for a safe and reliable working of an industry. These require carrying out various studies and analysis to assess and mitigate hazards prevalent in the factory in line with the above goal of safe and reliable working. These are more commonly known as “Risk Assessment Studies”.

Risk assessment refers to the technical, scientific assessment of the nature and magnitude of risk and uses a factual base to define the health effects of exposure of individuals or populations or ecological receptors to hazardous contaminants and situations.

This chapter explains the basis of Risk Assessment and its objectives.

6.3 OBJECTIVE OF THE STUDY

The main objectives of the Risk Assessment Studies are as given below:

- 1) To identify the potential hazards and their sources.
- 2) To define various accident release scenarios with respect to the hazard.
- 3) To assess the damage caused by the source in the event of accidents
- 4) To devise strategies for the prevention of the accidents.
- 5) To define and assess emergencies, including risk impact assessment
- 6) To control and contain incidents.
- 7) To safeguard employees and people in vicinity.
- 8) To minimize damage to property and environment.
- 9) To inform the employees, the general public and the authority about the hazards / risk assessed, safeguards provided, residual risk if any and the role to be played in them in the event of emergency.
- 10) To ensure safety of the workers before personnel re - enter and resume work.
- 11) To work out a plan with all provisions to handle emergencies and to provide for emergency preparedness and the periodical rehearsal of the plan.

6.4 PHILOSOPHY AND METHODOLOGY OF RISK ASSESSMENT

Risk is defined as the probability of an adverse event due to disturbances in the environment. One can also describe risk with the following expression.

$$\text{Risk} = \text{Severity of event (Hazard)} \times \text{Exposure}$$

Major hazard installations have to be operated to a very high degree of safety; this is the duty of the management. In addition, management holds a key role in the organization and implementation of a major hazard control system. In particular, the management has the responsibility to,

- i. Provide the information required to identify major hazard installations;
- ii. Carry out hazard assessment;

- iii. Report to the authorities on the results of the hazard assessment;
- iv. Set up an emergency plan;
- v. Take measures to improve plant safety.

In order to fulfill the above responsibility, the Management must be aware of the nature of the hazard, of the events that cause accidents and of the potential consequences of such accidents. This means that in order to control a major hazard successfully, the Management must have answers to the following questions:

- a. Do toxic, explosive or flammable substances in our facility constitute a major hazard?
- b. Which failures or errors can cause abnormal conditions leading to a major accident?
- c. If a major accident occurs, what are the consequences of a fire, an explosion or a toxic release for the employees, people living outside the factory, the plant or the Environment?
- d. What can Management do to prevent these accidents from happening?
- e. What can be done to mitigate the consequences of an accident?

The most appropriate way of answering these questions is to carry out a hazard or risk assessment study, the purpose of which is to understand why accidents occur and how they can be avoided or at least mitigated. A properly conducted assessment will therefore

- i. Analyze the existing safety concept or develop a new one;
- ii. Identify the remaining hazards; and
- iii. Develop optimum measures for technical and organization protection in event of an abnormal plant operation.

6.5 DETAILS OF MANUFACTURING PROCESS

Detail of manufacturing process is given in chapter-2.

6.6 DETAILS OF STORAGE FACILITY

The list of hazardous materials with classification, state, storage and operational details are given in table-6.1.

TABLE - 6.1 LIST OF HAZARDOUS MATERIALS

SR. NO.	NAME OF THE CHEMICAL	DESCRIPTION OF STORAGE	CAPACITY & No. OF STORAGE	DIMENSION OF TANK IN M		MAH CATEGORY
				DIAMETER	HEIGHT	
1.	Rectified Sprite	Daily Receivers	72 m ³ x 1No.	2.4	4	F, T
		Bulk Storage	460 m ³ x 1No.	4.2	8.3	
2.	Extra Natural Alcohol	Daily Receivers	72 m ³ x 3No.	2.4	4	F, T
		Bulk Storage	540 m ³ x 2No.	4.5	8.5	
3.	Technical Alcohol	Daily Receivers	33 m ³ x 1No.	1.9	3	F, T
		Bulk Storage	128 m ³ x 1 No.	2.35	7.45	
4.	Fuel Oil	Storage Tank	25 m ³ x 1No.	1.45	3.8	F
5.	Malt spirit	Daily Receivers	7.5 m ³ x 2 No.	1	2.5	F
		Bulk Storage	30m ³ x 1 No.	1.8	3	F

Note:

1. Fire fighting system as per OISD 117 norms.
2. Third Party safety audit to find out probable unsafe condition/ cause & to take remedial action.

6.6.1 SAFETY PRECAUTIONS FOR THE STORAGE OF MATERIALS

Following precautions shall be taken while storage of chemicals/products in tanks;

- The tanks shall be located and marked in the designated area for the chemical storage.
- Tanks of proper material of construction will be selected.
- The tanks shall be filled up to 90% of its capacity
- All tanks shall be uniformly tagged.
- Level indicators in tanks shall be provided.
- Industrial type electrical fittings shall be provided.
- Electrical installation shall be of flame proof type.
- Safe working place shall be provided in between all tanks/equipments.
- Proper colour coding shall be done to all pipe lines.
- Adequate fire fighting equipments shall be provided.
- Anti corrosive painting to be done.
- No smoking board shall be displayed.
- Safety instruction board shall be displayed.
- Standard Operating Procedure for the storage will be prepared.
- Proper earthing/bonding shall be provided.
- Lightning arrestor should be provided.

Precautions for storage in drums or bags;

- Separately stored with proper enclosures and marked, within premises in closed shed
- Proper ventilation shall be provided
- Sufficient fire extinguishers and PPE shall be provided
- Flame proof fittings will be provided
- Smoking will be prohibited

6.7 IDENTIFICATION OF HAZARDS

The first step in risk assessment is to identify the types of adverse health effects that can be caused by exposure to some agent in question, and to characterize the quality and weight of evidence supporting this identification.

6.7.1 MAJOR HAZARDS

M/s. Manglam Distilleries and Bottling Industries would be manufacturing Extra Neutral Alcohol & Ethanol, 60 KLPD. With the nature of product, organization will be handling hazardous materials in the process. A **hazardous material** is any item or agent (biological, chemical, physical) which has the potential to cause harm to humans, animals, or the environment, either by virtue of its intrinsic property or through interaction with other factors.

The potential hazard associated with the distillery industry are primarily classified into

- Chemical Hazard:
 - a. Toxicity
 - b. Flammable
 - c. Explosive
 - d. Corrosive
 - e. Carcinogen
 - f. Irritant

6.7.1.1 SOURCE

- **ETHYL ALCOHOL**

Ethanol, also called ethyl alcohol, pure alcohol, grain alcohol, or drinking alcohol, is a volatile, flammable, colorless liquid.

HAZARDOUS INGREDIENTS / IDENTITY INFORMATION

Component: Ethyl Alcohol 95%
 OSHA PEL: 1000 ppm (1900 mg/m³)
 ACGIH TLV: 1000 ppm (1900 mg/m³)

FIRE AND EXPLOSION HAZARD DATA

Flash Point: 12.8°C TCC

Flammable (Explosive) Limits in Air (% By Volume): Lower 3.3; Upper 19.0

Auto ignition Temperature: 422°C

OSHA Class: 1B Flammable Liquid

HEALTH HAZARD DATAACGIH Threshold Limit Value: 1000 ppm (1900 mg/m³)

Primary Routes Of Exposure: Skin Contact; Skin absorption; Inhalation

Signs / Symptoms of Exposure:

Acute: Exposure to ethyl alcohol vapors in excess of 1000 ppm in air may cause headache and irritation of the eyes, nose and throat. Prolonged exposure may cause symptoms of alcohol intoxication, drowsiness, weakness, loss of appetite, and inability to concentrate. Exposure to very high concentrations may cause symptoms of alcohol intoxication, headache, drowsiness, tremors, fatigue, dizziness, and unconsciousness. Ingestion of 190 proof ethyl alcohol produces the typical effects of alcohol intoxication. Ingestion of very large doses can cause alcohol poisoning and death. Contact of liquid ethyl alcohol with the skin may cause drying and cracking due to defatting of the tissue.

Chronic: Repeated, prolonged skin contact can cause drying and cracking of the skin and possible dermatitis.

Medical Conditions Generally Aggravated By Exposure: Skin, eyes, liver, respiratory system, central nervous system.

ECOLOGICAL EFFECTS

Pure ethanol has demonstrated lethal concentrations for fish (rainbow trout) at 11,200 to 15,300 milligrams per liter (mg/L). Pure ethanol is expected to biodegrade rapidly and bioaccumulation or concentration in the food chain is not expected. However, the biodegradation may decrease the DO in surface water resulting in fish kills.

- **SODIUM HYDROXIDE**

Sodium hydroxide (NaOH), also known as lye and caustic soda, is a caustic metallic base.

HAZARDOUS INGREDIENTS / IDENTITY INFORMATION

Component: Caustic Soda

OSHA PEL: 2 mg/m³

Auto ignition Temperature: Not applicable.

Flash Point: Not applicable.

Decomposition Temperature: Not available.

Explosion Limits: Lower: Not available. Upper: Not available.

Health Rating: 4 - Extreme (Poison)

Flammability Rating: 0 - None

Reactivity Rating: 2 - Moderate

Contact Rating: 4 - Extreme (Corrosive)

Stability:

Stable under ordinary conditions of use and storage. Very hygroscopic. Can slowly pick up moisture from air and react with carbon dioxide from air to form sodium carbonate.

HEALTH HAZARD DATAACGIH Threshold Limit Value: 2 mg/m³

Primary Routes Of Exposure: Skin Contact; Skin absorption; Inhalation

POTENTIAL HEALTH EFFECTS

Eye: Causes eye burns. May cause chemical conjunctivitis and corneal damage.

Skin: Causes skin burns. May cause deep, penetrating ulcers of the skin. May cause skin rash (in milder cases), and cold and clammy skin with cyanosis or pale color.

Ingestion: May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns. May cause perforation of the digestive tract. Causes severe pain, nausea, vomiting.

ECOLOGICAL EFFECTS

Highly toxic to aquatic life. As a contaminant in surface water, the primary effect of sodium hydroxide would be to raise the pH. Not bioaccumulated.

- **SULFURIC ACID**

Clear, colorless to dark brown, odourless, dense, oily liquid.

HAZARDOUS INGREDIENTS / IDENTITY INFORMATION

Component: Sulfuric Acid, 52 - 100 %

Health Rating: 4 - Extreme (Poison)

Flammability Rating: 0 - None

Reactivity Rating: 2 - Moderate

Contact Rating: 4 - Extreme (Corrosive)

Stability: Stable under ordinary conditions of use and storage. Concentrated solutions react violently with water, spattering and liberating heat.

HEALTH HAZARD DATA

ACGIH Threshold Limit Value: 0.2 mg/m³ (T) (TWA) for sulfuric acid - A2, Suspected Human Carcinogen for sulfuric acid contained in strong inorganic mists.

Primary Routes Of Exposure: Skin Contact; Skin absorption; Inhalation

POTENTIAL HEALTH EFFECTS

Inhalation: Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. May cause lung edema,.

Ingestion: Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow ingestion or skin contact. Circulatory shock is often the immediate cause of death.

Skin Contact: Corrosive. Symptoms of redness, pain, and severe burn can occur. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow skin contact or ingestion. Circulatory shock is often the immediate cause of death.

Eye Contact: Corrosive. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.

Chronic Exposure: Long-term exposure to mist or vapors may cause damage to teeth. Chronic exposure to mists containing sulfuric acid is a cancer hazard.

Aggravation of Pre-existing Conditions: Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

ECOLOGICAL EFFECTS

Because sulfuric acid is a direct-acting toxicant, rather than a substance that causes toxic effects after being absorbed into the blood stream, bioavailability from different media is not an important issue for sulfur trioxide and sulfuric acid. Lethal doses for fish are 24.5 ppm/24 hour/bluegill/lethal/fresh water and 42.5 ppm/48 hour/prawn/lethal concentration 50% (LC50)/salt water. Sulfur is an important constituent of normal biomolecules. Food chain bioaccumulation is not an important issue for either sulfur trioxide or sulfuric acid. Once sulfuric acid enters the environment, the sulfur enters the natural sulfur cycle which is well defined.

M/s. Manglam Distillers & Bottling Industries will take due care to overcome the hazard. The complete structure of the manufacturing area is painted with special type of anticorrosive paint. Good quality materials shall be used for transferring corrosives. Regular thickness testing of equipment, pipelines etc. will be carried out to have the exact picture of effect of corrosion.

While hazards of other type along with safety measures, flood control measures and earthquake control measures are given in table-6.2, table-6.3 and table-6.4 respectively.

TABLE - 6.2 HAZARDS AND ITS CONTROL

SR. NO	NAME OF THE POSSIBLE HAZARD & EMERGENCY	IT'S SOURCE & REASONS	IT'S EFFECT ON PERSONS PROPERTY & ENVIRONMENT	PLACE OF EFFECT	CONTROL MEASURES PROVIDED
1.	Fire	Transformer Transfer oil short circuit etc.	Electrical power failure Production hindrance Loss of transformer	Transformer near power control centre	<ul style="list-style-type: none"> • Fire Fighting Equipment's • Graved bed for oil spillage or soaking isolated fenced area • Lightening arrestor nearby • DG set for emergency power supply
2.	Fire & Toxic chemical spillage	Natural Disaster, Earthquakes, Lightening, war.	Production hindrance Trapping under debris, death Chemical burn Toxic chemical spillage	Whole factory & population nearby	<ul style="list-style-type: none"> • Hydrant system • First aid available • Smoking prohibited inside the factory • Security at all the time guarding important locations
3.	Fire & smoke	Fire in storage tank	Burns Storage tank catching fire Production hindrance	Tank area	<ul style="list-style-type: none"> • Adequate earthing Tanker unloading permit • Unauthorized person not allowed to enter • Breathing Apparatus for rescue operations • Alarm system for indicating unusual incidence

TABLE - 6.3 FLOOD CONTROL MEASURES

SR.NO.	HAZARD	SAFETY PRECAUTIONS	EMERGENCY CONTROL
1.	Electric shock	- All electric line cut off / switch off from main supply - Hand siren use to declare emergency - Shock proof hand gloves should be used if needed	Stop electric power Inform site main controller for outside help
2.	Slippery Surface	- Clean the working place - Keep away all persons at safe assembly points - Evacuate all persons through emergency exit door immediately	Start the emergency water tapping

TABLE - 6.4 EARTHQUAKE CONTROL MEASURES

SR.NO.	HAZARD	SAFETY PRECAUTIONS	EMERGENCY CONTROL
1.	Fire	- Minimum stock of Hazardous chemicals - Earthquake proof building	- Stop the leakage - Inform site main controller for outside help
2.	Mixing of incompatible chemicals	- Safe distance between chemicals - Dyke wall at all storage tank of chemicals	- Stop the leakage - Inform site main controller for outside help

6.8 PROCESS HAZARD AND SAFETY

Process Hazard Analysis

Process Hazard Analysis (PHA) is a method to evaluate and identify credible hazardous scenarios. PHA is a thorough, orderly, systematic approach for identifying, evaluating, and controlling the hazards of processes involving hazardous chemicals. Proposed hazardous process details of plant are given in following table-6.5.

TABLE - 6.5 PROCESS HAZARD AND ITS CONTROL

SR. NO.	PARTICULARS		CONTROL MEASURE
01	Name of the Process	Ethanol Distillation	<ul style="list-style-type: none"> - Skill Supervisor - Process Safety Information - Operating Procedures - Fire proof electricity fitting - Earthing Bonding - Proper MOC selection - Transportation of raw materials & intermediates through fix piping - Mechanical seal in all pumps and reactors - Process automation with safety lock
	Material involved in process	Ethanol	
	Location	Within Plant	
	Hazard details	Raising in Temperature VOCs emission	

Process Hazard Safety Management:

Process Safety Management is a new discipline covering all aspects of risk and involving the identification, assessment and control of hazards in process facilities. The hazards most commonly considered include fires, explosions and release of hazardous substances.

Process Safety Management System integrates all aspects of risks in a facility and puts them under the control of a management system. By establishing a heightened awareness of the safety impacts of technology, personnel and the management, the system provides a dynamic environment for continual improvement.

6.9 SAFETY PRECAUTIONS FOR HANDLING AND TRANSPORTATION OF MATERIALS

Following safety precautions will be taken for handling and transportation of materials;

- PPE will be used
- Proper earthing bonding
- Flam arrestor will be used
- Contact with skin and eyes will be avoided

6.9.1 SAFETY PRECAUTION FOR HANDLING AND TRANSPORTATION OF ALCOHOL

Grain alcohol, or drinking alcohol, is a volatile, flammable, colorless liquid. It burns with a smokeless blue flame that is not always visible in normal light. Mixtures of ethanol and water that contain more than about 50% ethanol are flammable and easily ignited. At room temperature, Ethanol is stable.

ENA (96%Ethanol) produced shall be stored in MS tanks in a cool, dry well-ventilated location. Tanks will be bonded and grounded for transfers to avoid static sparks. Transfer of alcohol will be done using special flame proof pumps with CF8 grade make. The storage area shall be a smoke free zone. Use of non-sparking type tools and equipment, including explosion proof ventilation.

To prevent accidental release or leakage from tank following precaution shall be taken;

- A visual external inspection according to a checklist that includes markings, valves, manhole and cover and paint condition
- Through external examination including corrosion, dents or mechanical damage, missing or loose bolts, required markings and frame & support are in acceptable condition.

- Nuts & bolts are of SS material. Valve colour coding & identification is periodically checked.
- The examination shall be witnessed by third party competent person.

Receiving storage tank is normally equipped with load cell arrangement and/or level monitoring device, which display on line transfer.

6.10 FIREFIGHTING SYSTEM

M/s. Manglam Distillers & Bottling Industries management shall take into consideration fire prevention measures at the project planning and during plant commissioning stage to avoid any outbreak of fire. But looking to the hazardous nature of process and the product ENA that shall be handled and processed, the chances of outbreak of fire cannot be totally refuted. Hence to avoid such a scenario, a well laid fire protection system conforming OISD norm 117 will be provided in the factory. List of proposed fire fighting equipments are given in table-6.6.

The ENA storage area shall be protected by hydrants system. A full flagged hydrant system (with hydrant lines and water spray system shall be provided covering storage areas and at different location within the premises. Water storage reservoir will be provided for hydrant system. Separate high capacity fire pumps preferably of CS will be provided to hydrant system.

Mobile/portable foam system shall be provided for suppression of pool fire in ENA storage area. Mobile system includes foam producing unit mounted on wheels towed by a vehicle or self propelled. Foams shall be supplied through foam towers to the burning surface.

A manually operated sirens located at strategic points shall be installed as fire alarm system in case of fire outbreak.

TABLE - 6.6 LIST OF PROPOSED FIRE FIGHTING EQUIPMENTS

SR. NO.	NAME OF EQUIPMENT
01.	DCP 10 Kgs.
02.	DCP 75 Kgs.
03.	Foam 9 Ltrs.
04.	Foam 45 Ltrs.
05.	CO ₂ 2 Kgs.
06.	CO ₂ 4.5 Kgs.
07.	Hydrant Post
08.	Hose Reel
09.	Hose Cabinet (MS)
10.	Nozzles
11.	Bucket Stand
12.	Water Reservoir

6.11 SAFETY FEATURES AND EMERGENCY CAPABILITIES TO BE ADOPTED

6.11.1 OBJECTIVES OF EMERGENCY PROCEDURES

Measures those are required to be taken during emergency are co-ordination of activities with many departments/ services and outside resources.

The objective of the procedure is to define role of key personnel of different services during major emergency to be effectively utilized to:

- 1) Safeguard lives
- 2) Contains of incident and bring it under control
- 3) Minimize damage to property & neighboring environment

- 4) Rescue & treatment of casualties & evacuation of persons to safe areas
- 5) Identification of affected persons, information to relatives and extending necessary assistance.
- 6) Preservation of information, records etc. which will help in investigation
- 7) Welfare assistance to casualties
- 8) Providing relevant information to police, district authorities and news media
- 9) Mobilizing inside resources
- 10) Initiating and organizing evacuation of affected persons

Collecting latest status, other information and requirement

6.11.2 BASIS OF PLAN AND HANDLING OF EMERGENCY

- 1) It is not possible to envisage and detail every action, which should be taken during an emergency. The basic philosophy is to get key personnel of necessary discipline who have the knowledge and background to assess the situation and give directions as per the objectives as quickly as possible.
- 2) The plan identifies the services / departments required to combat emergencies and also identifies the key persons to discharge the duties.
- 3) Key personnel have been identified for emergencies and are responsible for providing necessary assistance.
- 4) Any outside assistance, which company shall get, shall be co-ordinate by the MAIN SITE CONTROLLER on duty.
- 5) Messages via telephones are restricted to key personnel only. This is required to keep the telephones free for key personnel to contact for necessary feed-back.
- 6) Senior person who arrives on scene is automatically incharge for the service group. He should not leave the site without entrusting the charge to his deputy. All the key personnel should be available at the main control room. All key personnel of other services will report to main site controller, who will co-ordinate between various departments and outside agencies.

6.11.3 INFORMATION ABOUT EMERGENCY AND SUBSEQUENT ACTIONS

- 1) Any person noticing fire/explosion/re lease of hazardous gases should shout FIRE, FIRE or HELP, HELP and will activate the emergency bell
- 2) Inform respective control rooms
- 3) The Executive in-charge along with the concerned Dept. Head will immediately rush to the incidence site to assess and take immediate action required to control the source of incidence. They will also inform Security and Safety personnel to come to the place of disaster/emergency and assist them.
- 4) If he feels that the situation is likely to escalate and may lead to emergency will communicate following minimum information to all senior persons.
 - a) Brief description of incident.
 - b) Status & seriousness of the situation
 - c) Actions immediately taken.
 - d) Immediate assistance required.
 - e) All key personnel of respective services, depending on nature of emergency will arrive at site to take charge of positions.

6.11.4 INSTRUCTIONS TO EMPLOYEES

The plan assumes certain discipline at site during emergency as given below;

- 1) Do not get panicky
- 2) Do not approach the scene of disaster as a spectator
- 3) Do not engage phones / P.A. system unnecessarily
- 4) Non-essential personnel to gather at security gate after receiving instructions
- 5) Do not move here & there unnecessarily
- 6) Do not approach unnecessarily to get information or more inquiry
- 7) Remain at your working place unless called and be attentive to instructions

- 8) Ensure that all contract laborers working in the premises are immediately sent to main security gate. They will receive further instructions from main site controller

All non - essential staff members should gather at safe assembly point after assessing the wind direction (from the wind sock, stack of boiler chimney) and wait for further instructions which will be communicated through PA system or by other available means.

6.11.5 INSTRUCTIONS TO CONTRACTORS

The plan assumes certain discipline at site during emergencies as given below;

- 1) Do not get panicky
- 2) Do not approach the scene of disaster as a spectator
- 3) Do not engage phones / P.A. system unnecessarily
- 4) Non-essential personnel to gather at security gate after receiving instructions
- 5) Do not move here & there unnecessarily.
- 6) Do not approach unnecessarily for information or more inquiry.
- 7) Remain at your working place unless called and be attentive to instructions
- 8) Ensure that all contract laborers working in the premises are immediately sent to main security gate. They will receive further instructions from main controller. All should gather at safe assembly points after assessing the wind direction (from the wind sock, stack of boiler chimney) and wait for further instructions which will be communicated through PA system or by other available means.
- 9) All fabricator contractors should ensure that all welding machines are switched off and all cylinders are closed before leaving the working area.
- 10) All civil contractors should be gathered at assembly points after declared emergency.

6.11.6 MITIGATION OF CONSEQUENCES DURING MAJOR ACCIDENT

No major hazard installation can ever be absolutely safe. Even if a hazard assessment has been carried out, if the hazards have been detected and appropriate measures have been taken, the possibility of an accident cannot be completely ruled out.

So safely systems provide measures, which can mitigate the consequences of accident or emergency situation.

Other measures for mitigating the consequences of an accident deal mainly with the response to Alcohol. In order to be able to initiate counter measures in the event of an accident, company shall install various safety systems to mitigate the consequences during Major Accident are as under:

- (1) Emergency Control members available round the clock in all plants
- (2) ECC room with full equipped with Fire Fighting Equipment
- (3) Fire Men available in Fire Department round the clock
- (4) TAC approved Fire Hydrant system with electric motor and D.G. Set and water reserved for fire fighting
- (5) QRA to be done by competent party
- (6) Alarm System and method of reporting / declaring emergency
- (7) Regular rehearsal of emergency preparedness
- (8) Training to all employees regarding emergency preparedness
- (9) MSDS of all hazardous chemicals are available in safety department and in concerned department.

6.11.7 EMERGENCY CONTROL CENTRE WITH LIST OF EQUIPMENT AND ACCESSORIES

Safety Office in front of Operation Building will act as Emergency Control Center. It is equipped with all necessary accessories as mentioned below and also given in table-6.7.

(A) DOCUMENTS

- Site Plan
- Disaster Control Plan copy
- List of essential telephone numbers
- List firefighting equipment

- Shift Schedule of Emergency Control members

(B) PERSONAL PROTECTIVE EQUIPMENT

- B. A. Sets (Breathing Apparatus)
- Face Masks
- Hand gloves
- Gum boots
- Goggles
- Helmets
- Safety belts
- Aprons
- Fire proximity suit

(C) EQUIPMENT LIST

- Internal / External Telephone
- Portable alarm
- Torches
- Emergency Cupboard with necessary PPE
- Artificial Respirator
- Racer watches (STOP WATCH)
- Gas Detector Tube
- Static Charge Meter

TABLE - 6.7 EMERGENCY CONTROL CENTRE WITH LIST OF EQUIPMENT AND ACCESSORIES

SR. NO.	ITEMS KEPT IN CENTRE	PERSONS WHO WILL HANDLE / OPERATE THIS ITEMS
1.	Safety helmet	Safety officer
2.	Safety hand gloves & shoes	
3.	Safety goggles	
4.	Self contained breathing apparatus	
5.	Gas mask with canister	
6.	Nose mask (dust)	
6.	Fire Extinguishers DCP (10 kg. Capacity) CO ₂ (3.2 kg Capacity) Foam type	
7.	Fire hose with branches	
8.	Intercom	
9.	Emergency Siren Switch	
10.	First Aid Box	

6.12 RISK ASSESSMENT AND CONSEQUENCE ANALYSIS

In a plant handling hazardous chemicals, the main hazard arises due to storage, handling & use of these chemicals. If these chemicals are released into the atmosphere, they may cause damage due to resulting fires or vapour clouds.

Blast Overpressures depend upon the reactivity class of material and the amount of gas between two explosive limits.

Operating Parameters

Potential vapour release for the same material depends significantly on the operating conditions. Especially for any liquefied gas, the operating conditions are very critical to assess the damage potential. If we take up an example of ammonia, if it is stored at ambient temperature, say 30°C, and then the vapour release potential of the inventory is much higher as compared to the case if it is stored at 0°C.

Inventory

Inventory Analysis is commonly used in understanding the relative hazards and short listing of release scenarios. Inventory plays an important role in regard to the potential hazard. Larger the inventory of a vessel or a system, larger the quantity of potential release. The potential vapour release (source strength) depends upon the quantity of liquid release, the properties of the materials and the operating conditions (pressure, temperature). If all these influencing parameters are combined into a matrix and vapour source strength estimated for each release case, a ranking should become a credible exercise.

Loss of Containment

Plant inventory can get discharged to Environment due to Loss of Containment. Certain features of materials to be handled at the plant need to be clearly understood to firstly list out all significant release cases and then to short list release scenarios for a detailed examination. Liquid release can be either instantaneous or continuous. Failure of a vessel leading to an instantaneous outflow assumes the sudden appearance of such a major crack that practically all of the contents above the crack shall be released in a very short time. The more likely event is the case of liquid release from a hole in a pipe connected to the vessel. The flow rate will depend on the size of the hole as well as on the pressure, which was present, in front of the hole, prior to the accident. Such pressure is basically dependent on the pressure in the vessel. The vaporisation of released liquid depends on the vapour pressure and weather conditions. Such consideration and others have been kept in mind both during the initial listing as well as during the short listing procedure. In the study, Maximum Credible Loss accident methodology is to be used, therefore, the largest potential hazard inventories have been considered for consequence estimation.

6.12.1 RISK MATRIX**OBJECTIVE**

- To establish and maintain a procedure to identify the occupational, health & safety hazards of all organizational activities, products and services.
- To identify three clauses of risks namely High risk, medium risk and low risk associated with the activities.
- The identification shall include the activities of all contractors and facilities at the work place.
- To review the information periodically, introduction of new chemicals, products and services included.

PROCEDURE

The initial evaluation shall consider the following:

- The concerned HOD shall identify the entire task and their associated activities of the operations under his control, which may have an occupational health and safety hazards. These activities shall include routine and non-routine activities, activities of contractors, and sub contractors activities at the facilities provided at the work place within the area of his control.
- The OH & S Hazards are reviewed arising out of normal condition of operation and abnormal condition of operations.
- This review shall also include contain hazards likely lead to an emergent situation.
- Each of the OH & S Hazards and their impacts are identified and evaluated distinctly.
 1. Will the possible risk affect the human or not
 2. Will the possible risk affect the property or asset
 3. Shall the risk invite the attention of regulatory authorities
 4. Will there be long term effect as permanent health Hazards or severe damage to the assets
 5. Does it involve Hazardous substance/process or machinery
 6. Does it arrive out of normal operation
 7. Does it arrive out of abnormal operation
- For every Yes assign the value by 1 and Zero if otherwise
- The evaluation scores shall be totaled and if the total exceeds 3 and also if attracts attention of regulatory authorities those Hazards carried over to the format 'rating of OH & S Hazards'.

Identifying High risks

The Hazards are rated as per the probability and duration / detection of the hazards identified as HI and H2 respectively

- The rating score for probability (HI).

SR. NO	THE PROBABILITY OF THE EVENT	SCORE
1	Very high (1 in 100)	10
2	High (1 in 1000)	7
3	Possible (1 in 10000)	3
4	Remote (1 in 100000)	1

- The rating score for detection /duration (H2).

SR.NO	THE TIME FACTORS	SCORE
1	Very large > 24 Hrs	10
2	Large > 8 Hrs	7
3	Low > 1 Hr	3
4	Negligible Immediate	1

- **The impacts arising out of various Hazards are rated as per the severity of the impact on human (I1) on the aspects and properly (I2) and concern generated (I3).**
- The rating score for impact (I1) for human.

SR.NO	THE IMPACT SEVERITY	SCORE
1	Death/Long- Term Health Afflictions	10
2	Long time hospitalization	7
3	Loss of man-days serious injury like fracture	3
4	small injury needing first aid- only	1

- The rating score for Impact on assets/property (I2),

SR.NO	THE IMPACT SEVERITY	SCORE
1	Replacement and long time loss	10
2	Repairable but needs long time/costly spares/ Depending on vendor	7
3	Repairable needs some time	3
4	Small damage repairable locally in short time	1

- The rating score for concern due to impact (I3).

SR.NO	THE IMPACT SEVERITY	SCORE
1	High concern authorities interference, Legal concern, Long production stoppage, Long delivery, loss of customers	10
2	Medium concern employees' mistrust, loss of products, Production hold up, etc.	7
3	Some concern of extra expenses, payable compensations, some delay in delivery etc.	3
4	Small concern of minor nature solution can be quick and at HOD level	1

- Overall rating for OH & S risk is calculated based on the formula

$$(H_1 + H_2) \times (I_1 + I_2 + I_3) = R$$

- The cut off scores of 'R' dividing the risk into three categories as high risk, medium risk and local risk are as below

176 and above	-	High risk
Above 60 & up to 175	-	Medium risk
60 & less than 60	-	Low risk

- The classifications are used for identification of methods to control the risk. Detail risk analysis and hazard management matrix is given in table-6.8.

TABLE - 6.8 DETAIL RISK ANALYSIS AND HAZARD MANAGEMENT MATRIX

SR NO	ACTIVITY	CONDI-TION N/A/E	HAZARDS	IMPACT	S1	S2	S3	S4	S5	S6	S7	TOTAL	I.1	I.2	I.3	H.1	H.2	RISK FACTOR	CLASS OF RISK MEDIUM/HIGH/LOW	ACTION PROPOSED SMP
1.	Grain Storage in Silos	E	Suffocation due to drowning	Fatal	1	0	0	0	0	0	1	2	10	1	10	1	1	42	Low	Guard rail to avoid Human entry; work permit system
2.	Grain Cleaning	N	---	---	0	0	0	0	0	0	0	0	0	0	0	0	0	0	---	---
3.	Grain Milling	N	Noise exposure	NIHL	1	0	0	1	0	0	0	2	10	0	3	3	3	78	Medium	Hearing conservation programme
		A	Contact with rotating portion	Cut injury	1	0	0	1	0	0	1	3	3	1	3	1	1	14	Low	Guard provided, PPE, Emergency switch
4.	Flour handling	N	Inhalation of flour dust	respiratory problem	1	0	0	1	0	0	0	2	3	0	3	1	1	12	Low	Ventilation, PPE
		A	Contact with nipping point of conveyor	Cut injury	1	0	0	1	0	0	1	3	3	1	7	1	1	22	Low	Guard provided, PPE, Emergency switch
5.	Slurry tank	N	---	---	0	0	0	0	0	0	0	0	0	0	0	0	0	0	---	---
		A	Water splash on body and Eye	Eye irritation	1	0	0	0	0	0	1	2	1	0	0	1	1	2	Low	Proper PPE provided
6.	Liquefaction tank	N	---	---	0	0	0	0	0	0	0	0	0	0	0	0	0	0	---	---
		A	Water splash on body and Eye	Eye Irritation	1	0	0	0	0	0	1	1	1	0	0	1	1	2	Low	Proper PPE provided
7.	Steam cooker Jet	N	Noise exposure	NIHL	1	0	0	1	0	0	0	2	10	0	3	3	3	78	Medium	Hearing conservation programme
		A	Change in Pressure and Temp.	Rupture	1	1	0	0	0	0	1	3	3	7	7	1	1	34	Low	OISD std, Alarm system for P and T, rupture disc
		E	High Pressure and Temp.	Rupture & Explode	1	1	1	0	0	0	1	4	7	10	10	1	1	54	Low	OISD std, Alarm system for P and T, rupture disc
8.	Retention Vessel	N	---	---	0	0	0	0	0	0	0	0	0	0	0	0	0	0	---	---
		A	Over flow of Slurry	Spill	0	1	0	0	0	0	1	2	1	1	1	1	1	6	Low	flow meter
9.	Flash tank	N	---	---	0	0	0	0	0	0	0	0	0	0	0	0	0	0	---	---
10.	Fermentation process	N	---	---	0	0	0	0	0	0	0	0	0	0	0	0	0	0	---	---
		A	Over flow of Slurry	Spill	0	1	0	0	0	0	1	2	1	1	1	1	1	6	Low	flow meter
		A	Acid Spillage	Skin & Eye	1	0	0	0	0	0	1	2	1	0	0	1	1	2	Low	leakage proof fittings,

SR NO	ACTIVITY	CONDI-TION N/A/E	HAZARDS	IMPACT	S1	S2	S3	S4	S5	S6	S7	TOTAL	L1	L2	L3	H.1	H.2	RISK FACTOR	CLASS OF RISK MEDIUM/HIGH/LOW	ACTION PROPOSED SMP
				Irritation																PPE
11.	Beer Well	N	---	---	0	0	0	0	0	0	0	0	0	0	0	0	0	0	---	---
12.	Cleaning process of fermentor	N	Caustic exposure in cleaning	Skin & Eye Irritation	1	0	0	1	0	0	0	2	1	0	1	1	3	8	Low	Proper PPE provided
13.	Distillation column	N	High Temperature	Heat Stroke	1	0	0	0	0	1	0	2	1	0	0	3	3	6	Low	OISD std, fire hydrant, Alarm system for P and T
		E	High Pressure	Explode or blast	1	1	1	1	1	0	1	6	7	10	10	1	1	54	Low	OISD std, fire hydrant, Alarm system for P and T
14.	Alcohol Transfer	N	Alc. Fugitive Emission	Skin & Eye Irritation	1	0	0	0	0	0	0	1	1	0	0	1	3	4	Low	Vent at height, leakage proof fittings, Earthing, PPE
		A	Alc. Spillage, Fire	Skin & Eye Irritation, Fire	1	1	0	0	0	0	1	3	3	0	0	1	3	12	Low	leakage proof fittings, Earthing, PPE
15.	Alcohol Bulk storage	N	Alc. Fugitive Emission	Skin & Eye Irritation	1	0	0	0	0	0	0	1	1	0	0	3	3	6	Low	Vent at height, leakage proof fittings, PPE
		A	Over flow of Storage	Spillage	1	1	0	0	0	0	1	3	1	3	1	1	1	10	Low	Over flow meter
		E	Fire	Burn injury production loss	1	1	1	0	0	0	1	4	3	10	7	1	3	80	Medium	Fire hydrant system, LEL-UEL detector, Flame electrical fitting, isolated storage, OISD standard, License from PESO
16.	Alcohol transportation	N	---	---	0	0	0	0	0	0	0	0	0	0	0	0	0	0	---	---
		A	Fire due to spark	Burn injury production loss	1	1	1	0	0	0	1	4	3	3	7	3	3	78	Medium	HAZCHEM, training to Driver, vehicle maintenance, MSDS, Fire extinguisher , Contact detail of nearest Fire station on the route of transportation

6.12.2 DAMAGE CRITERIA

In consequence analysis, use is made of a number of calculation models to estimate the physical effects of an accident (spill of hazardous material) and to predict the damage (lethality, injury, material destruction) of the effects. The calculations can roughly be divided in three major groups:

- a) Determination of the source strength parameters;
- b) Determination of the consequential effects.
- c) Determination of the damage or damage distances.

The basic physical effect models consist of the following.

Source strength parameters

- * Calculation of the outflow of liquid, vapour or gas out of a vessel or a pipe, in case of rupture. Also two-phase outflow can be calculated.
- * Calculation, in case of liquid outflow, of the instantaneous flash evaporation and of the dimensions of the remaining liquid pool.
- * Calculation of the evaporation rate, as a function of volatility of the material, pool dimensions and wind velocity.
- * Source strength equals pump capacities, etc. in some cases.

Consequential effects

- * Dispersion of gaseous material in the atmosphere as a function of source strength, relative density of the gas, weather conditions and topographical situation of the surrounding area.
- * Intensity of heat radiation [in kW/ m²] due to a fire or a BLEVE, as a function of the distance to the source.
- * Energy of vapour cloud explosions [in N/m²], as a function of the distance to the distance of the exploding cloud.
- * Concentration of gaseous material in the atmosphere, due to the dispersion of evaporated chemical. The latter can be either explosive or toxic.

It may be obvious, that the types of models that must be used in a specific risk study strongly depend upon the type of material involved:

- Gas, vapour, liquid, solid
- Inflammable, explosive, toxic, toxic combustion products
- Stored at high/low temperatures or pressure
- Controlled outflow (pump capacity) or catastrophic failure?

Selection of Damage Criteria

The damage criteria give the relation between extent of the physical effects (exposure) and the percentage of the people that will be killed or injured due to those effects. The knowledge about these relations depends strongly on the nature of the exposure. For instance, much more is known about the damage caused by heat radiation, than about the damage due to toxic exposure, and for these toxic effects, the knowledge differs strongly between different materials.

In Consequence Analysis studies, in principle three types of exposure to hazardous effects are distinguished:

1. Heat radiation, from a jet, pool fire, a flash fire or a BLEVE.
2. Explosion
3. Toxic effects, from toxic materials or toxic combustion products.

In the next three paragraphs, the chosen damage criteria are given and explained.

Heat Radiation

The consequence caused by exposure to heat radiation is a function of:

- The radiation energy onto the human body [kW/m^2];
- The exposure duration [sec];
- The protection of the skin tissue (clothed or naked body).
- The limits for 1% of the exposed people to be killed due to heat radiation, and for second-degree burns are given in the table herein:

Damages to Human Life Due to Heat Radiation

EXPOSURE DURATION	RADIATION FOR 1% LETHALITY (KW/M^2)	RADIATION FOR 2 ND DEGREE BURNS (KW/M^2)	RADIATION FOR FIRST DEGREE BURNS, (KW/M^2)
10 Sec	21.2	16	12.5
30 Sec	9.3	7.0	4.0

Since in practical situations, only the employees will be exposed to heat radiation in case of a fire, it is reasonable to assume the protection by clothing. It can be assumed that people would be able to find a cover or a shield against thermal radiation in 10 sec. time. Furthermore, 100% lethality may be assumed for all people suffering from direct contact with flames, such as the pool fire, a flash fire or a jet flame. The effects due to relatively lesser incident radiation intensity are given below.

Effects Due To Incident Radiation Intensity

INCIDENT RADIATION – kW/m^2	TYPE OF DAMAGE
0.7	Equivalent to Solar Radiation
1.6	No discomfort for long exposure
4.0	Sufficient to cause pain within 20 sec. Blistering of skin (first degree burns are likely)
9.5	Pain threshold reached after 8 sec. second degree burns after 20 sec.
12.5	Minimum energy required for piloted ignition of wood, melting plastic tubing etc.

Explosion

In case of vapour cloud explosion, two physical effects may occur:

- * A flash fire over the whole length of the explosive gas cloud;
- * A blast wave, with typical peak overpressures circular around ignition source.

As explained above, 100% lethality is assumed for all people who are present within the cloud proper.

For the blast wave, the lethality criterion is based on:

- * A peak overpressure of 0.1 bar will cause serious damage to 10% of the housing/structures.
- * Falling fragments will kill one of each eight persons in the destroyed buildings.

The following damage criteria may be distinguished with respect to the peak overpressures resulting from a blast wave:

Damage Due To Overpressures

PEAK OVERPRESSURE	DAMAGE TYPE
0.83 bar	Total Destruction
0.30 bar	Heavy Damage
0.10 bar	Moderate Damage
0.03 bar	Significant Damage
0.01 bar	Minor Damage

From this it may be concluded that $p = 0.17 \text{ E}+5 \text{ pa}$ corresponds approximately with 1% lethality. Furthermore it is assumed that everyone inside an area in which the peak overpressure is greater than $0.17 \text{ E} + 5 \text{ pa}$ will be wounded by mechanical damage. For the gas cloud explosion this will be inside a circle with the ignition source as its centre.

Intoxication

The consequences from inhalation of a toxic vapour/gas are determined by the toxic dose. This dose D is basically determined by:

- Concentration of the vapour in air;
- Exposure duration.

Furthermore, of course, the breathing rates of the victim, as well as the specific toxic mechanism unto the metabolism play an important role.

The dose is defined as $D = C^n \cdot t$, with:

- C = concentration of the toxic vapour, in [ppm] or [mg/m^3];
- t = exposure duration, in [sec] or [min];
- n = exponent, mostly > 1.0 ; this exponent takes into account the fact that a high concentration over a short period results in more serious injury than a low concentration over a relatively longer period of exposure. The value of n should be greater than zero but less than 5.

The given definition for D only holds if the concentration is more or less constant over the exposure time; this may be the case for a (semi) continuous source. In case of an instantaneous source, the concentration varies with time; the dose D must be calculated with an integral equation:

$$D = \int C^n \cdot dt$$

For a number of toxic materials, so-called Vulnerability Models (V.M.) have been developed. The general equation for a V.M. (probit function) is:

$$\text{Pr} = a + b \cdot \ln(C^n \cdot t), \text{ with}$$

Pr = probit number, being a representation of the percentage of people suffering a certain kind of damage, for instance lethality

- $\text{Pr} = 2.67$ means 1% of the population;
- $\text{Pr} = 5.00$ means 50% of the population;
- a and b material dependent numbers;

$C^n \cdot t =$ dose D , as explained above.

The values for a and b are mostly derived from experiments with animals; occasionally, however, also human toxicity factors have been derived from accidents in past. In case only animal experiments are available, the inhalation experiments with rats seem to be best applicable for predicting the damage to people from acute intoxication. Although much research in this field have been done over the past decades, only for a limited number of toxic materials consequence models have been developed. Often only quite

scarce information is available to predict the damage from an acute toxic exposition. Data transformation from oral intoxication data to inhalation toxicity criteria is sometimes necessary. Generally, in safety evaluations pessimistic assumptions are applied in these transformation calculations. The calculated damage (distance) may be regarded as a maximum. For the purposes of a response to a major incident, the IDLH value level has been chosen for the ‘wounded’ criteria. This type of injury will require medical attention.

6.12.3 MAXIMUM CREDIBLE LOSS ACCIDENT SCENARIOS

A Maximum Credible Accident (MCA) can be characterised as the worst credible accident. In other words: an accident in an activity, resulting in the maximum consequence distance that is still believed to be possible. A MCA-analysis does not include a quantification of the probability of occurrence of the accident. Another aspect, in which the pessimistic approach of MCA studies appears, is the atmospheric condition that is used for dispersion calculations. As per the reference of the study, weather conditions having an average wind speed of 1.0 m/s have been chosen.

The Maximum Credible Loss (MCL) scenarios have been developed for the Facility. The MCL cases considered, attempt to include the worst “Credible” incidents- what constitutes a credible incident is always subjective. Nevertheless, guidelines have evolved over the years and based on basic engineering judgement, the cases have been found to be credible and modelling for assessing vulnerability zones is prepared accordingly. Only catastrophic cases have been considered and not partial or small failures (as is the case in Quantitative Risk Assessment where contributions from low frequency - high outcome effect as well as high frequency - low outcome events are distinguished). The objective of the study is emergency planning, hence only holistic & conservative assumptions are used for obvious reasons. Hence though the outcomes may look pessimistic, the planning for emergency concept should be borne in mind whilst interpreting the results.

6.12.4 SELECTION OF INCIDENTS AND CONSEQUENCE CALCULATIONS

The Consequence Analysis has been done for selected scenarios. This has been done for weather conditions having wind speed 1.0 m/s. In Consequence Analysis, geographical location of the source of potential release plays an important role. Consideration of a large number of scenarios in the same geographical location serves little purpose if the dominant scenario has been identified and duly considered.

6.12.4.1 SOFTWARE USED FOR CALCULATIONS

1. ARCHIE (AUTOMATED RESOURCE FOR CHEMICAL HAZARD INCIDENT EVALUATION)

This software programme has been developed by Federal Emergency Management Agency (FEMA), U.S. Department of Transportation (USDOT) and U.S. Environmental Protection Agency (USEPA) for comprehensive hazard assessment including accident hazard assessment and consequence analysis procedures.

The core of the program is a set of hazard assessment procedures and models that can be sequentially utilized to evaluate consequences of potential discharges of hazardous materials and thereby assist in development of a basis for emergency planning.

2. ALOHA (AREAL LOCATIONS OF HAZARDOUS ATMOSPHERES)

Aloha is a computer program designed especially for use by people responding to chemical accidents, as well as for emergency planning and training. ALOHA can predict the rates at which chemical vapors may escape into the atmosphere from broken gas pipes, leaking tanks, and evaporating puddles. It can then predict how a hazardous gas cloud might disperse in the atmosphere after an accidental chemical release.

ALOHA is an air dispersion model, which you can use as a tool for predicting the movement and dispersion of gases. It predicts pollutant concentrations downwind from the source of a spill, taking into consideration the physical characteristics of the spilled material. ALOHA also accounts for some of the physical characteristics of the release site, weather conditions, and the circumstances of the release. Like many computer programs, it can solve problems rapidly and provide results in a graphic, easy-to-use format. This can be helpful during an emergency response or planning for such a response.

ALOHA provides output as amount of chemical discharged from the source as well as its concentration in air it takes in to account different levels of concentrations for a specified chemical. Different concentration levels are given below:

ERPG 1: is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odor.

ERPG 2: is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.

ERPG 3: is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.

IDLH: The Immediately Dangerous to Life or Health (IDLH) level. A chemical's IDLH is an estimate of the maximum concentration in the air to which a healthy worker could be exposed without suffering permanent or escape-impairing health effects.

6.12.5 SCENARIOS (VULNERABILITY AREA IDENTIFICATION)

Possible accident scenarios at M/s. Manglam Distillers & Bottling Industries are given in following table-6.9.

TABLE - 6.9 POSSIBLE ACCIDENT SCENARIOS

SR. NO.	SHORT DESCRIPTION OF SCENARIO	CAPACITY OF THE TANK	TYPE OF RISK	PROBABILITY	SEVERITY	CONCENTRATION & DAMAGE DISTANCE FROM SOURCE (METERS)
1.	Rectified Spirit Bulk Storage tank	460 m3	Pool Fire	Very unlikely	Potentially lethal within 60 sec	10 kW/sq m < 32 m
					2nd degree burns within 60 sec	5 kW/sq m 32 m to 45 m
2.	Rectified Spirit Daily receivers tank	72 m3	Pool Fire	Very unlikely	Potentially lethal within 60 sec	10 kW/sq m < 19 m
					2nd degree burns within 60 sec	5 kW/sq m 19 m to 27 m
3.	Extra Neutral Alcohol Bulk Storage tank	540 m3 x 2 No.	Pool Fire	Very unlikely	Potentially lethal within 60 sec	10 kW/sq m < 32 m
					2nd degree burns within 60 sec	5 kW/sq m 32 m to 45 m
4.	Extra Neutral Alcohol Daily receivers tank	72 m3 x 3 No.	Pool Fire	Very unlikely	Potentially lethal within 60 sec	10 kW/sq m < 19 m
					2nd degree burns within 60 sec	5 kW/sq m 19 m to 27 m
5.	Technical Alcohol Bulk Storage tank	128 m3	Pool Fire	Very unlikely	Potentially lethal within 60 sec	10 kW/sq m < 32 m
					2nd degree burns within 60 sec	5 kW/sq m 32 m to 45 m
6.	Technical Alcohol Daily Receivers tank	33 m3	Pool Fire	Very unlikely	Potentially lethal within 60 sec	10 kW/sq m < 19 m
					2nd degree burns within 60 sec	5 kW/sq m 19 m to 27 m

FIGURE - 6.1 MCA SCENARIO: POOL FIRE OF 460 M3 BULK STORAGE TANK OF RECTIFIED SPIRIT

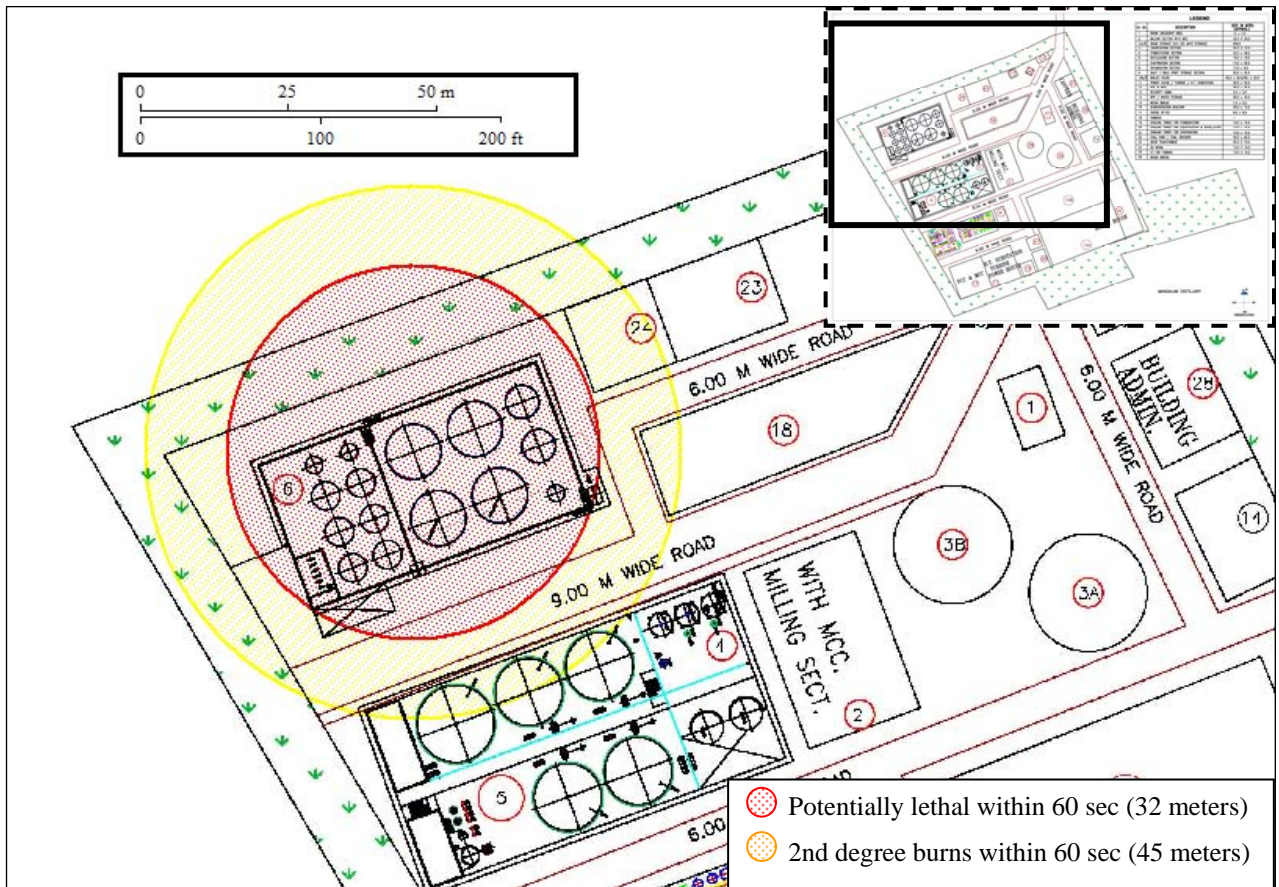


FIGURE - 6.2 MCA SCENARIO: POOL FIRE OF 72 M3 DAILY RECEIVERS TANK OF RECTIFIED SPIRIT

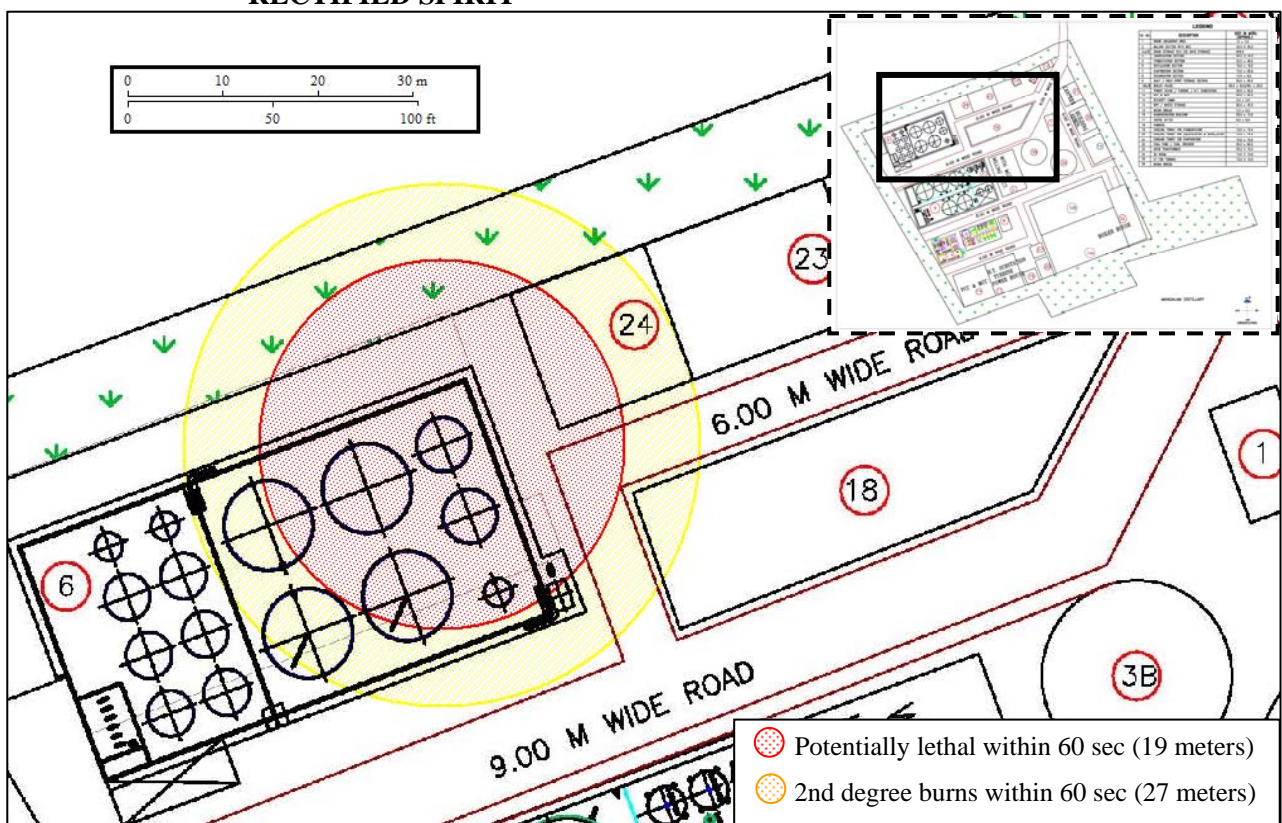


FIGURE - 6.3 MCA SCENARIO: POOL FIRE FOR 540 M3 BULK STORAGE TANK OF EXTRA NEUTRAL ALCOHOL

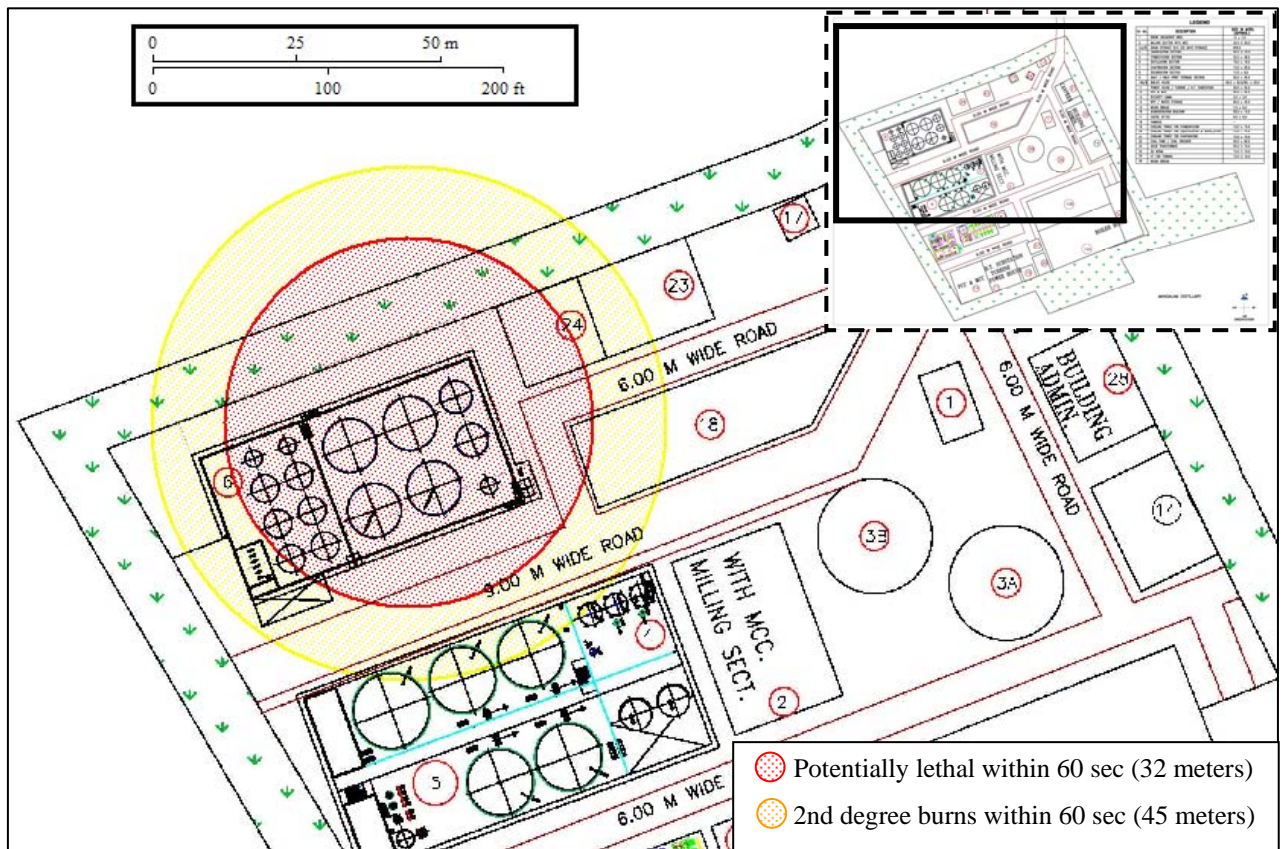


FIGURE - 6.4 MCA SCENARIO: POOL FIRE FOR 72 M3 DAILY RECEIVERS TANK OF EXTRA NEUTRAL ALCOHOL

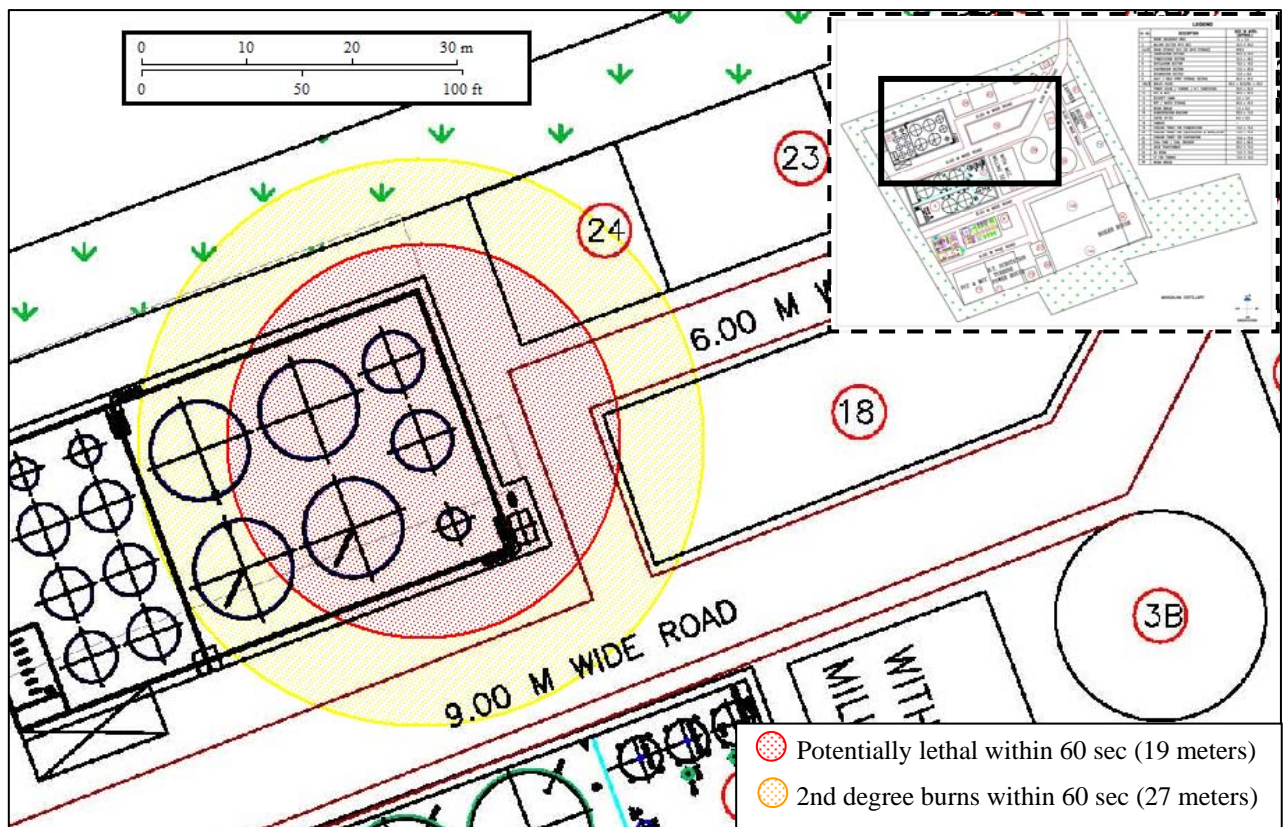


FIGURE - 6.5 MCA SCENARIO : POOL FIRE OF 128 M3 BULK STORAGE TANK OF TECHNICAL ALCOHOL

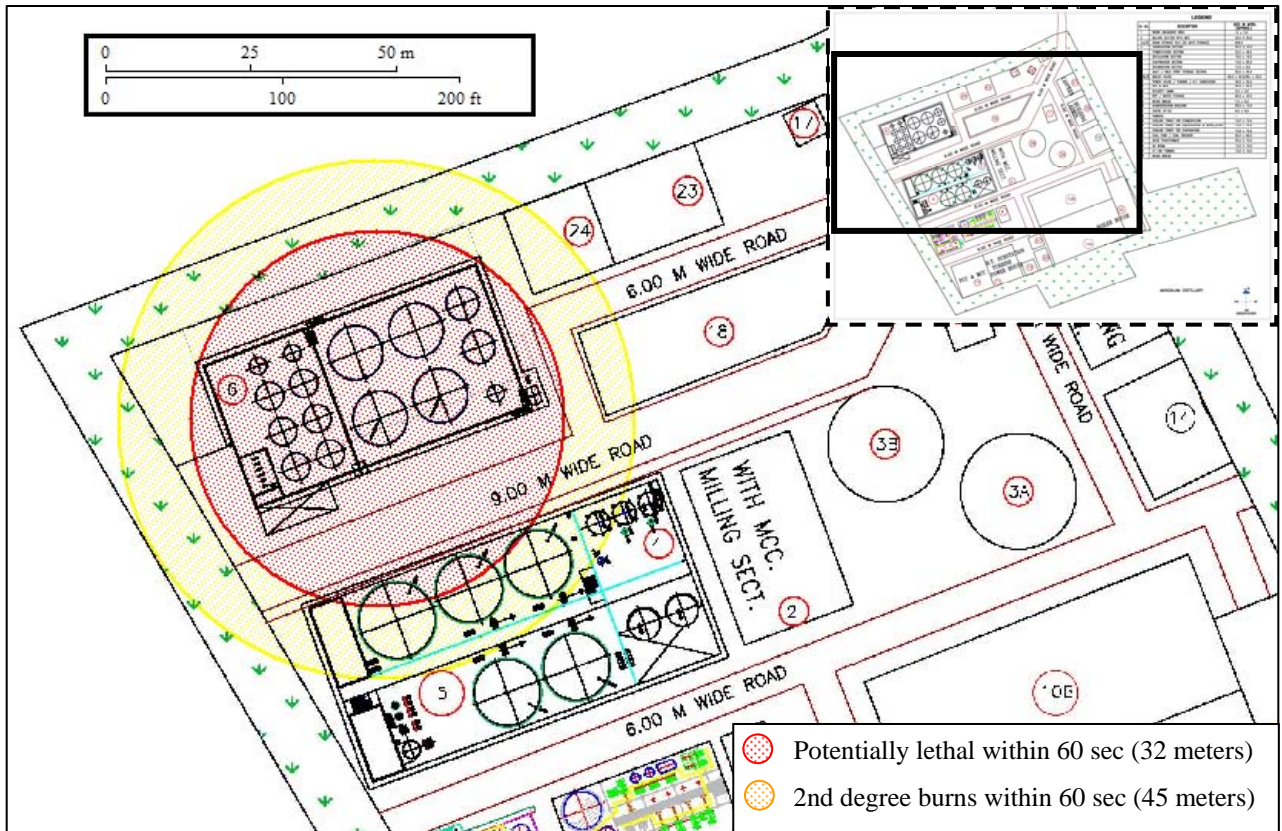
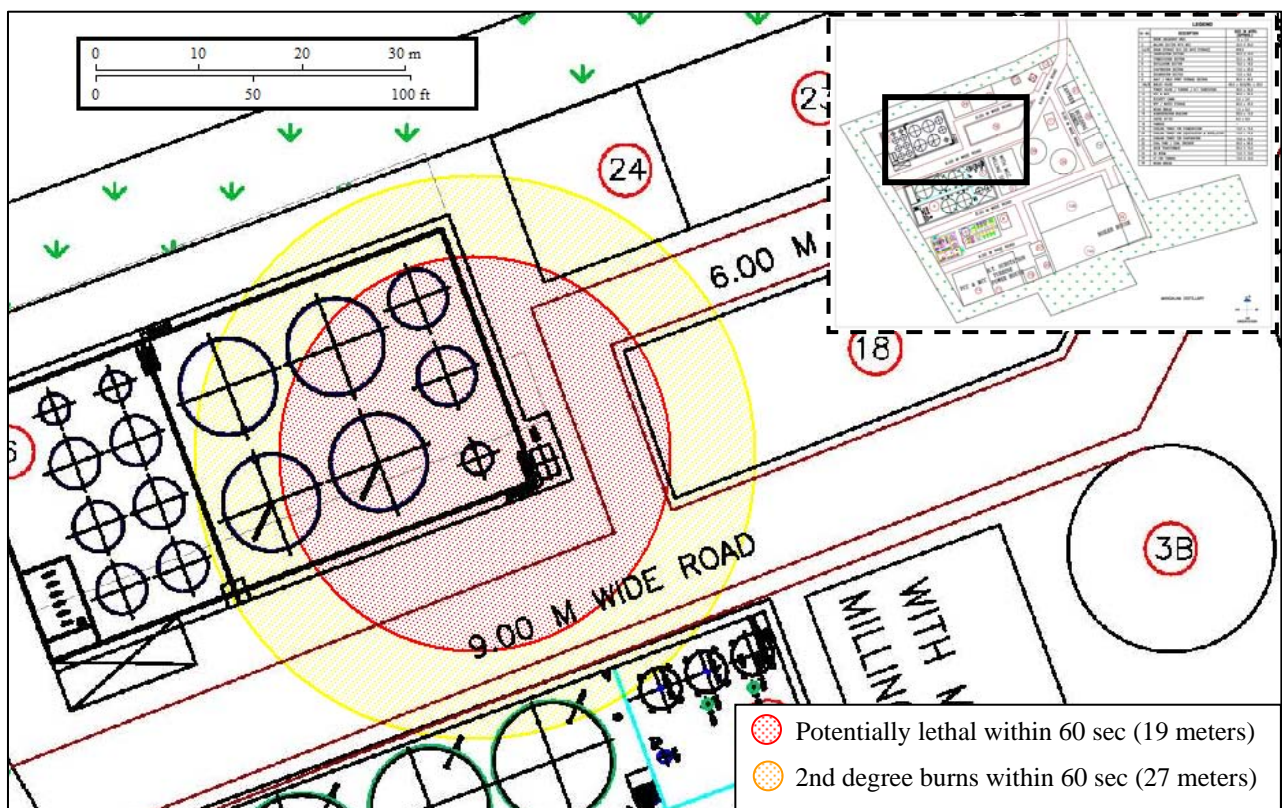


FIGURE - 6.6 MCA SCENARIO : POOL FIRE OF 33 M3 DAILY RECEIVERS TANK OF TECHNICAL ALCOHOL



6.12.6 RECOMMENDATIONS ON THE BASIS OF RISK ASSESSMENT DONE***Storage of Hazardous Materials:***

- Alcohol storage and handling area fire fighting facility provided as per OISD 117 norms.
- Good housekeeping must be practiced
- All hazardous materials must be properly labeled including their exact contents, hazardous properties, date of receipt, and if appropriate, date of expiration.

6.13 DISASTER MANAGEMENT PLAN**6.13.1 INFORMATION REGARDING KEY PERSONS AND THEIR RESPONSIBILITIES DURING EMERGENCY****6.13.1.1 SITE MAIN CONTROLLER**

After getting information of emergency, the site main controller will rushed to the Emergency Control Center immediately.

- 1) On reaching he will assess the magnitude of the situation in consultation with Incident Controller and decide whether inside or outside help are to be called (i.e. Fire Service, Police, Ambulance etc.).
- 2) Ensure that key persons are called in.
- 3) Give guidance and direction in vital and important activities to control the emergency situation.
- 4) Direct to close down and evacuation of the plants in consultation with Incident controller and key personnel.
- 5) If necessary arrange for evacuation of neighboring population.
- 6) Inform the Government authorities such as Collector, MC, Factory Inspector, Health Officer & medical Officer and request them for their help as situation demands.
- 7) Give prime importance to human life and guidance in organizing the rescue operations as well as ensure whether injured people getting proper medical attention in time.
- 8) Always be in touch with the Incident Controller to get further progress and decide further plan.
- 9) On completion of emergency situation declare the normalcy through Administrative Officer.
- 10) Control the re-occupation of the affected areas on discontinuation of emergency.
- 11) Do not permit to re-start the plant unless it is safe.
- 12) Give authentic statement of the incident to News Media & Government Authorities.

6.13.1.2 INCIDENT CONTROLLER

- 1) Take the charge of situation and assess the magnitude of the event
- 2) Control and guide all the operations with priorities to the Safety of Personnel, minimize pollution, loss of material and loss to the plant equipment and property.
- 3) Provide advice and guide to the Fire Fighting and Rescuing squad and Fire Brigade while they arrive.
- 4) Establish communication with emergency control center.
- 5) Report on all significant developments to the emergency control center through phone/Messenger.
- 6) Ensure that evacuation of the areas in the factory getting affected is complete.
- 7) After the emergency situation is brought under control, assure that the necessary evidence for further investigation in the incident is preserved and inform Site Controller regarding control of emergency.

6.13.1.3 TECHNICAL STAFF / DEPARTMENT HEAD

- 1) As soon as informed, rush to the spot and take charge of the situation till senior group arrives.
- 2) Ensure that emergency siren is raised which gives information to Security, Safety, Administration Staff and Technical Staff.
- 3) On arrival of Incident Controller, inform him about the gravity of the situation and then to work under his guidance to control the situation.
- 4) Ensure that only experienced and essential people remains at the location for controlling, while others to be evacuated from the scene.

6.13.1.4 EMPLOYEES NEAR THE SPOT (INCIDENT AREA)

The employees near affected area, under the guidance of the **Incident Controller** shall

- 1) Tackle the emergency as per laid down procedures for the area bearing in mind the requirements of the situation called for by the progress of the emergency.
- 2) Remove all non-essential employees (who are not assigned any emergency duty) shall evacuate the area and gather at the specified assembly points.
- 3) Stop the operations as per the information of the Incident Controller.

6.13.1.5 EMPLOYEES OF OTHER DEPARTMENTS

- 1) On getting information of incident, take permission of superior and confirm own plant, department, safety and then after trained and skill persons will rush to incident spot with necessary personnel protective equipment.
- 2) Approach the spot from up wind direction and assemble at safe place near to the spot taking in to consideration the wind direction.
- 3) Extend help to control the situation as per the instruction and guidance given by the senior persons controlling the operation.

6.13.1.6 PERSONNEL OFFICER

- 1) When emergency declared immediately rushed to emergency control center.
- 2) Basically he will work as a Liaison Officer and will stationed at emergency control center during emergency. He will work under the direction of Site Controller.
- 3) To ensure that the casualties receives adequate attention at first aid center, also ensure additional help if require from Government authorities or outside agencies.
- 4) Arrange transport facility for injured personnel to get timely medical help.
- 5) He will also arrange for head count at assembly points and will inform Site Controller.
- 6) Also be in touch with the Security and Other Departments for help.
- 7) Will check the Roll call from Time Office for availability of trained personnel during emergency situation at the site.
- 8) Determine the need to inform statutory authorities of the accident and fill the necessary forms for submission with consultation of the Site Controller.
- 9) When emergency is prolonged, arrange for the relief of personnel as well as inform the families of injured persons and organize refreshments / catering facility.

6.13.1.7 ADMINISTRATIVE OFFICER

- 1) When emergency declared, immediately rushed to the emergency control center and establish contact with Site Main Controller.

- 2) Ensure the communication between site controller and incident controller. Keep messenger for communication.
- 3) Make arrangement to send portable megaphone and torches to the Incident Controller if required.
- 4) On receiving instructions from Site Controller, organize transportation for the evacuation of people from the assembly points.
- 5) As per instructions from Site Controller will inform to Head Office, Insurance Surveyor, other relevant authorities and neighboring areas.
- 6) On getting instructions from Site Controller / Incident Controller, he will be in touch with other Industries for help in emergency.
- 7) Will arrange to announce necessary instructions for all personnel.
- 8) Ensure that telephone operator keeps the EPABX free to extend possible for in coming calls.
- 9) Ensure that Press and other Media do not publish unauthentic news.

6.13.1.8 ENGINEERING SERVICES KEY PERSONNEL

- 1) When emergency declared, immediately proceed to Emergency Control Center.
- 2) Ensure the availability of electrical wiremen, utility, maintenance employees and drivers.
- 3) Ensure the water supply & electric power generator in case of power failure.
- 4) Be in touch with the Site controller / Incident Controller to extend help as and when required.
- 5) Ensure availability of Light Motor Vehicles as well as Fork Lifts, JCBs etc.
- 6) Arrange the vehicle as per required by Administrative / Personnel Officer.

6.13.1.9 SECURITY & FIRE IN-CHARGE

- 1) When emergency declared, ensure that the Fire man in the fire station and Security guards at the main gate are sufficient.
- 2) On getting instruction from Site Controller/Incident controller, cordon the affected area to maintain law and order.
- 3) As per instruction from Site Controller/ Incident controller, arrange to start the fire hydrant pump.
- 4) Ensure the following duties by Security Guards;
 - Stop all vehicles and visitors entering into the factory, except any Government authorities such as Fire Brigade, Police, Factory Inspector, Medical Staff and inform the Administrative Officer on their arrival.
 - If any press reporter and local Leader comes at the main gate, take them to the Administration Office.
 - Do not allow any vehicle to park at the main gate or nearby at main road.
 - Assure that the entrance of the gate is clear for thorough fare. In Similar way control/ guide internal traffic for smooth operations.
 - Act according instructions given by Personnel and Administrative Officer.
 - Ensure that all essential personnel evacuated and assembled at Assembly points.
 - Arrange effective security nearby the incident place.

6.13.1.10 FIRST AID ATTENDANTS

- 1) As per the instructions given by the Incident Controller, arrange the supply of additional emergency related equipment to the incident place. Give necessary First Aid treatment to the affected persons immediately.
- 2) Inform the Personnel and Administration Officer regarding the severity of injury and advise for further medical help if necessary.
- 3) Ask for additional trained First-Aider, if required.
- 4) On arrival of Doctor, assist him to give medical treatment to the affected people.

6.13.1.11 SAFETY OFFICER

- 1) On hearing emergency siren rush to the spot and assume the position of incident controller and take care of the situation till a senior personnel arrives and on their arrival work with them in team, extending their own expertise.
- 2) Give instructions and guideline to the people involved in control measures. As well as help in providing required PPE
- 3) Give instructions to the safety attendants.
- 4) Brief the Site Main Controller about the progress of control measures.
- 5) Advise site controller regarding type of help required from outside.
- 6) Give instructions to other department through internal phones /Communication Officer.
- 7) Make arrangement to carry out monitoring whenever necessary and appraise results to the concerned seniors

6.13.1.12 ESSENTIAL EMPLOYEES AND THEIRS DUTIES**[A] Fireman:**

- 1) On getting information, check the water level in emergency tanks and overhead /under ground storage tanks. Maintain the emergency tank water level to its fullest capacity.
- 2) Start fire hydrant pump as per the instruction from Security & Fire incharge.
- 3) Ensure continuous water supply to the incident place.
- 4) Do not leave the Fire Hydrant pump house till further instruction

[B] Driver:

- 1) On getting information from Communication Officer remain alert and wait for further instructions along with Ambulance van to meet with emergency.
- 2) Extend help to shift the injured people from site of incident to First-Aid and if required to hospital through Ambulance / Other vehicle.
- 3) For material handling take Fork-lift / JCB to the spot if required.

[C] Electrical / Utility Personnel:

- 1) After getting the information rush to the spot with necessary personal protective equipment and if instructed by incident controller cut off the power supply to the affected area.
- 2) Ensure that the D.G. Set is in running condition.
- 3) Extend help to the Utility Operator in maintaining adequate supply of water and others under guidance of Supervisors.
- 4) Water in water hydrant storage tank is in full capacity or not

6.13.2 EMERGENCY ORGANIZATION FOR IDLE HOURS**1. Security:-**

- i) After getting information through emergency hooter inform at least two senior persons at their residence by telephone/messenger.
 - (a) Site controller
 - (b) Safety Officer
 - (c) Incident controller.
 - (d) Technical Staff/Senior Staff
- ii) Assure that the front side of the gate is clear for thoroughfare.
- iii) Act according to the instructions of Incident Controller/Senior Officers
- iv) Inform Emergency Control Center for emergency.

2. SAFETY/FIRST AID ATTENDANT:

One attendant remains present around the clock.

Duties:

- 1) On hearing emergency hooter does not leave the Occupational Health Center.
- 2) As per the instructions given by the person In charge of the emergency operation or Incident Controller arrange the supply of additional emergency safety equipment to incident place.
- 3) Give necessary first aid to the affected person immediately. Inform the site controller about the severity of the Injury and advice for further medical help if required. On arrival of doctor, assist him for medical treatment offered to the affected people.

6.13.3 LIST OF IMPORTANT AUTHORITIES WITH THEIR ROLE IN EMERGENCY AND TELEPHONE NUMBERS

List of important authorities with their role in emergency and telephone numbers will be prepared and placed wherever required.

6.13.4 INFORMATION ABOUT EXTERNAL COMMUNICATION SYSTEM**(1) Communication will be through Emergency Central Alarm System**

(2) Telephones: An EPABX unit will be installed to connect all departments internally. Company will also provide mobile connections to all important personnel at site.

(3) STD PHONE & FAX/TELEX: Will be provided at IMP places

(4) IN THE EVENT OF FAILURE OF TELEPHONE SYSTEM:

Communication officer will arrange special messengers for communication Minimum one vehicle with driver/trained security personnel are available in the company premises round the clock.

We will communicate through our Administration department by our vehicle to nearby community.

6.13.5 ANNOUNCEMENT SYSTEM DETAILS

During emergency it is necessary that the alarm should be heard by all employees wherever they work, for that speakers will be placed at various locations within plant.

6.13.6 OUT SIDE IMPORTANT ADDRESSES AND PHONE NUMBERS

List of Important addresses in the nearby area such as hospitals, ambulance services, fire fighting services, Government personnel (Municipal Commissioner, district collector, zilla panchayat, police station and emergency control services and their telephone numbers will be prepared and will be displayed outside emergency control room.

6.13.7 REHERSAL AND UPDATION OF PLAN

- 1) Every year mock drills will be organized. Shortfalls in actions observed during drill will be explained to participants and will be corrected accordingly.
- 2) Any shortcomings regarding On-Site Emergency Plan observed during such drills will be corrected and incorporated in On-Site Emergency Plan and same will be communicated to all.
- 3) The On-Site Emergency Plan will be updated after any significant development in factory or change in the law.

6.14 OCCUPATIONAL HEALTH AND SAFETY PROGRAM FOR THE PROJECT

Health hazards associated with the occupation are called occupational hazards. In chemical industry due to handling of toxic and hazardous chemicals there are possibilities of developing occupational diseases.

Company shall carry out the following checks to curb the problem:

- i) Pre - employment medical check up at the time of employment.
- i) Annual medical check up shall be done for all employees.
- iii) First aid training shall be given to the employees.
- iv) Monitoring of occupational hazards like noise, ventilation, chemical exposure shall be carried out at frequent intervals, the records of which shall be documented.

All precautions shall be taken to avoid foreseeable accidents like spillage, fire and explosion hazards and to minimize the effect of any such accident and to combat any emergency at site level. Some of the preventive safety measures shall be taken to minimize the risk of accident with respect to Technical Safety, Organizational Safety and Personal Safety are listed below:

- ◆ The factory shall take all reasonably practicable measures to minimize the risk of such accident in compliance with the legal obligation under the relevant safety.
- ◆ All building plans and installations shall be as per relevant acts and duly approved by competent government authorities.
- ◆ Process and Equipment shall be designed by qualified and experienced professionals and fabricated to applicable national / international codes with stage wise inspection.
- ◆ Hazardous processes shall be operated by trained workers and shall be looked after by qualified & experienced supervisors.
- ◆ Safety features such as fire extinguishers, fire hydrant system and suitable Personal Protective Equipment (PPE) shall be provided. Regular operations and testing of fire hydrant system and fire extinguishers shall be carried out.
- ◆ Suitable provisions for control of critical process / storage parameters within specified safe limits (use of pressure relief valves, rupture discs, safety valves, trip circuits, wherever necessary) shall be done.
- ◆ Use of flameproof electrical equipment, flame arresters and breather valves shall be done.
- ◆ Provision of Earthing and lightning arrestor to prevent electrical fires and explosions in flammable / explosive chemicals storage / processing areas shall be done.
- ◆ Drums storing hazardous liquid chemicals shall be placed separately to confine any spillage and facilitate easy collection. Necessary separation distance shall be maintained.
- ◆ Periodic inspection and testing of pressure vessels, equipment, machineries and equipment handling hazardous substances shall be done.
- ◆ Training of workers and Staff shall be given for fire fighting, work permit system, first aid, safe handling of hazardous chemicals and integrating safety, in all activities.
- ◆ Adequate scrubber system shall be provided to control air pollution.
- ◆ Good housekeeping in factory premises shall be ensured.
- ◆ Accident / Incident reporting system and information of employees about the same shall be done for better awareness.
- ◆ Suitable notices / boards shall be displayed at several locations indicating appropriate hazards warning as well as DOs and DON'Ts for ensuring operational and personal Safety for information of workers / staff and visitors.
- ◆ Details of the Evacuation plan shall be distributed among the workers.

Personal Protective Equipment (PPE) like goggles, safety shoes, helmet, apron, earplugs, facemask & clothing shall be provided to employees as per the job requirements. The company shall prepare a comprehensive on - site emergency plan with well-defined responsibilities to face any eventuality caused under adverse circumstances and unforeseen reason.

Company shall adequately install fire-fighting system in different sections of the plant.

Some of the safety precautionary measures shall be taken for manufacturing process are listed below:

- ◆ Safety Relief Valve, Rupture disk, temperature scanner, pressure indicator, and flow meter shall be installed to vessel wherever required.
- ◆ Cooling / Chilling water circulation arrangement shall be provided to avoid abrupt increase of pressure.

- ◆ Pressure controller at the process lines shall be provided and vent shall be connected with scrubber as per the requirement.
- ◆ PPE shall be provided to workers during charging of various raw materials and exhaust ventilation lines shall be provided as per requirement.
- ◆ Local Foam based fire extinguisher along with fire hydrant system shall be installed.
- ◆ Necessary interlocking and alarm system shall be installed wherever required.
- ◆ Gas detection system shall be installed in the plant wherever required

6.14.1 INFORMATION OF ASSEMBLY POINTS

At the time of emergency, non - essential workers, casual workers, visitors and others are to be replaced to Assembly Points and separate in charge are nominated. No of assembly points and location will be decided based on the layout of the plant.

In case of an emergency, the visitors, contract persons and factory employees will gather at nearby assembly point. Pre-designated persons will take their roll call. If needed, they can be evacuated easily through any gate in a short period as per instruction of site main controller.

MEDICAL AID SCHEME

For outside help, company authority will make a mutual understanding with the following authorities to extend their help whenever an emergency occurs;

- (1) Doctors from Civil Hospital
- (2) Police Station
- (3) Fire Brigade

Time to time company shall inform/impart training to concerned employees for awareness about chemicals and its hazards and the precautionary measures on their part. An emergency guide will be provided to each employee, which gives guidance to him or her during an emergency.

CHAPTER – 7

PROJECT BENEFITS

7.1 PHYSICAL INFRASTRUCTURE

As the proposed project is a new, all the major physical infrastructure development shall take place, which will improve the existing infrastructure scenario.

7.2 EMPLOYMENT OPPORTUNITIES

Skilled and unskilled manpower will be needed. This will temporarily increase the employment opportunity. Secondary jobs are also bound to be generated to provide day-to-day needs and services to the work force. This will also temporarily increase the demand for essential daily utilities in the local market. The manpower requirement for the proposed project will generate some permanent jobs and secondary jobs for the operation and maintenance of plant. This will increase direct / indirect employment opportunities and ancillary business development to some extent for the local population. This phase is expected to create a beneficial impact on the local socio-economic environment.

The project will benefit the people living in the neighboring villages by giving preference to them in relation to direct employment associated with the various project activities. Construction and operation phase of the proposed project will involve a certain number of laborers. There is a possibility that local people will be engaged for this purpose. The operation phase will involve a number of skilled and unskilled workers. There is a possibility that local people will be engaged for this purpose to the extent possible and hence improve the existing employment scenario of the region.

7.3 INDUSTRIES

The required raw materials and skilled and unskilled laborers will be utilized maximum from the local area. The increasing industrial activity will boost the commercial and economical status of the locality, to some extent.

7.4 PUBLIC REVENUE AND EXPENDITURE

- Indirectly, the proposed project will help the Government by paying different taxes (sales tax, excise duty, etc) from time to time, which is a part of revenue and thus, will help in developing the area.
- Due to proposed project, the surrounding environment will not face any problem related to pollution because all kind of wastes will be handled properly.
- The area has well developed transportation routes as it is situated in a well notified industrial area. No alteration in transport routes will be required.

7.5 SOCIO-ECONOMIC DEVELOPMENT ACTIVITIES

An obligation, beyond that required by the law and economics, for a firm to pursue long term goals that are good for society.

The continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as that of the local community and society at large

Corporate Social Responsibility (CSR)

India has a long history of community and social initiatives being taken up by the corporate. Corporate Social Responsibility (CSR) has been in practice by the big Indian corporations for a considerable period. The goal of CSR is to hold the Company responsible for social activities and encourage a positive impact through these activities on the environment, consumers, employees, communities, stakeholders and all other related spheres. Usually CSR is characterized by the following aspects:

- Responsible entrepreneurship
- Voluntary initiatives beyond legislative requirements and contractual obligations

- Activities to benefit the employees, business relevant groups, the society as a whole and the environment around the area
- A positive contribution to the society by minimizing negative effects
- Regular activities rather than one-time-events

Implementation of CSR activities is a very challenging task which M/s. Manglam Distillers and Bottling industry is interested to take up with consistency and determination. The Company plans the implementation of chosen initiatives and follows through with commitment across the organization to make this happen and ensures that implementation will be successful, with resources, milestones, measurement, and accountability. The Industry intends to undertake CSR activities in and around their Plant. A total amount of Rs. 400 lacs would be utilized for CSR programme for five years which is 5% of total project cost that is Rs. 8000 lacs and company would to identify stake holders for the planning of CSR activities and implementation of it. Which activities with its estimated cost is given in table-7.1 for benefitting the society at large and the local rural community in particular for the period of 5 years after that the company will do as per the regulations.

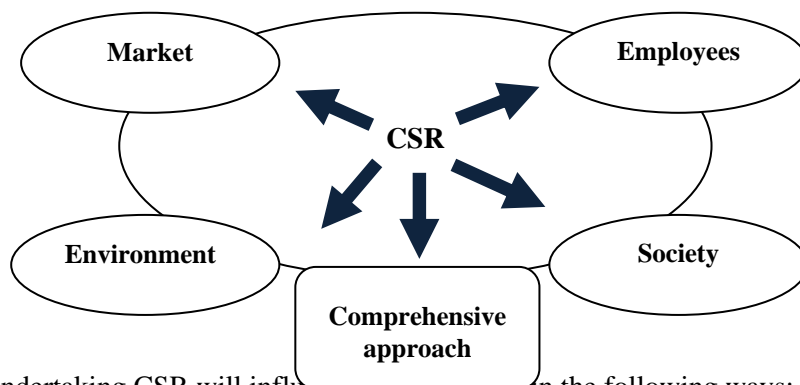
Keeping the local situation in view it has been felt that the Company will be able to take a wide range of initiatives including sanitation facility, drinking water, health, education, agriculture and a range of other activities. With time it will progressively be able to find new ways to address social, economic, and environmental effects of their business while balancing conflicting demands.

Plan of Actions

The Company will carry out the CSR activities and collect information from the employees about their-social background, exposure to development issues, skills and ideas, etc. This will help in involving the interested employees in CSR activities. An initial assessment of current status of all programmes- both for the Company as well as for the Government schemes in the area, it will also collect employees’ background and interest, funding possibilities, information regarding local Community Based Organizations (CBOs), None Governmental Organizations (NGOs), local clubs and other partners etc, CSR activities will be planned with local governing bodies (*Gram Panchayats*), NGOs and stake holders.

An annual plan or calendar will be prepared on the basis of initial assessment. Indicators for assessing the progress of initiatives and a systemic database on CSR activities shall be developed with inputs from employees. The Company shall submit a report of its activities on completion of each quarter in a year. A strategic review should follow in order to streamline the CSR programs. Basic work space and facilities will be provided by the Company at its campus. Budget for each activity should be outlined in the annual calendar/plan. The working contract shall be governed by a Terms of Reference (ToR) mutually agreed by consultant and the Company. CSR activities will have manifold practical approaches which are as follows:

EFFECT OF CSR ACTIVITIES ON VARIOUS AREAS



It is expected that undertaking CSR will influence the Company in the following ways:

- Better customer satisfaction and loyalty due to work/life balance

- Higher motivation and loyalty of employees, resulting in a higher creativity and innovativeness
- Better publicity for its activities
- Better position at the labour market and better networking with business partners and authorities including better access to public funds due to a better Company image
- Cost savings and increased profitability due to a more efficient deployment of human and resources
- Increased turnover/sales due to a competitive advantage derived from the above

The approach of this programme will be a preventive one through life cycle approach. The salient feature of activities is as follows:

a. Drainage facility

Contributions in providing drainage facility with government schemes in the community as these villages are not having proper drainage facility.

b. Safe Drinking Water Facility

Providing facilities for safe drinking water in villages through installation of water purifiers and water supply pipelines.

c. Health Care Facility

Organizing first aid trainings twice a year, paying the hospital fees of needy peoples in villages, develop one primary health centre coordinating with local governing bodies, carried out Information Education and Communication (IEC) programme.

d. New techniques in Agriculture

Training to local farmers about new techniques for cultivation by experts and/or annual tour for the new techniques about farming to local farmers

e. Awareness Programmes

Awareness creation in schools, in villages among youth and young girls through organizing lectures and programmes of experts on various subjects

f. Construction of Rain Water Harvesting

Rainwater harvesting structures in nearby villages as well as in industry camps also and recharges it in ground water.

g. Promoting Education

Award (books and sponsorships shall be given to the first three students of the area in nearby schools)

h. Development of village schools

Develop schools through donations of various equipments, repairing of infrastructures and establishing vocational centre in villages.

i. Low cost Latrine for tribal

Support needy households who want to construct low cost latrine at their houses

j. Plantation

Plantation at roadsides and in villages

k. Park/Playground

Development of parks/Playground of village parks

l. Sports

Support and sponsor to the sports activities in nearby areas

2. Financing Plan

The estimated budget for the planned CSR activities is as follows:

In future the responsibilities for all these facilities will be handed over to the Government. A yearly CSR cost bifurcation for 5 years is given in below table:

TABLE – 7.1 PROPOSED CSR ACTIVITIES

NO.	ACTIVITIES	DETAIL	TOTAL (Rs.)
1.	Drainage facility	Contribution in providing drainage facility	80,00,000
2.	Safe Drinking Water Facility	Provide facility of Safe drinking water	80,00,000
3.	Health Care Facility	Training, payment of bills and development of PHC	40,00,000
4.	New techniques in Agriculture	Tour and/or Training to Farmers	13,50,000
5.	Awareness Programmes	Awareness of various subjects	13,00,000
6.	Construction of Rain Water Harvesting	Rainwater harvesting structures in nearby villages and in premises	27,00,000
7.	Promoting Education	Award to outstanding students	13,50,000
8.	Development of village schools	Donation of equipments in schools	26,50,000
9.	Construction of Low cost latrines	Construction of low cost latrine for Tribal coordinating with Government	20,00,000
10.	Plantation	Plantation on roadsides and in villages	30,00,000
11.	Park/Playground	Development of parks/playground	30,00,000
12.	Sports	Support sports activities	26,50,000
	TOTAL		4,00,00,000

CHAPTER – 8

ENVIRONMENTAL MANAGEMENT PLAN

8.1 INTRODUCTION

Industrial development is associated with a few positive and negative impacts on the environment. The negative impacts should not hinder industrial development but they should be properly mitigated.

An environmental management plan (EMP) has been prepared for the proposed plant, M/s. Manglam Distillers & Bottling Industries to minimize negative impacts and is formed on the basis of prevailing environmental conditions and likely impacts of this project on various environmental parameters. This plan will also facilitate monitoring of environmental parameters.

Preparation of Environmental Management plan is required for the formulation, implementation and monitoring of environmental protection measure. EMP includes schemes for proper and scientific treatment and disposal mechanism for air, liquid and solid hazardous pollutants. Apart from this, green belt development, safety aspect of the workers, noise control, fire protection etc. are also included in it. The various components of the EMP are outlined in subsequent sections.

8.2 PURPOSE OF ENVIRONMENTAL MANAGEMENT PLAN

Various purposes of the environmental management plan are:

- To treat and dispose off all the pollutants viz. liquid, gaseous and solid waste so as to meet statutory requirements (Relevant Pollution Control Acts) with appropriate technology.
- To support and implement work to achieve environmental standards and to improve the methods of environmental management.
- To promote green-belt development.
- To encourage good working conditions for employees.
- To reduce fire and accident hazards.
- Budgeting and allocation of funds for environment management system.
- To adopt cleaner production technology and waste minimization program.

8.3 DETAILS OF ENVIRONMENTAL MANAGEMENT PLAN

8.3.1 DURING CONSTRUCTION PHASE

8.3.1.1 AIR ENVIRONMENT

Construction phase will be for a short period and hence the impacts will also be for a short and temporary period. During construction activities, mainly emission of dust and gases from movement of vehicles and construction activity is expected. However, following measures will be taken to reduce/contain such emissions:

- Preparation of paved internal movement roads will be taken up at the initial stage of civil construction work.
- Water will be sprinkled on loose top soil to prevent re-suspension of dust into ambient air due to movement of vehicles etc.
- Separate civil construction material storage yard will be created within the site and it will be enclosed.
- Possibility of raising green belt along with construction activity will also be explored.
- Transport vehicles and construction equipments / machineries will be properly maintained to reduce air emissions.
- Vehicles and equipments will be periodically checked for pollutant emissions against stipulated norms.
- Idle running of vehicles will be minimized during material loading / unloading operations.
- Exhaust vent of D.G. set will be kept at proper height to ensure quick dispersal of gaseous emissions.
- All construction workers will be provided appropriate PPEs like dust mask, ear plug, helmet, safety belt etc. and made to wear them during working hours.

8.3.1.2 WATER ENVIRONMENT

Water quantity being small, no major impact on existing water resources of the study area is envisaged. Further, there will be no housing facilities at site for construction workers and hence a major source of impact on water environment will be avoided. Proper and sufficient sanitary facilities will be provided to construction workers to maintain all hygienic conditions at site. Storm water drain compatible with the local hydrological pattern of the area, will be provided to carry – off, any run - off or storm water from the premises. Care should be taken during construction work & will nor create any obstruction/dips in the topography which can lead to accumulation of water within premises leading to undesirable consequences like health and hygiene problems etc.

8.3.1.3 SOLID WASTE

Main solid waste generation during construction phase will be construction debris like rubble, brick bats, debris, steel scrap, wooden scrap, sand, gravel etc. However, these materials are inert in nature and will not result into leaching of any substance or constituent.

These materials will be properly sorted and will be used within premises for filling of low lying areas. Wooden scrap, steel scrap will be given to scrap dealers.

On completion of civil work, all debris etc. will be completely removed from site to avoid any incompatibility with future use.

8.3.1.4 NOISE ENVIRONMENT

Following measures are proposed during construction period to mitigate adverse impacts:

- Construction machinery and vehicles will undergo periodic maintenance to keep them in good working condition.
- All machineries to be used for construction purpose will be of highest standard of reputed make and compliance of noise pollution control norms by these equipments will be emphasized by company.
- Feasibility of putting up acoustic enclosure / temporary barrier around areas with high noise levels will also be explored.
- All construction workers working in high noise areas will be provided appropriate PPE,s like ear muffs and made to wear them during working hours.
- Possibility of raising green belt along with construction activity will also be explored so as to serve as a noise barrier.

8.3.1.5 LAND ENVIRONMENT

Following steps are proposed to take care of impact of construction activity on project land area:

- On completion of civil works, all debris etc. will be completely removed from site to avoid any incompatibility with future use.
- Other materials like paints, diesel etc. will be properly stored and handled to prevent any spillage on land.
- All the wastes will be stored at a designated site within the premises to prevent scattered discharge on land.

8.3.1.6 ECOLOGY

As the Project site is having few shrubs and no major cutting exercise will be there and hence no major impact on ecology is anticipated.

However, possibility of rising of green - belt along with construction activity will be explored so that greening of area can be started at the beginning of project.

8.3.1.7 SOCIO-ECONOMIC

As there will be no temporary housing colony for construction workers, neither socio - economic impact due to the same is envisaged.

Overall socio - economic effect of construction phase will be positive due to direct and indirect employment opportunity for the local livings. Local people from nearby villages of the surroundings of the site will be employed for construction work to the maximum extent possible.

8.3.2 DURING OPERATION PHASE

Operation phase of any industry being longer in duration and because of its potential to create continuous impacts is quite important from the impact point of view. Comprehensive and effective EMP has to be prepared and implemented to safe-guard environmental concerns during operation phase of any unit.

8.3.2.1 AIR ENVIRONMENT

The air pollutants in the plant may be classified broadly into particulate matter like dust, fumes etc. and gases like Sulphur dioxide, carbon mono oxide, nitrogen oxide etc. The measure to control the air pollution will ensure the ambient air quality standards as laid down by Central Pollution Control Board for industrial areas.

The system proposed for air pollution control will provide acceptable environment condition in the working areas and abate air pollution in the surrounding area of the plant. The technological equipment and processes have been selected with the above objectives. Depending on quality of emission from different sources, suitable air pollution control system will be provided. The chimney height will be as per CPCB norms to ensure ground level concentration of different pollutants within permissible limit.

Dust collection equipment such as fabric filter etc. will be adopted to remove particulate matter from gas streams. The pollutant itself will be collected through suction hoods, ducts etc.

Following measures are proposed to mitigate negative impact of operation phase of the project on the surrounding air environment:

- All transfer points will have bag filter attached to them to control and capture dust emission.
- Height of all the stacks will be as per statutory requirement. All the stacks will have stack monitoring facility (SMF) consisting of sampling port-hole, platform and access ladder.
- Adequate spares of critical components of dust collection systems will be kept to ensure trouble - free operations and continuous compliance to emission norms.
- A comprehensive plan for fugitive emission control based on CPCB guidelines is prepared and followed.
- Transport vehicles will be properly maintained to reduce air emissions.
- Vehicles will be periodically checked for pollutant emissions against stipulated norms.
- Idle running of vehicles will be minimized during material loading / unloading operations.

8.3.2.2 CONTROL AND MONITORING OF SECONDARY FUGITIVE EMISSIONS

The unit will install air pollution control equipments to control particulate matter emissions. Fugitive emissions from the proposed plant would be significant as there will be air pollution due to activities like material handling, crushing, transfer points of materials and movement of vehicles. These operations generate large quantity of dust. Specific instances of fugitive dust generation may include dust blown by wind from the raw-materials stockpile, dust caused by vehicular traffic within the factory, dust leakage from conveyors, conveyor transport points, storage hoppers and packers etc, Good housekeeping, proper maintenance, wetting of dusty areas, use of enclosed storage wherever feasible etc., would considerably reduce fugitive dust.

For effective prevention and control of fugitive emissions, the M/s. Manglam Distillers & Bottling Industries shall implement the followings:

- Storage area shall be clearly earmarked.
- Enclosure shall be provided for all the loading & unloading operations, if possible.
- All transfer points shall be fully enclosed.
- Airborne dust shall be control by sprinkling of water.
- All roads shall be paved on which movement of raw materials or products will take place.
- Preventive measures shall be employed to minimize dust build up on road.
- Conveyors shall be provided with conveyor cover.
- Maintenance of air pollution control equipment shall be done regularly.
- All the workers shall be provided with disposable dust mask.
- Green belt will be developed around the plant to arrest the fugitive emissions.
- Regular training shall be given to the personnel operating and maintaining fugitive emissions control systems.

The fugitive emission will be monitored at following locations within plant area as per CPCB/SPCB guidelines, details of such locations is given in table-8.1.

TABLE - 8.1 LOCATION OF FUGITIVE MONITORING

SR.NO.	AREA	MONITORING LOCATION
1.	Raw material handling	Transfer points
2.	Product processing area	Furnace area

8.3.2.3 WATER ENVIRONMENT

- Total water requirement for the proposed project would be 720 KLPD which will be sourced from deep bore well within premises. Water conservation measures shall be taken to optimize the fresh water requirement. Moreover, record of water consumption for different usages shall be maintained.
- Spent wash holding tank shall be provided having capacity of 5 day retention time with HDPE lining as per CPCB guidelines. Regular monitoring will be carried out of ground water around spent wash holding tank.
- Proper and sufficient sanitary facility will be provided to construction workers to maintain hygienic conditions at site. The sewage will be disposed off through septic tank followed by soak pit/well.
- Philosophy of maximum recycling and reuse of treated waste water within the plant will be adopted to minimize consumptive water requirements and to achieve “zero” effluent discharge from the plant.
- Adequate spares for effluent collection, handling, treatment and disposal system shall be maintained.
- Records of analysis results of treated and untreated wastewater should also be maintained.
- Record of the wastewater generation and recycle shall be maintained on printed logbook/computer.
- Proper housekeeping shall be adopted to prevent spillages and contaminated surface runoff going to storm water drains.

RAIN WATER HARVESTING SCHEME:

Rain Water Harvesting is a way to capture the rain water when it rains, store that water above ground or charge the underground and use it later.

There are a number of types of systems to harvest rainwater ranging from very simple to the complex industrial systems. Generally, rainwater is either harvested from the ground or from a roof. The rate at which water can be collected from either system is dependent on the plan area of the system, its efficiency, and the intensity of rainfall.

As the company will require continuous water, it would be met from ground water. To compensate the ground water loss, it is proposed to recharge the water through rain water harvesting system.

Storm Water Drainage Line: Channels will be installed wherever required to collect and transport rain water to the storage tank. Drainage will be semi-circular and will be made using Galvanized Iron sheet folded to required shapes. Drainages will be fixed using Iron Brackets.

Conduits: Pipes will be used to carry rain water from catchment to the recharge pit, passing through filter. A valve will be put at the end of wall for first flushing.

Filter: Sand Filter will be used to remove suspended pollutants from the rainwater.

Recharge: After filtration, water will be recharged using percolation pit, filled with pebbles or brick and river sand and covered with perforated concrete slabs. Depth of recharge pit will be designed according to Water table of the area.

8.3.2.4 SOLID WASTE

Solid wastes shall be generated in the form Distillers Wet Grains with Soluble (DWGS) and Dried Distillers Grains with Soluble (DDGS) from process and Fly ash from boiler. Following steps shall be taken;

- Dried Distillers Grains with Soluble (DDGS) will be sold for cattle feed.
- Fly as generated from boiler will be sold to the cement or brick manufacturer.
- Record of solid waste generation and disposal shall be maintained on printed logbook.
- All Necessary precaution shall be taken during handling, loading and unloading of solid waste.

There will be no major generation of hazardous waste from the project. A small quantity of used lubricating oil will be generated which will be properly stored and disposed off. There will be no disposal of industrial effluent on land as small quantity of treated industrial effluent will be used on land for gardening purpose and sewage waste water will be disposed off through soak pit/well.

8.3.2.5 NOISE ENVIRONMENT

Following precautionary measures will be adopted to control the noise level:

- Noise generating sources and their platforms will be maintained properly to minimize noise vibrations generated by them
- Personnel working near the noisy machines in different plant locations, will be provided with well designed ear muffs / plugs (effective noise reduction 10-15 dBA)
- Green belt will be developed to act as a noise barrier.
- Noise barriers/ shields in the form of walls, beams will be provided around the units wherever found feasible
- Training to personnel will be imparted to generate awareness about effects of noise and importance of using PPEs.

8.3.2.6 LAND ENVIRONMENT

There will be no major generation of hazardous waste from the project. A small quantity of used lubricating oil will be generated which will be properly stored and disposed off. There will be no disposal of industrial effluent on land as small quantity of treated industrial effluent will be re-used. Only treated sewage will be used on land for gardening purpose.

8.3.2.7 BIOLOGICAL ENVIRONMENT

8.3.2.7.1 GREEN BELT DEVELOPMENT

Green belt with properly selected plant species can serve as a useful buffer to contain the menace of pollution from the different sources. As a control measure of atmospheric pollution, as a barriers noise generated in the plant premises and to utilize the wastewater generated as treated effluent, it is recommended to develop vast green belt around the periphery of the plant, along the road side and other area available for the plantation. Total 11,920 sq. m. of land are earmarked in the layout plan for the development of green belt.

Guidelines for plantation

The plant species identified for greenbelt development shall be planted using pitting technique. The pit size will be either 45 cm x 45 cm x 45 cm or 60 cm x 60 cm x 60 cm. bigger pit size will be considered at marginal and poor quality soil. Soil used for filling the pit should be mixed with well decomposed farm yard manure or sewage sludge at the rate of 2.5 kg (on dry weight basis) and 3.6 kg (on dry weight basis) for 45cm x 45 cm x 45 cm and 60 cm x 60 cm x 60 cm size pits respectively. The filling of soil should be completed at least 5-10 days before actual plantation. Healthy sapling of identified species should be planted in each pit with the commencement of monsoon. Provision for regular and liberal watering during the summer period during the commissioning stage of the plant will be arranged from the local available resources. The authorities responsible for plantation will also make adequate measures for the protection of the saplings.

While making choices of plant species for cultivation in green belts, weightage has been given to the natural native species, bio climatic condition, plants which can be grown as per normal horticultural practices.

8.3.2.7.2 RECOMMENDED PLANTS FOR GREEN BELT DEVELOPMENT

Greenbelt is an effective mode of control of air pollution, where green plants form a surface capable of absorbing air pollutants and forming a sink of pollutants. Leaves with their vast area in a tree crown, sorbs pollutants on their surface, thus effectively reduce pollutant concentration in the ambient air. Often the adsorbed pollutants are incorporated in the metabolic pathway and the air is purified. Plants grown to function as pollution sink are collectively referred as greenbelts.

An important aspect of a greenbelt is that the plants are living organism with their varied tolerance limit towards the air pollutants. A green belt is effective as a pollutant sink only within the tolerance limit of constituent plants. Planting few, known pollutant sensitive species along with the tolerant species within a

green belt however, do carry out an important function of indicator species

Apart from function as pollution sink, greenbelt would provide other benefit like aesthetic improvement of the area and providing suitable habitats for birds and animals.

8.3.2.7.3 SELECTION OF PLANTS FOR GREEN BELTS

The main limitation for plants to function as scavenger of pollutants are, plant's interaction to air pollutants, sensitivity to pollutants, climatic conditions and soil characteristics. While making choice of plants species for cultivation in green belts, due consideration has to be given to the natural factor of bio- climate. Xerophytes plants are not necessarily good for greenbelts; they with their sunken stomata can withstand pollution by avoidance but are poor absorber of pollutants.

Character of plants mainly considered for affecting absorption of pollutant gases and removal of dust particle are as follows.

FOR ABSORPTION OF GASES:

- Tolerance towards pollutants in question, at concentration, that are not too high to be instantaneously lethal
- Longer duration of foliage
- Freely exposed foliage
- Adequate height of crown
- Openness of foliage in canopy
- Big leaves(long and broad laminar surface)
- Large number of stomatal apertures

FOR REMOVAL OF SUSPENDED PARTICULAR MATTER

- Height and spread of crown.
- Leaves supported on firm petiole
- Abundance of surface on bark and foliage
- Roughness of bark
- Abundance of axillary hairs
- Hairs or scales on laminar surface
- Protected Stomata

8.3.2.7.4 PLANTATION ALONG ROAD SIDES

Automobiles are the source of pollution of gaseous and particulate pollutants. Component of green belt on road side hence should be with both absorbers of gases as well as of dust particles. The choice of plants for road side should include shrubs of height 1 to 1.5 meter and trees of 3-5 meter height. Medium sized trees, alternating with shrubs are ideal for sorption of particulates and gases, as the company is doing the same in existing plant. The budgetary plan is given in the table-8.2.

TABLE-8.2 BUDGETARY OUTLETS OF GREENBELT DEVELOPMENT FOR FIVE YEARS

SR. No.	YEAR	NO. OF PLANTS	BUDGET (RS. IN LAKHS)
1.	1 st Year	1000	5,00,000
2.	2 nd Year	800	4,00,000
3.	3 rd Year	500	2,50,000
4.	4 th Year	400	2,00,000
5.	5 th Year	300	1,50,000
TOTAL		3000	15,00,000

8.3.2.8 SOCIO - ECONOMIC ENVIRONMENT

A comprehensive plan for Socio - economic uplift of the area has been prepared by M/s. Manglam Distillers & Bottling Industries, and presented in chapter-7.

8.3.2.9 OCCUPATIONAL HEALTH SURVEILLANCE PROGRAMME

Health hazards associated with the occupation are called occupational hazards. In chemical industry due to handling of toxic and hazardous chemicals there are possibilities of developing occupational diseases. Company shall carry out the following checks to curb the problem:

- i) Pre - employment medical checkup at the time of employment.
- ii) Annual medical checkup shall be done for all employees.

1.	Nature of Laboratory examination
	Pathological
	i) Blood
	ii) Urine
	iii) Stool
2.	Radiological (X-Ray)
3.	Pathological
	i) Lung function test
	ii) Sputum test
	iii) Liver function test
4.	Audiometric Exam
5.	Occupational diseases suspected
6.	Occupational diseases detected
7.	No. of workers declared unfit for further work
8.	Others (clinical exam)

8.3.2.10 GENERAL CONSIDERATIONS

For good housekeeping of the proposed project, following measures will be planned:

- Maintaining cleanliness of roads to prevent accumulation of dust and waste material.
- Inculcating positive attitude among employees for good house-keeping.
- Maintaining hygienic conditions in canteens, near drinking water source and toilets.

8.3.2.11 CONCEPT OF WASTE-MINIMISATION, RECYCLE/REUSE/RECOVER TECHNIQUES, ENERGY CONSERVATION, AND NATURAL RESOURCE CONSERVATION

Waste-minimisation: Process optimization by using latest technology equipment.

Recycle/reuse/recover: Wastewater generated from the process and other sources shall be reutilized in the process and or shall be used for gardening and green belt development after giving suitable treatment.

The solid waste generated from the process shall be dried and sold for cattle feed. The boiler ash shall be sold to suitable vendors.

Energy Conservation Measures: Latest Technology has been selected for distillation process consuming optimal energy. In order to conserve Energy, the following measures have been taken right at the time of selection of Equipments and Technology:

- To go for highly energy efficient Bag Filters
- To go for automatic system for plant functioning
- False leakages in the plant will be arrested by carrying out regular checks.

Natural Resource Conservation: Rice husk shall be used as fuel boiler fuel as a replacement of coal. This will reduce the coal consumption rate.

To conserve ground water rain water harvesting will be carried out to store rain for future use and also to recharge ground water. Recycling of process water shall be done up to the extent possible to reduce the fresh water demand.

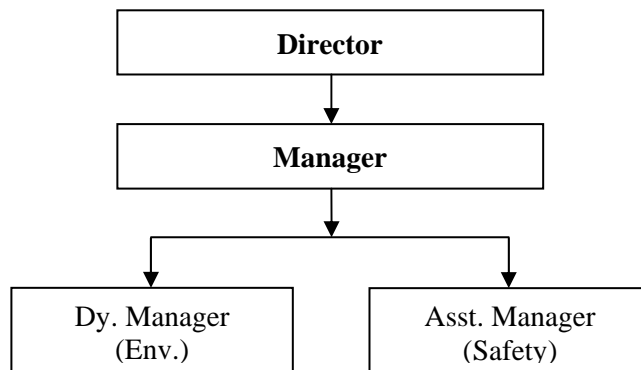
8.4 ENVIRONMENTAL MANAGEMENT CELL

In addition to preparing an EMP, it is also necessary to have a permanent organizational set up to ensure its effective implementation. Hence, proposed plant will create a team consisting of officers from various departments to co-ordinate the activities concerned with management and implementation of the

environmental control measures. This team will undertake the activity of monitoring the stack emissions, ambient air quality, noise level etc. either departmentally or by appointing external agencies wherever necessary. Regular monitoring of environmental parameters will be carried - out to find out any deterioration in environmental quality and also to take corrective steps, if required, through respective internal departments.

The Environmental Management Cell will also collect data about health of workers, green belt development etc. Organogram of the Environmental Management Cell is presented in figure-8.1.

FIGURE - 8.1 AN ORGANOGRAM OF ENVIRONMENT MANAGEMENT CELL



The cell will also be responsible for monitoring of the plant safety and safety related systems which include:

- Checking of safety related operating conditions.
- Visual inspection of safety equipments.
- Preparation of a maintenance plan and documentation of maintenance work specifying different maintenance intervals and the type of work to be performed.
- Other responsibilities of the cell will include :
- Conduct and submit annual Environmental Audit. A SPCB registered agency will be retained to generate the data in respect of air, water, noise, soil and meteorological data and prepare the Environmental Audit report. Timely renewal of Consolidated Consents & Authorization (CC & A) will also be taken care of.
- Submitting environmental monitoring report to SPCB. Data monitored by the cell will be submitted to the Board regularly and as per the requirement of SPCB. The cell will also take mitigative or corrective measures as required or suggested by the Board.
- Keeping the management updated on regular basis about the conclusions / results of monitoring activities and proposes measures to improve environment preservation and protection.
- Conducting regular safety drills and training programs to educate employees on safety practices. A qualified and experienced safety officer will be responsible for the identification of the hazardous conditions and unsafe acts of workers and advise on corrective actions, organize training programs and provide professional expert advice on various issues related to occupational safety and health.
- Conducting safety and health audits to ensure that recommended safety and health measures are followed.

8.5 ENVIRONMENTAL POLICY

The Standard Operating Procedure (SOPs) shall be developed and followed for the smooth operation of the unit. The company also shall obtain International Organization for Standardization (ISO) certificate and plan for Integrated Management System (IMS) to meets the standards of certification and improve business processes. Once such certification obtained, M/s. Manglam Distillers & Bottling Industries will develop health, Safety, environment policy which will be approved by the Board of Directors.

8.6 REPORTING SYSTEM TO THE DIRECTORS

At M/s. Manglam Distillers & Bottling Industries, all the safety officers and HSE officers collect the Environment and safety compliance data and submit it to their respective Heads and then safety & HSE

Heads submit a signed Environment and safety compliance report to the unit manager and unit manager gives the compliance report to Managing Director who submit it with his sign to the Board of Directors, every month. Any Environment related non compliances / violations / notices are immediately brought to the notice of the Board of directors and discussed in board meeting.

8.7 BUDGETORY PROVISIONS FOR EMP

Adequate budgetary provisions have been made by M/s. Manglam Distillers & Bottling Industries, Management for execution of environmental management plans. The details of capital and recurring (per annum) budget earmarked for pollution control / monitoring equipment; operation and maintenance of pollution control facilities, for greenbelt development and maintenance will be as given in table-8.3.

TABLE - 8.3 COST OF ENVIRONMENTAL PROTECTION MEASURES (RS. IN LAKHS)

SR. NO.	ITEM	CAPITAL COST (RS. IN LAKHS)	RECURRING COST (RS. IN LAKHS)
CAPITAL EXPENDITURE:			
1.	Waste water management System	650.00	35.00
2.	Air pollution control measures	220.00	20.00
3.	Solid waste management	35.00	7.00
4.	Noise pollution control measures	20.00	5.00
5.	Green belt development	15.00	5.0
6.	Environment Monitoring and Management	10.00	3.00
	TOTAL COST OF ENVIRONMENTAL PROTECTION MEASURES	950.00	75.00

CHAPTER – 9

SUMMARY AND CONCLUSION

9.1 INTRODUCTION

M/s. Manglam Distillers & Bottling Industries, Company incorporated on 17th day of April 2008 with its Registered Office at House No. 17, Chitralkha Lane, Usha Nagar, Dispur, Guwahati – 781006, Assam and Factory/Works at Pachari, Dalarpathar, Mouza Pub Bongsor, Tehsil Hajo, District Kamrup, Assam, set up a 60 KLPD Grain Based Distillery, 6 KLPD Malt Spirit along with co-generation Power Plant of 3 MW. Project comes under Category A, 5(g), (II) All Can Juice/Non Molasses based Distilleries \geq 30 KLPD as per EIA Notification dated 14th September, 2006 and its subsequent amendments.

9.2 PROJECT DESCRIPTION

9.2.1 PROJECT DETAILS

Name of the company	M/s. Manglam Distillers & Bottling Industries.
Category of the project	A
S. No. In the schedule	5(g), (II) All Can Juice/Non Molasses based Distilleries \geq 30 KLPD
Location of the project	Village Pachari, Dalarpathar, Mouza Pub Bongsor, Tehsil Hajo, District Kamrup, Assam.
Capacity of the project	Proposed Grain Based Distillery (60 KLPD ENA/RS/Industrial Alcohol) Malt Spirit (6 KLPD) along with co-generation Power plant of 3 MW)
General condition & Specific condition	Does not attract general condition & Specific conditions.
Total project cost	Rs. 80.00 Crores
Cost for EPCM	Capital Cost: Rs. 950.00 lacs & Recurring cost: Rs. 75.0 lacs.
Cost for CSR activity	Rs. 400 lacs shall be utilized over a period of 5 years.

9.2.2 PROJECT REQUIREMENT

Land requirement	Total 36,120.7 sq. m. private land is already acquired.
Water requirement & its source	Total 720 KLPD water will be required for the proposed project which will be met through ground water. Necessary permission will be obtained from competent authorities.
Electricity requirement & its source	3.0 MW Cogeneration Power Plant.
Manpower requirements	60 personnel and local people will be employed as far as possible.
Fuel requirement & its source	Coal: 70 TPD or Rice Husk: 100 TPD for 30 TPH Boiler, Coal will be Source from Assam and Meghalaya while Rice Husk from Nearby sources. HSD: 300 lit/hr for D. G. Set, from nearest sources
D.G. set for emergency use	One 900 KVA Capacity for initial start up and emergency purposes

9.2.3 RAW MATERIAL REQUIREMENT

SR. NO.	NAME OF THE RAW MATERIAL	CONSUMPTION MT/DAY	SOURCE	MODE OF TRANSPORTATION
1.	Grains (Broken Rice / Maize / Sorghum / Bajra / Wheat)	150 TPD	Assam, Bihar, West Bengal, Uttar Pradesh.	By Road
2.	Malt	15 TPD	Assam, Bihar, West Bengal, Uttar Pradesh.	By Road

SR. NO.	NAME OF THE RAW MATERIAL	CONSUMPTION MT/DAY	SOURCE	MODE OF TRANSPORTATION
3.	Alpha Amylase	30 Kg	Directly from the Chemical Companies	By Road
4.	Amyloglucosidase	30 Kg	Directly from the Chemical Companies	By Road
5.	Sulphuric Acid	50 Kg	Authorized Dealers	By Road
6.	Urea	60 Kg	Local Market	By Road
7.	Nutrients Ammonia	150 Kgs	Local Market	By Road
8.	Antifoam	0.6 kg per KL 36 kgs	Local Market	By Road
9.	Yeast	As per requirement	Authorized Dealers	By Road
10.	Biocides	30 kg	Local Market	By Road

Mode of Transportation:

Road traffic to and from the proposed plant during operation of proposed project will be increased to some extent (around 85 trucks/day). The regular maintenance of vehicle shall limit the pollution within limits.

9.2.4 WASTE WATER GENERATION

The effluent generated from the ENA production process is segregated as process effluent (spent wash and spent lees) and effluent from utilities like Boiler, Vacuum pump, washings. The company proposes to follow & set up a “Zero Effluent Discharge” scheme. The condensates from evaporation shall be recycled and reused in Process & Make up water streams. Spent wash shall be decanted for separation of Suspended Solids and Multi-Effect Evaporation arrangement. Condensate shall be reused and spent less shall be recycled back to Distillation.

Wastewater from Boiler (Blow down) as well as miscellaneous Water shall be used in Gardening and Green Belt development. Domestic wastewater generated shall be disposed off through septic tanks followed by soak pit/well.

9.2.5 AIR EMISSION & AIR POLLUTION CONTROL MEASURES

NO. OF STACK	STACK ATTACHED TO	NAME & QUANTITY OF FUEL	POLLUTION CONTROL EQUIPMENT	STACK HEIGHT & DIAMETER (M)	POLLUTANTS
1.	30 TPH Boiler	Coal 70 TPD or Rice Husk 100 TPD	Bag Filter / ESP	Ht. 45 m & dia. - 2 m	PM – 150 mg/Nm ³ SO ₂ – 100 ppm NO _x – 50 ppm
2.	D. G. Set of 900 KVA (Standby facility)	Diesel 300 Lit./Hr	Industrial Grade Resistive Mufflers and RCC room with proper ventilation	Ht. - 9 m & dia. - 0.4 m	PM – 150 mg/Nm ³ SO ₂ – 100 ppm NO _x – 50 ppm

9.2.6 SOLID WASTE GENERATION & DISPOSAL

SR. NO.	TYPE OF SOLID WASTE	SOURCE	QUANTITY PER DAY	DISPOSAL METHOD
1.	Grain Residue (DDGS/DWGS)	Process	Approx 120 MT as DWGS or approx 42 MT as DDGS	Dried and sold for cattle feed
2.	Fly ash	Boiler	Approx 10 MT	Sold to Cement or brick manufacturers.

9.3 DESCRIPTION OF THE ENVIRONMENT

9.3.1 INTRODUCTION

The baseline environmental quality of air, water, soil, noise, socioeconomic and ecology has been assessed during November 2014 to January 2015 in a study area of 10 km radial distance from the project site.

9.3.2 ENVIRONMENTAL SETTING OF THE AREA

Project location	Village Pachari, Dalarpathar, Mouza Pub Bongsor, Tehsil Hajo, District Kamrup, Assam.
Site coordinates	Latitude : 26° 14' 24.73" N Longitude : 91° 38' 39.53" E
Nearest Village	Pacharia
Nearest Town	Changsari at 5 km in North-East Direction
Nearest City	Guwahati at 11 km South-East Direction
Nearest Dist Headquarter	Kamrup at 12 km in South-East Direction
Nearest National Highway	NH 31 at 4.5 km in East Direction
Nearest Railway Station	Changsari at 5.2 km in North-East Direction
Nearest Airport	Guwahati at 13 km in South Direction
Nearest River	Brahmaputra River at 4 km in South Direction
National Park / Reserve Forest, Biosphere Reserve	Sila RF - 1.5 km in East Direction Agyathuri RF - 3.5 km in South-East Direction Diregheswar RF - 6.5 km in North-East Direction Sildar RF - 8.6 km in West Direction Hajo RF - 9.2 km in West Direction
Seismicity	Seismic Zone-V

9.3.3 BASE LINE DATA

Base line data has been collected during the study period i.e. November 2014 to January 2015.

9.3.4 SITE SPECIFIC MICRO-METEOROLOGY

The maximum and minimum temperatures observed in the study period are 39.3 °C and 14.2 °C with average relative humidity 71%. The predominant wind direction is North-East and South-West.

9.3.4.1 AMBIENT AIR QUALITY

The ambient air samples were collected from eight locations and analyzed for PM₁₀, PM_{2.5}, SO₂, NO_x, CO and hydrocarbons. As per the ambient air monitoring, PM₁₀, PM_{2.5}, SO₂, NO_x, CO and hydrocarbons level were in the range of 33.5 - 89.3 µg/m³, 17.1 - 45.3 µg/m³, 4.4 - 9.3 µg/m³, 12.5 - 24.6 µg/m³, 162 - 510 µg/m³, BDL respectively. The results of the monitored data indicate that the ambient air quality of the region in general is in conformity with respect to rural / residential norms of National Ambient Air Quality standards of Central Pollution Control Board (CPCB).

9.3.4.2 SURFACE WATER QUALITY MONITORING

Total eight nos. of surface water samples were collected from the study area. The pH varied is from 6.62-7.56, the turbidity varied from 1.9-3.6 NTU, the total dissolved solids varied from 138-328 mg/l, Conductivity varied from 218-512 µS/cm, The total alkalinity varied from 50-100 mg/l the total hardness varied from 60-180 mg/l, calcium varied from 16.0-40.0 mg/l, chloride varied from 25-75 mg/l and the sulphate varied from 16.0-45.0 mg/l.

9.3.4.3 GROUND WATER QUALITY MONITORING

Eight nos. of ground water samples in the study area were collected and analyzed during November, 2014 to January, 2015. The pH varied in the range of 6.99-7.52, turbidity 0.6-1.2 NTU, total hardness 160-320 mg/l, total alkalinity 100-240 mg/l, total dissolved solids 288-868 mg/l, Conductivity 460-968 µS/cm, Chloride 55.0-120.0 mg/l, Sulphate 37.7-60.4 mg/l, and nitrate was found in the range 3.7-6.9 mg/l. All the samples are conforming to the prescribed drinking water standards.

9.3.4.4 BACKGROUND NOISE LEVEL

Background noise level was measured at eight different locations in the study area. The day time noise levels at all the locations ranged between 40.3-71.2 dB(A). The night time noise levels at all the locations ranged between 37.3-60.3 dB(A).

9.3.4.5 SOIL QUALITY

Total eight nos. of samples were collected from the study area and tested in the laboratory. Mostly texture of the soil is clay followed by loamy sand, clay loam and sandy clay loam soil. Regular cultivation practices increase the bulk density of soil, thus inducing compaction.

9.3.5 LAND USE PATTERN

The land use classification within a distance of 10 kilometers from the project location and the areas falling under the respective classifications are as given in the following table:

S.NO.	LAND USE	AREA (SQ. KM)	%
1.	BUILT UP LAND		
	a. Settlements/IIT	27.004	8.6
	b. Industrial area	13.188	4.2
2.	WATERBODIES		
	a. Tank / River etc.	41.134	13.1
	FORSET		
	a. Scrub forest	22.294	7.1
4.	CROP LAND		
	a. Single crop	103.934	33.1
	b. Double crop	41.134	13.1
	c. Plantation	18.212	5.8
5.	WASTELANDS		
	a. Land with scrub	23.864	7.6
	b. Land without scrub	3.454	1.1
	c. Water logged area	19.782	6.3
	TOTAL	314.000	100.0

9.3.6 BIOLOGICAL ENVIRONMENT

In the project area, the wild animals as well as other fauna are not seen excepting domestic animals. The study area doesn't form any part of National park, wild life sanctuary, and natural biosphere reserve. Only five reserve forests are present in the study area of 10 km radius.

9.3.7 SOCIO-ECONOMIC STUDY

In 2011, Kamrup district had population of 15,17,542. Decadal growth rate of District Kamrup is 15.69% during 2001-2011. As per 2011 census, 90.62% of total population live in rural area while 9.38% of total population live in urban area comparing to 2001 census. The initial provisional data released by the Census of India 2011, shows that density of population in District Kamrup is 489 people per sq. km. Average literacy rate of District Kamrup in 2011 census were 75.55 compared to 67.73 of 2001. Male and female literacy were 81.30 and 75.89 respectively in 2011 census.

9.4 ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

9.4.1 IMPACT ASSESSMENT

An effort has been made to identify various environmental, social and ecological impacts due to proposed project during construction and operation phases considering present environmental scenario as baseline. The corresponding mitigation measures to take care of the adverse impacts are also discussed in following sections.

9.4.2 IMPACTS DURING CONSTRUCTION PHASE & ITS MITIGATION MEASURES

During Construction Phase, the fugitive dust emission due to civil work and vehicular movement is not expected to spread too far as water spraying will be carried out to suppress the dust emission at the site and as well as on road. The increase in noise levels due to the movement of vehicles will be taken care of by regulating the movement of vehicles and the impact on the human beings will be taken care of by providing the working people with ear plugs / ear muffs. During construction, drainage pattern and water supply system of overland water flow will not be changed during the site preparation activities. Suspended solids can be controlled by sprinkling water and by employing enclosures to construction area to allow the

particles to settle down, prior to discharge. During construction period, the project is likely to generate substantial employment and income.

9.4.3 IMPACT DURING OPERATION PHASE & MITIGATION MEASURES

9.4.3.1 AIR ENVIRONMENT

Major air emissions are anticipated by the gaseous emissions from a single stack is a local phenomenon. The ISCST3 scientific model has been used to predict the proposed air quality on the environment. The maximum 24 hourly average GLC's for Particulate Matter, SO₂ and NO_x is observed to be 1.16 µg/m³, 1.97 µg/m³ and 0.72 µg/m³ respectively at a distance of 1000 m towards south-west direction. Fugitive emission will be generated from storage and processing vessels, loading and unloading section.

Mitigation measures:

- Effective stack height with proper air pollution control equipment shall be provided to stack.
- Regular maintenance of APCE shall be done and recorded.
- Green belt shall be developed on 33% are of the total plant area.

9.4.3.2 NOISE ENVIRONMENT

The noise pollution management will be taken up in the following manner;

- By selecting low noise generating equipment, which would have below 75 dBA noise level at 1 m distance. This is taken care at the equipment design stage.
- By isolating the noise unit from the working personnel's continuous exposure by providing acoustic aids for plant personnel.
- By administrative & safety measures, providing noise level monitoring, remedial measures, providing noise safety appliances to the working personnel.

By these measures, it is anticipated that noise levels in the plant will be maintained below 75 dBA.

9.4.3.3 WATER ENVIRONMENT

The company will follow zero discharge effluent concept wherein waste water from Boiler Blow down, bottle washing etc. shall be utilize for ash quenching and green belt development after suitable treatment confirming norms prescribed by Pollution Control Board. Hence, no significant impact on water environment due to the proposed activities is envisaged.

9.4.3.4 LAND ENVIRONMENT

All the solid waste will be stored separately in the isolated storage area within premises. Solid waste generated in the form of DDGS/DWGS (approximately 120/42 MT/day) will be sold for cattle feeding and fly ash approximately 10 MT per day shall be trapped and sold to brick manufacturers.

9.4.3.5 INFRASTRUCTURE AND SERVICES

As a result of development of industry, the neighbouring areas shall be developed for commercial use. The infrastructure services e.g. roads, state transport, post and telegraph, communication, education and medical facilities, housing, etc. shall be improved in the surrounding areas.

9.4.3.6 GREEN BELT DEVELOPMENT

About 11,920 sq. m. area shall be developed as green belt at plant boundary, road side, around offices & buildings and Stretch of open land. In Green belt area about 1,000 tree per acre of land shall be planted.

9.5 ENVIRONMENTAL MONITORING PROGRAMME

9.5.1 ENVIRONMENTAL MONITORING

A regular monitoring of environmental parameters like air, water, noise and soil as well as performance of pollution control facilities and safety measures in the plant are important for proper environmental management of any project. The following routine monitoring programme as detailed in as under will be implemented at site.

- Stack monitoring for the parameters like PM, SO₂, and NO_x, once in a month
- Ambient air quality monitoring for the parameters like PM₁₀, PM_{2.5}, SO₂ and NO_x, once in a six months.
- Work zone environment monitoring for the parameters like HC and VOC once in a six months.

- Liquid effluent monitoring once in a month.
- Ground water, surface water and soil quality monitoring once in a year.
- Noise monitoring near noise generating units once in six months and within plant premises once in a month.

9.6 ADDITIONAL STUDIES

9.6.1 PUBLIC HEARING

Public hearing is applicable for the proposed project as per Para 7(i) III (b) of EIA Notification, 14th September, 2006 as the project is located outside the notified industrial area. Details of the Public hearing will be incorporated after completion of public hearing.

9.6.2 RISK ASSESSMENT

The management is very much aware of their obligation to protect all persons at work and others in the neighbourhood who may be affected by an unfortunate and unforeseen incidence occurring at the works. Any hazard either to employees or others arising from activities at the plant site shall, as far as possible, be handled by the personnel of the company and prevented from spreading any further. However in the case of eventuality the Disaster Management plan adopted by the proponents is sufficient and may be able to control the situation.

9.7 PROJECT BENEFITS

9.7.1 PHYSICAL INFRASTRUCTURE

As a project M/s. Manglam Distillers & Bottling Industries will adopt CSR activities which will surely develop the existing scenario of the area. As in the existing scenario, condition of the physical infrastructure is not so good.

9.7.2 EMPLOYMENT POTENTIAL

For the proposed project, 60 personnel are required for manufacturing activities of proposed unit. Preference shall be given to local people. This is for the direct employment and indirect employment will also increase that will improve the socio-economical status of area.

9.7.3 CORPORATE SOCIAL RESPONSIBILITY (CSR)

Funds to the extent of Rs. 160 lacs will be utilize for the CSR activities for the five years after words Rs. 5 lacs shall be utilized per annum as recurring expenditure. The company will utilize the fund as per regulations for CSR activities like Safe drinking water facility, Health care, Education and Training, Infrastructural development, Awareness programme on environment, Rain water harvesting plan, Plantation, Sports, etc.

9.8 ENVIRONMENTAL MANAGEMENT PLAN

9.8.1 ENVIRONMENTAL MANAGEMENT PLAN (ADMINISTRATIVE ASPECTS)

Environmental monitoring of different parameters will be done regularly and the activity will be coordinated by the Environmental Management Cell (EMC). Mitigation of environmental impacts has to be implemented according to the suggestions and will be monitored regularly to prevent any lapse. The EMC will be under the overall supervision of the Manager (Environment). The cell will report on a regular basis to the Unit Head. The EMC will prepare a formal report on environmental management and mitigation at six month intervals. The company will undertake various training programme for improving the performance of the working personnel. Special training will be arranged in regular intervals to combat emergency scenarios that may occur during the plant operation.

9.9 CONCLUSION

Company has committed to implement all the pollution control measures to protect the surrounding environment. The project can definitely improve the regional, state and national economy. Industrial growth is an indication of socio economic development. The implementation of this project will definitely improve the physical and social infrastructure of the surrounding area.

CHAPTER – 10

CONSULTANT ENGAGED

Environmental Impact Assessment Study of the proposed Grain Based Distillery Grain Based Distillery (60 KLPD), Malt Sprit Plant (6 KLPD) alongwith Co-generation Power Plant (3 MW) of M/s. Manglam Distillers & Bottling Industries conducted by,

Name	: M/s. Envision Enviro Engineers Pvt. Ltd.
Address	: 208, G-Tower, Shankheshwar Complex, Above Girish Group of Hospitals, Sagrampura, Surat-395 002, Gujarat.
Phone	: (0261) 2470653, 2472374, 2473905
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E-mail	: eia@en-vision.in
Website	: en-vision.in

M/s. En-vision Enviro Engineers Pvt. Ltd. (ISO 9001:2008 certified company) is a consulting, engineering and equipment supplier firm delivering exceptional service and quality to public and private clients in India. En-vision is working with zeal in the field of environmental engineering for more than 15 years. En-vision has a vision of supporting and being a part of development that is sustainable to our environment.

En-vision is one of the leading companies as Environmental Consultants providing the EIA study required for Environmental Clearance from MoEF/DoEF and NOC (Consent to establish), CCA (Consent to Operate) from Pollution Control Board. En-vision has a well established laboratory with environmental monitoring and analysis of environmental parameters (Air & Water monitoring, Waste Water analysis, Stack analysis).

En-vision is also working as consultants, turnkey project executors and equipment suppliers in the field of Pollution Control (Environmental) Engineering and deals with turnkey projects in Incineration System for Solid and Hazardous waste. En-vision also does the Design, construction, erection and commission of Water Treatment Facility (Effluent treatment plants, Sewage treatment plants, etc.) and Secured Landfill sites.

En-vision is enlisted contractor with PWD, Goa as Class-I-A (One-A) in the category of Water Supply & Waste Water Disposal. En-vision is recognized as Environmental Auditors and enlisted as consultants and pollution control equipment suppliers with Gujarat Pollution Control Board. Provide Services in the field of Structural Engineering, Water Supply Engineering and Civil Engineering. It has national cliental from state of Gujarat, Chhattisgarh, Assam, Haryana, Andra Pradesh, Rajasthan, Goa, etc and international cliental from Dubai and Egypt.

EEEPL is Member of Consulting Engineers Association of India, Indo-German Chamber of Commerce, Society of Environmental Auditors and Consultants, Ahmedabad and Member of CII. EEEPL is operated by Mr. Nihar Doctor and Mr. Kunhal Shah, who are actively involved in achieving their vision to be a significant contributor in the development sustainable by Environment using collective technical acumen to provide services & equipments and be a part of movement of building Modern India with better environment and safety aim.

Mr. Nihar Doctor: He possesses Bachelor's degree in Civil Engineering and Master's Degree exclusively in the specialized field of structural Engineering as well as Environmental Engineering. Presently he is holding the position of Director in M/s. Envision Enviro Engineers Pvt. Ltd. He is having fourteen years experience in Environmental Engineering field.

Functional area experts and assistance to FAE involved in the EIA study for M/s. Manglam Distillers & Bottling Industries is as follow:

FUNCTIONAL AREA EXPERTS INVOLVED IN THE EIA

Name of EIA Coordinator / Assignment Head involved	FUNCTIONAL AREA EXPERTS INVOLVED	
	FUNCTIONAL AREA	NAME/S
Mr. Nihar Doctor Associate: Mr. Jignesh Patel	LU (Land Use)	Dr. Y. Rama Mohan
	AQ (Meteorology, Air Quality Modeling & Prediction)zz	Mr. Nihar Doctor, Ms. Smitha Rajesh Associate: Mr. Rajendranadh Chokkara
	AP (Air Pollution Monitoring, Prevention & Control)	Mr. Nihar Doctor, Ms. Neelima Roy Associate: Ms. Vaibhavi Kanani, Ms. Nirali Patel
	WP (Water Pollution Monitoring, Prevention, & Control)	Mr. Nihar Doctor, Ms. Smitha Rajesh, Mr. Mayur Harsora Associate: Mr. Jayanti Makwana, Ms. Shweta Tailor
	EB (Ecology & Biodiversity)	Mr. Satyendra Singh Unchawal, Associate:Ms. Vaibhavi Kanani
	SE (Socio-Economoiics)	Mr. Arif Shaikh
	Noise	Mr. Mayur Harsora Associate: Ms. Vaibhavi Kanani, Ms. Nirali Patel
	SC (Soil Conservation), HG (Hydrology, Ground Water & Water Conservation), Geology	Mr. Ravikant Sharma Associate: Mr. Krunal Patel, Mr. Apoorva Ghantiwala
	RH (Risk Assessment & Hazard Management)	Ms. Smitha Rajesh Associate: Mr. Jignesh Patel, Mr. Krunal Patel, Mr. Rajendranadh Chokkara
SHW (Solid & Hazardous Waste Management)	Mr. Nihar Doctor, Ms. Smitha Rajesh Associate: Mr. Jayanti Makwana	

Laboratory for Analysis:

1. **Vision Labs**

H.No. 16-11-23/37/A, Flat No. 205, 2nd Floor,
Opp. R.T.A. Office, N-mart Building,
Musarambagh, Malakpet, Hyderabad - 500036

Monitoring, Collection and Analysis of Air, water and soil samples;
Recognized by NABL, MoEF certified laboratory

ANNEXURE

ANNEXURE – I

A COPY OF TERMS OF REFERENCE LETTER

J-11011/113/2014-IA II (I)
Government of India
Ministry of Environment, Forests and Climate Change
(I.A. Division)

Indira Paryavaran Bhawan
Aliganj, Jorbagh Road
New Delhi – 110 003

E-mail : lk.bokolia@nic.in
Telefax : 011: 24695398
Dated: 6th January, 2015

To,

Shri Rajesh Kumar Jalan
Director
M/s Mangalam Distillers & Bottling Industries
17, Chitra Lekha Lane
Usha Nagar Super Market
Dispur Guwahati 781006 (Assam)

Email.: rajesh_jalan1@yahoo.com / rkdubey_rk@rediffmail.com
Fax.: 0361--2229955

Subject: Grain based Distillery (60 KLPD), Malt Spirit (6 KLPD) along with Cogeneration Power Plant (3 MW) of M/s Mangalam Distillers & Bottling Industries at Village Pacharia (Changsari), District Kamrup, Assam,- TOR reg.

Ref.: Your letter no. nil dated 15.7.2014 (received in the Ministry on 01.09.2014)

Sir,

This has reference to your letter dated nil alongwith project documents including Form-I, Pre-feasibility Report and draft 'Terms of Reference' as per the EIA Notification, 2006. It is noted that proposal is for setting up of grain based Distillery (60 KLPD), Malt Spirit (6 KLPD) along with Cogeneration Power Plant (3 MW) of M/s Mangalam Distillers & Bottling Industries at Village Pacharia (Changsari), District Kamrup, Assam.

2.0 Draft Terms of Reference (TOR) have been discussed and finalized during the 20th Reconstituted Expert Appraisal Committee (Industry) held during 23rd June, 2014 to 24th June, 2014 for preparation of EIA/EMP report. Following are the 'TORs':

1. Executive summary of the project.
2. Justification of the project
3. Detailed break-up of the land area along with latest photograph of the area.
4. Present land use based on satellite imagery and details of land availability for the project along with supporting document.
5. Details of site and information related to environmental setting within 10 km radius of the project site.
6. Information regarding eco-sensitive areas such as national park/wildlife sanctuary/ biosphere reserves within 10 km radius of project area. Authenticated map of Wildlife Warden, State Government indicating national park/wildlife sanctuary to be submitted.
7. Total cost of the project along with total capital cost and recurring cost/annum for environmental pollution control measures.
8. A copy of lease deed or allotment letter, if land is already acquired.

ANNEXURE – I (CONT.)

9. List of existing distillery units in the study area along with their capacity and sourcing of raw material.
10. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area greenbelt area, utilities etc.
11. Details of proposed products along with manufacturing capacity.
12. Number of working days of the sugar unit, distillery unit and CPP.
13. Details of raw materials, its source with availability of all raw materials including cereal grains requirement in case of grain based distillery. If molasses based distillery, then give source and quantity available for molasses.
14. Manufacturing process details of Sugar, distillery and CPP along with process flow chart.
15. Sources and quantity of fuel (rice husk/bagasse/ coal etc.) for the boiler. Measures to take care of SO₂ emission. A copy of Memorandum of Understanding (MoU) signed with the coal suppliers should be submitted.
16. Storage facility for raw materials, prepared alcohol, fuels and fly ash.
17. Action plan for ambient air quality parameters as per NAAQES Standards for PM₁₀, PM_{2.5}, SO₂ and NO_x as per GSR 826(E) dated 16th November, 2009.
18. One season site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall and AAQ data (except monsoon) for PM₁₀, PM_{2.5}, SO₂, NO_x, CO and HC (methane & non methane) shall be collected. The monitoring stations should take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests. Data for water and noise monitoring should also be included.
19. Mathematical modeling for calculating the dispersion of air pollutants and ground level concentration along with emissions from the boiler's stack.
20. An action plan to control and monitor secondary fugitive emissions from all the sources.
21. An action plan prepared by SPCB to control and monitor secondary fugitive emissions from all the sources.
22. Details of boiler and its capacity. Details of the use of steam from the boiler.
23. Ground water quality around proposed spent wash storage lagoon and the project area.
24. Details of water requirement, water balance chart for existing unit as well as proposed expansion (as applicable). Measures for conservation water by recycling and reuse to minimize the fresh water requirement.
25. Source of water supply and permission of withdrawal of water from Competent Authority.
26. Proposed effluent treatment system for grain/molasses based distillery (spent wash and spent lees) along with utility wastewater including CPP/Co-gen Unit (wherever applicable) as well as domestic sewage and scheme for achieving zero discharge. Details of treatment of effluent generation from sugar unit.
27. Spent wash generation should not exceed 8 KL/KL of alcohol production. Details of the spent wash treatment for molasses based distillery based distillery.
28. Capacity for spent wash holding tank and action plan to control ground water pollution.
29. Layout for storage of bagasse/biomass/coal.
30. Capacity for spent wash holding tank and action plan to control ground water pollution.
31. Dryer shall be installed to dry DWGS.
32. Layout for storage of rice husk/biomass/coal.
33. Details of solid waste management including management of boiler ash.
34. Risk assessment for storage and handling of alcohol and mitigation measure due to fire and explosion and handling areas.
35. Alcohol storage and handling area fire fighting facility as per norms. Provision of Foam System for fire fighting to control fire from the alcohol storage tank.

ANNEXURE – I (CONT.)

36. Action plan for development of green belt over 33 % of the total project area within plant premises with at least 10 meter wide green belt on all sides along the periphery of the project area, in downward direction, and along road sides etc.
37. List of flora and fauna in the study area.
38. Noise levels monitoring at five locations within the study area.
39. Detailed Environment management Plan (EMP) with specific reference to details of air pollution control system, water & wastewater management, monitoring frequency, responsibility and time bound implementation plan for mitigation measure should be provided.
40. EMP should also include the concept of waste-minimization, recycle/reuse/ recover techniques, Energy conservation, and natural resource conservation.
41. Action plan for rainwater harvesting measures at plant site should be included to harvest rainwater from the roof tops and storm water drains to recharge the ground water.
42. Details of occupational health surveillance programme.
43. Details of socio-economic welfare activities.
44. Transportation of raw materials and finished products for the project (proposed/expansion) in respect of existing traffic, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.
45. Action plan for post-project environmental monitoring.
46. Corporate Environmental Responsibility
47. (a) Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.
(b) Does the Environmental Policy prescribe for standard operating process/procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA report.
(c) What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the EC conditions. Details of this system may be given.
(d) Does the company have a system of reporting of non compliance / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism should be detailed in the EIA report.
48. At least 5 % of the total cost of the project should be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan should be prepared and incorporated.
49. Total capital cost and recurring cost/annum for environmental pollution control measures.
50. Expansion/modernization proposals:
 - i. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments should be provided. In addition, status of compliance of Consent to Operate for the ongoing /existing operation of the project from SPCB shall be attached with the EIA-EMP report.
 - ii. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification, 1994 and/or EIA Notification 2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.

ANNEXURE – I (CONT.)

51. Any litigation pending against the project and / or any direction / order passed by any Court of Law against the project, if so, details thereof.

Additional TOR

52. Availability of grain to be included.

53. The following general points shall be noted:
- i. All documents shall be properly indexed, page numbered.
 - ii. Period/date of data collection shall be clearly indicated.
 - iii. Authenticated English translation of all material in Regional languages shall be provided.
 - iv. The letter/application for environmental clearance shall quote the MOEF file No. and also attach a copy of the letter.
 - v. The copy of the letter received from the Ministry shall be also attached as an annexure to the final EIA-EMP Report.
 - vi. The index of the final EIA-EMP report must indicate the specific chapter and page no. of the EIA-EMP Report
 - vii. The consultants involved in the preparation of EIA-EMP report after accreditation with Quality Council of India (QCI) /National Accreditation Board of Education and Training (NABET) would need to include a certificate in this regard in the EIA-EMP reports prepared by them and data provided by other organization/Laboratories including their status of approvals etc. 'Certificate of accreditation' issued by QCI to the environmental consultant should be included.

3.0 These 'TORs' should be considered for the preparation of EIA / EMP report for setting up of Grain based Distillery (60 KLPD), Malt Spirit (6 KLPD) along with Cogeneration Power Plant (3 MW) of M/s Mangalam Distillers & Bottling Industries at Village Pacharia (Changsari), District Kamrup, Assam in addition to all the relevant information as per the 'General Structure of EIA' given in Appendix III and IIIA in the EIA Notification, 2006. The EIA/EMP as per TORs should be submitted to the Chairman, Assam Pollution Control Board, (APCB) for public consultation. The SPCB shall conduct the public hearing/public consultation as per the provisions of EIA notification, 2006.

4.0 You are requested to kindly submit the final EIA/EMP prepared as per TORs and incorporating all the issues raised during Public Hearing / Public Consultation to the Ministry for considering the proposal for environmental clearance *within 3 years as per the MoEF O.M. No. J-11013/41/2006-IA.II (I) (Part) dated 8th October, 2014.*

5.0 The consultants involved in the preparation of EIA/EMP report after accreditation with Quality Council of India / National Accreditation Board of Education and Training (QCI/NABET) would need to include a certificate in this regard in the EIA/EMP reports prepared by them and data provided by other Organization(s)/Laboratories including their status of approvals etc.


(Lalit Bokolia)
Additional Director

Copy to :

1. The Conservator of Forests (Central), Ministry of Environment & Forests, Regional Office (Northeast Eastern Regional Office, Uplands Road, Laitumkhrah, Shillong – 793003, Meghalaya.
2. Chairman, Assam Pollution Control Board, Bahunimatram, Assam, Guwahati.


(Lalit Bokolia)

ANNEXURE – II

LAND AGREEMENT DOCUMENT



असम ASSAM



Sl./Instrument No. 1238 A
Date 31/1/14

Sweta Jalan
Rajesh Kumar Jalan
Suresh Kumar Jalan
Sangeeta Jalan

055468

LEASE DEED

THIS DEED OF LEASE IS MADE ON THIS 31st DAY OF JANUARY 2014 AT GUWAHATI

BETWEEN

(1) Smti. Sweta Jalan, wife of Sri Rajesh Kumar Jalan, (2) Sri Rajesh Kumar Jalan, S/o.- Late Lakshmi Narayan Jalan, (3) Sri Suresh Kumar Jalan, S/o.- Late Lakshmi Narayan Jalan, (4) Smti. Sangeeta Jalan, W/o.- Sri Suresh Kumar Jalan, (5) Sri Sanjay Kumar Jalan, S/o.- Late Lakshmi Narayan Jalan and (6) Snowfall Commercial Pvt. Ltd. having its Registered Office at - 9 Mango Lane, Kolkata (West Bengal) and Administrative Office at - H. No. 17, Chitralekha Lane, Usha Nagar, Super Market, Dispur, Guwahati, Assam duly represented by its Director Sri Rajesh Kumar Jalan son of Late Lakshmi, residents of House No. 17, Chitralekha Lane, Usha Nagar, Super Market, P.O. & P. S.- Dispur, Guwahati, Kamrup, Assam, hereinafter called the "LESSOR" (which expression shall unless excluded by or repugnant to the context shall mean and include their heirs, executors, administrators, successors and assigns) of the FIRST PART.

Saligram Chelra
NOTARY GOVT OF ASSAM
Kamrup (Metro) Guwahati
Regd No-KAM-14

Rajesh Kumar Jalan

AND

Manglam Distillers & Bottling Industries

Partner

Snowfall Commercial Pvt. Limited
Director.

Director

ANNEXURE – II (CONT.)

M/S. Manglam Distillers and Bottling Industries, a Partnership Firm having its Branch Office at Vill.- Pacharia, Mouza- Pub Bongsar, Dist.- Kamrup, Assam and Head Office at A. T. Road, Hijuguri, P.O. & P.S.- Tinsukia, Assam, represented by its Managing Partner Sri Rajesh Kumar Jalan hereinafter called the **“LESSEE”** (which expression shall unless excluded by or repugnant to the context shall mean and include the Lessee, its heirs, executors, administrators, successors and assigns) of the **SECOND PART**.

Sri Rajesh Kumar Jalan

WHEREAS, the Lessor is the absolute owner and possessor of a plot of land, measuring more or less 23 Bighas, 3 Katha, 15 Lechas, covered by Dag No. 160, 161, 154, 151, 155, 150, 156 and 157, comprised in K.P. No. 306, 248, 94, 75, 237, 317, 211 and 168 respectively, situated at Revenue Village- Pacahria Dalarpathar, Mouza- Pub Bongsor in the District of Kamrup, Assam (Fully described in the schedule below).

AND WHEREAS, the Lessee being a Partnership Firm and being interested in setting up a factory for manufacturing of Sprit and allied products in the state of Assam, required a suitable land for the proposed factory, approached the Lessor for leasing out the plots of land, fully described in the schedule herein below to it for the purpose of setting up the above said factory.

AND WHEREAS, the Lessor finding the proposal of the Lessee suitable and in consideration of the rent proposed to be paid by the Lessee fair, according to the prevailing market rate, has agreed to lease out the land more fully described in the schedule below under the terms and conditions as set forth herein below.

WHEREBY IT IS MUTUALLY AGREED AS FOLLOWS:

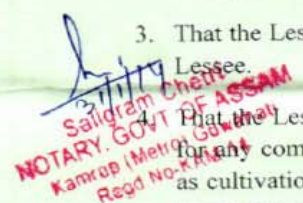


1. That the Lessor agrees to lease out the said land and Lessee agrees to take on lease all that piece and parcel of the said land situated at Revenue Village- Pacahria Dalarpathar, Mouza- Pub Bongsor in the District of Kamrup, Assam, more fully described in the Schedule herein under, for a period of **40 (Forty) years** commencing on and from the date of execution of the Lease Deed, and accordingly the Lessor will hand over the possession of the said land to the Lessee free from all encumbrances.

*Suresh Kumar Jalan
Sangeeta Jalan*

2. That the rent of entire demised land more fully described in the schedule herein below is fixed at Rs. 32,00,000/- (Thirty Two Lac) only for the **entire lease period of 40 years** at the rate of Rs. 80,000/- (Eighty Thousand) only per annum.

3. That the Lessor shall issue valid receipt for the rents received by the Lessor from the Lessee.



4. That the Lessee shall occupy and use the said land absolutely at its sweet discretion for any commercial venture, industry, agriculture or non- agricultural purposes such as cultivation, horticulture, forestry, business, trade and/or for other purposes as the Lessee may deem fit and proper and the Lessor shall have no right whatsoever to interface with regards to the use of the demised land.

*Sweta Jalan
Rajesh Kumar Jalan*

Manglam Distillers & Bottling Industries

Rajesh Kumar Jalan
Partner

Snowfall Commercial Private Limited
Rajesh Kumar Jalan
Director

ANNEXURE – II (CONT.)

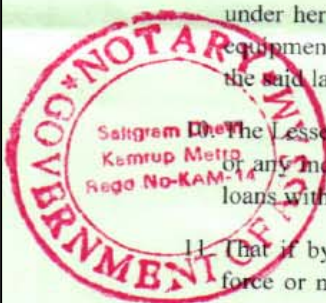
5. That the lessee shall be solely liable for the payment of electricity bills in connection with the power consumed in the land and the proposed factory during the entire period of the lease as per the bills raised by the Energy and power Department, Government of Sikkim.
6. That the Lessee shall bear all the expenses towards water charges, sanitation charges as per the bills raised by the concerned authority for the lease period.
7. That the Lessee shall be at liberty to insure the premises and properties as demised at its own cost, if so desires.
8. That the Lessee shall be entitled to transfer, assign, lien or mortgage its lease right onto the said land to any financial institution, scheduled bank, or any individual without written consent from the Lessor.
9. That the Lessee can alter/modify the demised land within its four corners as per its requirements and it shall at all times be entitled to apply for and obtain own electricity, water, telephone, telex and other utilities and services at the demised land and it shall also be at liberty to construct or build houses, tenements, sheds, passage, drains, electrification, boundary wall, place of worship, whatsoever thereon at its own cost without any written consent from the Lessor or any other person claiming under her directly or indirectly and to fix and to set up plant and machinery, tools, equipments, fixtures, fittings, laying of wire, conduits and pipes underneath or over the said land as lessee shall think fit and proper.
10. The Lessee shall have right to obtain loan from scheduled bank, financial institutions or any individual by mortgaging the lease right of the land as security against such loans without any written consent from the Lessor.
11. That if by fire, tempest, flood or landslide or riot or violence or other irresistible force or natural calamities, the said land or part thereof is destroyed / damaged or rendered unfit the lessee can restore or build, construct the whole and or part thereof as the case may be at its own cost and the Lessor shall have no right to raise any kind of objection.
12. All taxes and other outgoing in respect of the said land upto the date of completion of the registration of the Deed of Lease shall be paid by the lessor.
13. That the lease rent shall be exclusive of the future taxes, assessments, dues, levies and cesses payable in respect to the said land and the plant, the building or buildings constructed thereon, to the government or the municipal corporation or any other local authority or public body and which taxes etc., will be payable by the lessee as and when they become due and payable.
14. That the cost by way of stamp duty and registration charges in respect of the Deed of Lease shall be borne by the Lessee.

Sangeeta Jalan

Surinder Kumar Jaisan

Sangeeta Jalan

Sweta Jalan
Jayesh Kumar Jalan



Saligram Chetra
NOTARY, GOVT OF SIKKIM
Kamrup (Metro) Guwahati
Regd No-KAM-14

Manglam Distillers & Bottling Industries
Pratish

Snowfall Commercial Private Limited
Pratish
Director.

ANNEXURE – II (CONT.)

15. That the Lessee shall keep the premises in such condition so as not to endanger human life and property.
16. That the lessee shall keep the premises in good and healthy condition and shall maintain the neatness and cleanliness so as not to cause nuisance or danger or harm to any person or persons living the vicinity of the demised premises.
17. That in the event of earlier determination of this lease on the part of the Lessor, the Lessor shall make good to the Lessee all the rent paid by the Lessee and shall also make arrangement for an alternate land and bear all the cost of setting new structures or factory or shifting of the existing structure/ factory to the new land so arranged. The Lessor shall also be liable to compensate the Lessee for the losses suffered by the Lessee.
18. That during the period of lease the Lessor shall not interfere with the Lessee in connection with the demised land and the running of the commercial venture or the factory and its business and shall extend all co-operation as and when the same is sought by the lessee.
19. That by virtue of this Lease Deed it shall be construed that the Lessee shall not require any no objection certificate from the Lessor for any purpose and it shall be construed that the Lessor has no objection to all the lawful acts the Lessee may do or plan to do in the demised land. However as and when demanded the Lessor shall give No Objection Certificate to the Lessee for any lawful purposes such as obtaining electricity construction, water connection, sanitation work, all the civil work to be carried out in the land, to procure licenses from the concerned authorities etc.
20. That the Lessee, paying the rent hereby the rent reserved and observing and performing the conditions of the covenants shall quietly and peacefully hold, possess, run and enjoy the above said demised land during the said term without any interference, disturbance and interruption by the lessor or any person claiming under him.

Sanjay Kumar Jalen

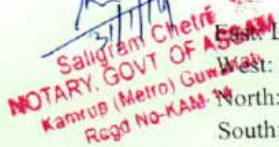
Smruti Kumar Jalen
Sangeeta Jalen

Sweta Jalen
Sanjeev Kumar Jalen



SCHEDULE OF THE LAND

All that piece and parcel of land measuring more or less 23 Bighas, 3 Katha, 15 Lechas, covered by Dag No. 160, 161, 154, 151, 155, 150, 156 and 157, comprised in K.P. No. 306, 248, 94, 75, 237, 317, 211 and 168 respectively, situated at Revenue Village- Pacahria Dalarpathar, Mouza- Pub Bongsor in the District of Kamrup, Assam and butted and bounded as under.



- East: Land of Dag No. 166, 158, 159, 163 and 164
- West: Land of Dag No. 149, 152, 153 and 656.
- North: Land of Dag No. 111.
- South: Land of Dag No. 153.

Manglam Distillers & Bottling Industries
Reesanti
Partner

Snowfall Commercial Private Limited
Reesanti
Director

ANNEXURE – II (CONT.)

IN WITNESS WHEREOF the parties hereto have set and subscribed their respective hands the day, month and the year herein above mentioned.

- 1. Sweta Jalan
- 2. Rajesh Kumar Jalan
- 3. Suman Kumar Jalan
- 4. Sangeeta Jalan.
- 5. Sanjay Kumar Jalan.

Snowfall Commercial Private Limited

Manglam Distillers & Bottling Industries

Partner



Director.

LESSORS

LESSEE

WITNESSES:-

Pawan Shama
Late Mohanlal Shama.
Lord Enclave.
Laxmi Nagar.
GUWANATI

2. Sajjan Agarwalla
70 Lote Durga Bazar Agarwalla
Fancy Bazar
Guwanati

Identified by
Anil K. Prasad
Advocate.

Saligram Chetri
NOTARY, GOVT OF ASSAM
Kamrup (Metro) Guwanati
Regd No-KAM-14

ANNEXURE – IV

NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) (2009)

[भाग III—खण्ड 4]		भारत का राजपत्र : असाधारण			3
NATIONAL AMBIENT AIR QUALITY STANDARDS CENTRAL POLLUTION CONTROL BOARD NOTIFICATION New Delhi, the 18th November, 2009					
No. B-29016/20/90/PCI-I.—In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevention and Control of Pollution) Act, 1981 (Act No.14 of 1981), and in supersession of the Notification No(s). S.O. 384(E), dated 11 th April, 1994 and S.O. 935(E), dated 14 th October, 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards with immediate effect, namely:-					
NATIONAL AMBIENT AIR QUALITY STANDARDS					
S. No.	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Other Area	Ecologically Sensitive Area (notified by Central Government)	Methods of Measurement
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur Dioxide (SO ₂), µg/m ³	Annual* 24 hours**	50 80	20 80	- Improved West and Gaeke -Ultraviolet fluorescence
2	Nitrogen Dioxide (NO ₂), µg/m ³	Annual* 24 hours**	40 80	30 80	- Modified Jacob & Hochheiser (Na-Arsenite) - Chemiluminescence
3	Particulate Matter (size less than 10µm) or PM ₁₀ µg/m ³	Annual* 24 hours**	60 100	60 100	- Gravimetric - TOEM - Beta attenuation
4	Particulate Matter (size less than 2.5µm) or PM _{2.5} µg/m ³	Annual* 24 hours**	40 60	40 60	- Gravimetric - TOEM - Beta attenuation
5	Ozone (O ₃) µg/m ³	8 hours** 1 hour**	100 180	100 180	- UV photometric - Chemiluminescence - Chemical Method
6	Lead (Pb) µg/m ³	Annual* 24 hours**	0.50 1.0	0.50 1.0	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter
7	Carbon Monoxide (CO) mg/m ³	8 hours** 1 hour**	02 04	02 04	- Non Dispersive Infra Red (NDIR) spectroscopy
8	Ammonia (NH ₃) µg/m ³	Annual* 24 hours**	100 400	100 400	-Chemiluminescence -Indophenol blue method

ANNEXURE – IV (CONT.)

THE GAZETTE OF INDIA : EXTRAORDINARY					
					[PART III—SEC. 4]
(1)	(2)	(3)	(4)	(5)	(6)
9	Benzene (C ₆ H ₆) µg/m ³	Annual*	05	05	- Gas chromatography based continuous analyzer - Adsorption and Desorption followed by GC analysis
0	Benzo(a)Pyrene (BaP) - particulate phase only, ng/m ³	Annual*	01	01	- Solvent extraction followed by HPLC/GC analysis
1	Arsenic (As), ng/m ³	Annual*	06	06	- AAS /ICP method after sampling on EPM 2000 or equivalent filter paper
2	Nickel (Ni), ng/m ³	Annual*	20	20	- AAS /ICP method after sampling on EPM 2000 or equivalent filter paper

* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Note. — Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

SANT PRASAD GAUTAM, Chairman
[ADVT-III/4/184/09/Exty.]

Note: The notifications on National Ambient Air Quality Standards were published by the Central Pollution Control Board in the Gazette of India, Extraordinary vide notification No(s). S.O. 384(E), dated 11th April, 1994 and S.O. 935(E), dated 14th October, 1998.

ANNEXURE – V

INDIAN STANDARDS/SPECIFICATIONS FOR DRINKING WATER IS: 10500-1991

SR NO.	SUBSTANCES OR CHARACTERISTICS MAX	REQUIREMENT (DESIRABLE LIMIT)	UNDESIRABLE EFFECTS OUTSIDE THE DESIRABLE LIMIT	PERMISSIBLE LIMIT IN ABSENCE OF ALTERNATE SOURCE	METHOD OF TEST CI REF OF IS: 3025	REMARKS
ESSENTIAL CHARACTERISTICS						
1	Colour, Hazen unit	5	Above this, consumer acceptance decreases	25	4 of 3025, 1983	Extended upto 25 only if toxic substances are not suspected in absence of alternate Source.
2	Odour		Unobjectionable	-	5 of 3025, 1983	a. Test cold and when heated b. Test at several dilutions
3	Taste		Agreeable	-	-	Test to be conducted only after safety has been established
4	Turbidity, NTU	5	Above this, consumer acceptance decreases	10	8	Test to be conducted only after safety has been established
5	pH Value	6.5-8.5	Beyond this range the water will affect the mucous membrane and/or water supply system	No relaxation	8	-
6	Total Hardness mg/L (as CaCO ₃)	300	Encrustation on water supply structure and adverse effects on domestic use	600	-	-
7	Iron (as Fe), mg/L	0.3	Beyond this limit,, taste/appearance are affected has adverse effect on domestic uses and water supply structures & promotes iron bacteria	1.0	32 of 3025, 1964	-
8	Chlorides (as Cl ⁻) mg/L	250	Beyond this limit taste, corrosion and palatability are affected	1000	32 of 3025	-
9	Residual free chlorine, mg/L	0.2	-	-	26 of 3025, 1986	To be applicable only when water is chlorinated tested at consumer end, when protection against viral infection is required it should be min 0.5 mg/L

ANNEXURE – V (CONT.)

SR NO.	SUBSTANCES OR CHARACTERISTICS MAX	REQUIREMENT (DESIRABLE LIMIT)	UNDESIRABLE EFFECTS OUTSIDE THE DESIRABLE LIMIT	PERMISSIBLE LIMIT IN ABSENCE OF ALTERNATE SOURCE	METHOD OF TEST CI REF OF IS: 3025	REMARKS
DESIRABLE CHARACTERISTICS						
10	Dissolved Solids, mg/L	500	Beyond this palatability decrease and may cause gastrointestinal irritation	2000	16 of 3025	
11	Calcium (as Ca) mg/L	75	-	200	40 of 3025, 1984	
12	Copper (as Cu), mg/L	0.05	Astringent, taste discoloration of pipes, fittings and utensils will be caused beyond this	1.5	36 of 3025, 1964	
13	Manganese (as Mn), mg/L	0.1	Astringent, taste discoloration of pipes, fittings and utensils will be caused beyond this	0.3	35 of 3025, 1964	
14	Sulphate (as SO_4^{2-}), mg/L	200	Beyond this causes gastrointestinal irritation when magnesium or sodium are present	400	24 of 3025, 1986	May be extended upto 400 provided (as Mg) does not exceed 30 mg/l
15	Nitrate (as NO_3^-), mg/L	45	Beyond this methaemoglobinemia	100	-	-
16	Fluoride (as F^-), mg/L	1.0	Fluoride may be kept as low as possible. High fluoride may cause fluorosis	1.5	23 of 3025, 1964	-
17	Phenolic substances mg/L (as $\text{C}_6\text{H}_5\text{OH}$)	0.001	Beyond this, it may cause objectionable taste and odour	0.002	54 of 3025	
18	Mercury (as Hg), mg/L	0.01	Beyond this, the water becomes toxic	No relaxation	See note mercury ion analyzer	To be tested when pollution is suspected
19	Cadmium (as Cd), mg/L	0.01	Beyond this the water becomes toxic	No relaxation	See note mercury ion analyser	To be tested when pollution is suspected
20	Selenium (as Se) mg/L	0.01	Beyond this the water becomes toxic	No relaxation	28 of 3025, 1964	To be tested when pollution is suspected
21	Arsenic (As), mg/L	0.05	Beyond this the water becomes toxic	No relaxation	37 of 3025, 1988	To be tested when pollution is suspected

ANNEXURE – V (CONT.)

SR NO.	SUBSTANCES OR CHARACTERISTICS MAX	REQUIREMENT (DESIRABLE LIMIT)	UNDESIRABLE EFFECTS OUT-SIDE THE DESIRABLE LIMIT	PERMISSIBLE LIMIT IN ABSENCE OF ALTERNATE SOURCE	METHOD OF TEST CI REF OF IS: 3025	REMARKS
22	Cyanide (CN), mg/L	0.05	Beyond this the water becomes toxic	No relaxation	27 of 3025, 1986	To be tested when pollution is suspected
23	Lead (Pb), mg/L	0.05	Beyond this the water becomes toxic	No relaxation	See note 86	To be tested when pollution plumbosolvency is suspected
24	Zinc (as Zn), mg/L	5	Beyond this limit it can cause astringent taste and an opalescence in water	15	39 of 3025,1964	To be tested when pollution is suspected
25	Anionic detergents mg/L (as MBAS)	0.2	Beyond this limit undesirable taste and odour after Chlorination takes place	1.0	Methylene blue extraction method	To be tested when pollution is suspected
26	Chromium (as Cr ⁺⁶), mg/L	0.01	May be carcinogenic above this limit	0.05	28 of 3025	To be tested when pollution is suspected
27	Polynuclear aromatic hydrocarbons, mg/L	-	May be carcinogenic	-	28 of 3025,1964	To be tested when pollution is suspected
28	Mineral Oil, mg/L	0.01	Beyond this limit undesirable taste and odour after Chlorination takes place	0.03	Gas chromatographic method	To be tested when pollution is suspected
29	Pesticides mg/L	Absent	Toxic	0.001	58 of 3025, 1964	-
30	Radioactive materials a. Alpha emitters Bq/L b. Beta emitters pci/L	- -	- -	0.1 1.0	- -	- -
31	Alkalinity (as CaCO ₃), mg/L	200	Beyond this limit taste becomes unpleasant	600	13 of 3025,1964	-
32	Aluminum (as Al), mg/L	0.03	Cumulative effect is reported to cause dementia	0.2	31 of 3025,1964	-
33	Boron (as B), mg/L	1	-	5	29 of 3025,1964	-

Note: Atomic absorption spectrophotometric method may be used.

ANNEXURE – VI

CLASSIFICATION OF INLAND SURFACE WATER (CPCB STANDARDS)

SR NO.	CHARACTERISTICS	A [@]	B [@]	C [@]	D [@]	E [@]
1	Dissolved Oxygen (mg/L), Min	6	5	4	4	-
2	Biochemical Oxygen Demand (mg/L), Min	2	3	3	-	-
3	Total Coliform Organisms, MPN/100 ml, Max.	50	500	5000	-	-
4	Total Dissolved Solids (mg/L), Max	500	-	1500	-	2100
5	Chlorides (as Cl ⁻), mg/L, Max.	250	-	600	-	600
6	Colour, Hazen units, Max	10	300	300	-	-
7	Sodium absorption ratio, Max	-	-	-	-	26
8	Boron (as B), mg/L, Max	-	-	-	-	2
9	Sulphates (as SO ₄ ⁻²), mg/L, Max.	400	-	400	-	1000
10	Nitrates (as NO ₃ ⁻), mg/L, Max	20	-	50	-	-
11	Free Ammonia (as N), mg/L, Max	-	-	-	1.2	-
12	Conductivity at 25°C, micromhos/cm, Max	-	-	-	1.0	2.25
13	pH value	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.0-8.0
14.	Arsenic (as As), mg/L, Max	0.05	0.2	0.2	-	-
15	Iron (as Fe), mg/L, Max	0.3	-	50	-	-
16	Fluorides (as F), mg/L, Max	1.5	1.5	1.5	-	-
17	Lead (as Pb), mg/L, Max	0.1	-	0.1	-	-
18	Copper (as Cu), mg/L, Max	1.5	-	1.5	-	-
19	Zinc (as Zn), mg/L, Max	15	-	15	-	-

Note: If the Coliform count is found to be more than the prescribed tolerance limits, the criteria for coliforms shall be satisfied if not more than 20 percent of samples show more than the tolerance limits specified, and not more than 5 percent of samples show values more than 4 times the tolerance limit. Further, the faecal coliform should not be more than 20 percent of the coliform.

A[@] Drinking water surface Without conventional treatment but after disinfection

B[@] Outdoor bathing (organized)

C[@] Drinking water source with conventional treatment followed by disinfection

D[@] Propagation of wild life, fisheries

E[@] Irrigation, industrial, cooling, controlled waste disposal

ANNEXURE – VII

CPCB RECOMMENDATIONS FOR COMMUNITY NOISE EXPOSURE (1989)

CATEGORY OF AREA	Leq (dBA) (DAYTIME) (0600 TO 2100 HRS)	Ldn (dBA) (NIGHT TIME) (2100 TO 0600 HRS)
Industrial Area	75	70
Commercial Area	65	55
Residential Area	55	45
Silence Zone	50	40

ANNEXURE – VIII**DAMAGE RISK CRITERIA FOR HEARING LOSS OCCUPATIONAL SAFETY& HEALTH ADMINISTRATION (OSHA)**

MAXIMUM ALLOWABLE DURATION PER DAY (HOURS)	NOISE LEVEL (SLOW RESPONSE) dBA
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or Less	115

ANNEXURE – IX

LIST OF FLORA IN THE STUDY AREA

SR. NO.	SCIENTIFIC NAME	FAMILY	VERNACULAR NAME
Gymnosperms			
1/1	<i>Podocarpus neriifolia</i>	Podocarpaceae	-
1/2	<i>Gnetum gnemon</i>	Gnetaceae	Khasi Pine
1/3	<i>Gnetum montanum</i>	Gnetaceae	Belinjau
Angiosperms			
2/1	<i>Magnolia sp.</i>	Magnoliaceae	-
2/2	<i>Alseodaphne Rugosa</i>	Lauraceae	-
2/3	<i>Litsea sp.</i>	Lauraceae	-
2/4	<i>Michelia sp</i>	Magnoliaceae	-
Bamboos			
3/1	<i>Bambusa vulgaris</i>	Poaceae	-
3/2	<i>Bambusa multiplex</i>	Poaceae	-
3/3	<i>Bambusa textilis</i>	Poaceae	Wever's Bamboo
Cane			
4/1	<i>Calamus floribundus</i>	Arecaceae	-
4/2	<i>Calamus latifolius</i>	Arecaceae	-
Medicinal Plant			
5/1	<i>Curcuma aromatica</i>	Zingiberaceae	Wild turmeric
5/2	<i>Embllica officinalis</i>	Phyllanthaceae	-
5/3	<i>Terminalia arjuna (Roxb.)</i>	Combretaceae	-
5/4	<i>Terminalia bellirica</i>	Combretaceae	Bahira
5/5	<i>Syzygium cumini</i>	Myrtaceae	Jambul
5/6	<i>Garcinia cambogia</i>	Clusiaceae	-
5/7	<i>Holarrhena antidysenterica</i>	Apocynaceae	Kutaja
5/8	<i>Hydnocarpus kurzii</i>	Flacourtiaceae	-
5/9	<i>Litsea cubeba</i>	Lauraceae	-
5/10	<i>Ocimum sanctum</i>	Lamiaceae	Tulsi
5/11	<i>Phlogacanthus thyriflorus</i>	Acanthaceae	Ram Basak
5/12	<i>Saraca indica</i>	Caesalpiniaceae	Ashoka tree
5/13	<i>Wedelia calendulacea</i>	Asteraceae	-
5/14	<i>Zingiber officinale</i>	Zingiberaceae	Ada
5/15	<i>Adina cordifloia</i>	Rubiaceae	Karam
5/16	<i>Aegle marmelos</i>	Rutaceae	Bel
5/17	<i>Albizzia amara</i>	Mimosaceae	-
5/18	<i>Albizzia procera, Benth.</i>	Fabaceae	Safed-siris
5/19	<i>Aloe vera</i>	Liliaceae	-
5/20	<i>Artocarpus lakoocha</i>	Moraceae	Badhar
5/21	<i>Azadiracta indica</i>	Meliaceae	Neem
5/22	<i>Barringtonia racemosa</i>	Lecythidaceae	-

ANNEXURE – IX (CONT.)

SR. NO.	SCIENTIFIC NAME	FAMILY	VERNACULAR NAME
5/23	<i>Bauhinia blakeana</i>	Fabaceae	Kachnar
5/24	<i>Bauhinia purpurea</i>	Fabaceae	Kachnar
5/25	<i>Butea monosperma</i>	Papilionaceae	Dhak
5/26	<i>Calotropis procera (Ait.) R.Br</i>	Aaclepiadaceae	Akado
5/27	<i>Camellia sinensis</i>	Theaceae	Chai (tea)
5/28	<i>Carex fuscifrutus</i>	Cyperaceae	Herb
5/29	<i>Eucalyptus sp.</i>	Myrtaceae	Nilgari
5/30	<i>Artocarpus heterophyllus</i>	Moraceae	Jackfruit
5/31	<i>Cassia fistula</i>	Fabaceae	Gulmohar
5/32	<i>Cassia siamea</i>	Leguminosae	Chakundi
5/33	<i>Ficus bengalensis</i>	Moraceae	Barh
5/34	<i>Hevea brasiliensis</i>	Euphorbiaceae	Rubber
5/35	<i>Madhuca longifolia</i>	Sapotaceae	Mahua
5/36	<i>Melia azedarach</i>	Meliaceae	Bakain
5/37	<i>Thespesia populnea</i>	Malvaceae	Portia Tree
5/38	<i>Thuja occidentalis</i>	Cupressaceae	Thuja
5/39	<i>Tinospora cordifolia</i>	Menispermaceae	Giloy
5/40	<i>Pongamia pinnata (L.) Pierre</i>	Leguminosae	Karanj
5/41	<i>Ricinus communis L.</i>	Euphorbiaceae	Devalo
5/42	<i>Inga dulcis</i>	Fabaceae	Jagal jalebi
5/43	<i>Zizyphus jujuba</i>	Rhamnaceae	Ber
5/44	<i>Colocasia esculenta</i>	Araceae	Taro
5/45	<i>Jatropha curcas</i>	Euphorbiaceae	Ratanjot
5/46	<i>Mimosa pudica</i>	Fabaceae	Touch-me-not
5/47	<i>Musa acuminata</i>	Musaceae	Banana
5/48	<i>Ananas comosus</i>	Bromeliaceae	Pineapple
5/49	<i>Carica papaya L.</i>	Caricaceae	Papaya
Timber			
6/1	<i>Anogesis latifolia</i>	Combretaceae	Axlewood
6/2	<i>Anthocephalus cadamba (Roxb.) Samama</i> Miq.	Rubiaceae	Kadamb
6/3	<i>Bombax ceiba</i>	Malvaceae	Semal
6/4	<i>Shorea robusta</i>	Dipterocarpaceae	Sal
6/5	<i>Syzygium cumini</i>	Myrtaceae	Jamun
6/6	<i>Tamarindus indicum L.</i>	Myrsinaceae	Aqli
6/7	<i>Tectona grandis</i>	Verbenaceae	Teak
6/8	<i>Toona ciliata</i>	Meliaceae	Red cidar
6/9	<i>Dulbergia sissoo</i>	Fabaceae	Shisham
6/10	<i>Ficus carica</i>	Moraceae	Dumar/Fig
6/11	<i>Ficus glomerata, Roxb.</i>	Moraceae	Gular

ANNEXURE – IX (CONT.)

SR. NO.	SCIENTIFIC NAME	FAMILY	VERNACULAR NAME
6/12	<i>Ficus infectoria, Roxb.</i>	Moraceae	Pakar
6/13	<i>Ficus religiosa</i>	Moraceae	Pipal
Flowering			
7/1	<i>Hibiscus rosa sinensis</i>	Malvaceae	Chinarose
7/2	<i>Lantana camara</i>	Verbenaceae	Lantana
7/3	<i>Plumeria rubra</i>	Apocynaceae	Champo
7/4	<i>Schleichera oleosa</i>	Sapindaceae	Kusum
Cactus			
8/1	<i>Carnegiea gigantea</i>	Cactaceae	-
8/2	<i>Cereus hexagonus</i>	Cactaceae	-
8/3	<i>Myrtillocactus geometrizans</i>	Cactaceae	Blue candle
Aquatic Plants			
9/1	<i>Sagittaria latifolia</i>	Alismataceae	-
9/2	<i>Ceratophyllum demersum</i>	Ceratophyllaceae	-
9/3	<i>Ipomea aquatica</i>	Convolvulaceae	-
9/4	<i>Hydrilla verticillata</i>	Hydrocharitaceae	-
9/5	<i>Lemna mino</i>	Lemnaceae	-
9/6	<i>Utricularia gibba</i>	Lentibulariaceae	-
9/7	<i>Ludwigia aquarium</i>	Onagraceae	-
9/8	<i>Potamogeton crispus</i>	Potamogetonaceae	-
9/9	<i>P. pectinatus</i>	Potamogetonaceae	-
9/10	<i>Eichhornia crassipes</i>	Pontederiaceae	-

ANNEXURE – X

LIST OF FAUNA IN THE STUDY AREA

OLD COMMON NAME	NEW COMMON NAME	SCIENTIFIC NAME	DIST.
I ORDER: FALCONIFORMES			
Family: Accipitridae (vulture, Sparrow hawk, Eagle, Harrier, Kite and Vulture)			
Shikra	Shikra	<i>Accipiter badius</i>	R
Black-winged Kite	Black-winged Kite	<i>Elanus caeruleus</i>	R
II. ORDER: : CICONIIFORMES			
Family: Ardeidae (heron, Egret, Bittern)			
Cattle Egret	Cattle Egret	<i>Bubulcus ibis</i>	R
Median or Smaller Egret	Intermediate Egret	<i>Mesophoyx intermedia</i> <i>Egretta intermedia</i>	R
Pond Heron	Indian Pond-Heron	<i>Ardeola grayii</i>	R
Family: Charadriidae (Plover, Stilt, Oystercatcher, Lapwing, Avocet)			
Red-wattled Lapwing	Red-wattled Lapwing	<i>Vanellus indicus</i>	R
V ORDER: COLUMBIFORMES			
Family: Columbidae (Pigeon, Dove)			
Blue Rock Pigeon	Rock Pigeon	<i>Columba livia</i>	R
Ring Dove	Eurasian Collared-Dove	<i>Streptopelia decaocto</i>	R
Spotted Dove	Spotted Dove	<i>Streptopelia chinensis</i>	R
III : ORDER: CORACIFORMES			
Family: Dacelonidae (Kingfishers)			
White breasted Kingfisher	White-throated Kingfisher	<i>Halcyon smyrnensis</i>	R
Family: Coraciidae (Roller)			
BlueJay or Roller	Indian Roller	<i>Coracias benghalensis</i>	
IV. ORDER: CUCULIFORMES			
Family: Centropodidae (Cocucal)			
Crow-Pheasant or Coucal	Greater Coucal	<i>Centropus sinensis</i>	R
Family: Cuculidae (cuckoo, Koel)			
Koel	Asian Koel	<i>Eudynamys scolopacea</i>	R
Indian Drongo Cuckoo	Drongo Cuckoo	<i>Surniculus lugubris</i>	R
V. ORDER: GRUIFORMES			
Family: Rallidae (Waterhen, coot, crake water cock, Moorhen, Rail)			
White-breasted Water hen	White-breasted Water hen	<i>Amaurornis phoenicurus</i>	R
VI. ORDER: PASSERIFORMES			
Family: Corvidae			
Large Cuckoo-shrike	Large Cuckoo-shrike	<i>Coracina macei</i> <i>Coracina novaehollandiae</i>	R
Raven	Common Raven	<i>Corvus corax</i>	R
House Crow	House Crow	<i>Corvus splendens</i>	R

ANNEXURE – X (CONT.)

OLD COMMON NAME	NEW COMMON NAME	SCIENTIFIC NAME	DIST.
King Crow	Black Drongo	<i>Dicrurus macrocercus</i> <i>Dicrurus adsimilis</i>	R
Family: Laniidae (shrike)			
Grey Shrike	Northern Shrike	<i>Lanius excubitor</i>	R
Family: Muscicapidae (Short wing, Chat, Robin, Shama)			
Indian Robin	Indian Robin	<i>Saxicoloides fulicata</i>	R
Pied Bushchat	Pied Bushchat	<i>Saxicola caprata</i>	R
Family: Passeridae (Avadavat, Pipit, Wagtail, Munia, Snowfinch, sparrow, weaver ,Accentor)			
House Sparrow	House Sparrow	<i>Passer domesticus</i>	R
Family: Pycnonotidae (Bulbul)			
Red-whiskered Bulbul	Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>	R
Red-vented Bulbul	Red-vented Bulbul	<i>Pycnonotus cafer</i>	R
Family: Sturnidae (Myna, Starling)			
Bank Myna	Bank Myna	<i>Acridotheres ginginianus</i>	R
Indian Myna	Common Myna	<i>Acridotheres tristis</i>	R
Family: Sylviidae (Warbler, Browning, Fulvetta, Babbler, Laughing thrash, Tailor birds)			
Jungle Babbler	Jungle Babbler	<i>Turdoides striatus</i>	R
Sibia	<i>Beautiful Sibia</i>	<i>Heterophasia pulchella</i>	R
VII. ORDER: PSITTACIFORMES			
Family: Psittacidae (Parrot and Parakeet)			
Rose-ringed Parakeet	Rose-ringed Parakeet	<i>Psittacula krameri</i>	R

Note: **R** = Widespread Resident, **r** = Very Local Resident, **W** = Widespread Winter Visitor, **w** = Sparse Winter Visitor, **RW** = Resident and winter visitor as per the distribution given in WCMC, Check list of Indian Birds

LIST OF THE BUTTERFLY IN THE STUDY AREA

SR. NO.	SCIENTIFIC NAME	COMMON NAME	FAMILY
1.	<i>Papilio polytes</i>	Common Mormon	Papilionidae
2.	<i>Eurema hecabe</i>	Common Grass yellow	Pieridae
3.	<i>Ixias Marianne</i>	White orange tip	Pieridae
4.	<i>Neophasia menapia</i>	Pine butterfly	Pieridae
5.	<i>Pieris rapae</i>	Cabbage white butterfly	Pieridae
6.	<i>Danaus genutia Cramer</i>	Stripped Tiger	Nymphalidae
7.	<i>Hypolimanas misippus</i>	Danaid egg fly	Nymphalidae
8.	<i>Mycalesis perseus</i>	Common bush brown	Nymphalidae
9.	<i>Heliconius melpomene cythera</i>	Postman Butterfly	Nymphalidae
10.	<i>Glaucopsyche lygdamus palosverdesensis</i>	Palos Verdes Blue	Lycaenidae

ANNEXURE – X (CONT.)

LISTS OF THE AMPHIBIAN AND REPTILE

SR. NO.	SCIENTIFIC NAME	COMMON NAME
Amphibians		
1.	<i>Bufo marinus</i>	Cane Toad
2.	<i>Hyla arborea</i>	Tree Frog
Reptiles		
1.	<i>Calotes versicolor (Daudin)</i>	Common garden lizard
2.	<i>Ptyas mucosus (Linn.)</i>	Common rat snake
3.	<i>Storeria occipitomaculata</i>	* Red-bellied Snake
4.	<i>Varanus bengalensis (Daudin)</i>	* Common Indian monitor
5.	<i>Hemidactylus flaviviridis (Ruppell)</i>	House Gecko
6.	<i>Sitana ponticeriana (Cuvier)</i>	Fan-Throated Lizard
7.	<i>Naja naja (Linn.)</i>	* Indian Cobra
8.	<i>Daboia russelii (Shaw and Nodder)</i>	* Russell's Viper
9.	<i>Bungarus caeruleus (Schneider)</i>	* Common Indian Krait

* Not sighted but included as per the secondary information.

LISTS OF THE WILD MAMMALS

SR. NO.	SCIENTIFIC NAME	COMMON NAME	FAMILY
MAMMALS IN THE CORE ZONE			
1.	<i>Sigmodon hispidus</i>	Cotton rat	-
2.	<i>Funambulus pennanii</i>	Five striped Palm squirrel	-
3.	<i>Mus booduga</i>	Indian field mouse	-
MAMMALS IN THE STUDY AREA			
1.	<i>Mus booduga (Gray)</i>	Indian field mouse	-
2.	<i>Lepus sp.</i>	Hare	-
3.	<i>Funambulus pennanii (Wroughton)</i>	Five striped Palm squirrel	-
4.	<i>Bubalus bubalis</i>	Water buffalo	-
5.	<i>Macaca mulatta</i>	Rhesus macaque	-

ANNEXURE – XI

QUESTIONNAIRE FOR SOCIOECONOMIC STUDIES

Questionnaire for Baseline Socio-Economic Survey

Questionnaire No _____

A. Background Information

Town _____ Ward _____ Locality _____

Street _____ HH No. _____ Socio-Economic Status _____

B. Demographic Information

1. Name of the Respondent _____

2. Name of the Head of the Household _____

3. Duration of stay _____ months/years

4. Household Composition

Age Group	Married Male	Married Female	Unmarried Male	Unmarried Female	Widower	Widow	Total
0-14 years							
15-44 years							
45-64 years							
65+ years							
Total							

5. Family Type: 1 Joint 2 Nuclear 3 Other (Specify).....

6. Religious Group: 1 Hindu 2 Muslim 3 Sikh 4 Christian 5 Buddhist 6 Jain
7 Other (Specify).....

7. If Hindu, Social Stratification: 1 SC 2 ST 3 OBC 4 General

8. Literacy

Group	Illiterate	Just Literate	Completed Primary	Completed Secondary	Higher Secondary	Graduate	Post Graduate	Other Professional	Total
Adult Male									
Adult Female									
Children									

9. Monthly Family Income (in Rs)

Agriculture	Service	Business	Labor	Professional	Any other	Total

10. Consumption Pattern (Kindly indicate expenditure on different items in the past year)

SN	Particulars/Source	Expenditure (Rs) Monthly
A	Food	
B	Cooking Fuel	
C	Electric	
D	Rent	
E	Tax	
F	Water	
G	Clothing	
H	Health	
I	Education	
J	Communication	
K	Travel	
L	Addiction	
M	Social functions	
N	Agriculture (such as seeds, hiring of farm implements etc.)	
O	Others (Specify)	
Grand Total		

ANNEXURE – XI (CONT.)

QUESTIONNAIRE FOR SOCIOECONOMIC STUDIES

C. Housing		
11. Nature of housing	1. Individual 2. Flats 3. Row housing	
12. Ownership of house	1. Own 2. Rented 3. Others (Specify)	
13. If on rent, the rent per month		Rs.
14. House type	1. Kutcha 2. Semi-pucca 3. Pucca	
15. Does any other Family (With separate kitchen) stay with you in this house?	1. Yes 2. No	
D. Infrastructural Services		
Water		
16. What is your primary source of water supply?	1. House connection 2. Public stand post 3. Neighbour's house 4. Municipal tanker 5. Private vendor 6. Own hand pump 7. Public hand pump 8. Own dug well 9. Public dug well 10. Own pond 11. Public pond 12. Others (Specify)	
17. If answer is 1; Do you have a water meter for house connection?	1. Yes 2. No	
18. What other sources of water is used in the household?	1. House connection 2. Public stand post 3. Neighbour's house 4. Municipal tanker 5. Private vendor 6. Own hand pump 7. Public hand pump 8. Own dug well 9. Public dug well 10. Own pond 11. Public pond 12. Others (Specify)	
Sanitation		
19. If you have a latrine in the house, type of it?	1. Pour flush 2. Twin pit latrine 3. Dry/bucket latrine 4. None	
Electricity		
20. Do you have electric connection in your house?	1. Yes 2. No	
21. If yes, do you have electric meter?	1. Yes 2. No	
E. Health		
22. Has any household member suffered from any illness in the last six month?	1. Yes 2. No If yes, How many suffered and how long?	
23. How many days of work were lost because of these illnesses in the last month?	1. None 2. Less than 5 days 3. 5-10 days 4. 11-20 days 5. More than 20 days	
24. What was the total cost of treatment for these illnesses?		Rs.
25. Has there been any death in the family in the last year?	1. Yes, child U-5 2. Yes, other 3. No	
26. If yes, probable cause of death		
27. What treatment facilities are available in the area?		
F. Perception and Priorities		
28. What is your opinion regarding setting up an industry in your locality?	1. Good 2. Neutral 3. Bad	
29. Do you think that this project/industry will be beneficial for you?	1. Yes 2. No 3. Do not know	
30. If yes, how?		
31. If no, why?		
32. Do you think that this project/industry will give you better earning opportunity?	1. Yes 2. No 3. Do not know	
33. Do you have any idea about environmental pollution?	1. Yes 2. No 3. Do not know	
34. If yes, what is the idea?		
35. Have you ever experienced problem from environmental pollution?	1. Yes 2. No 3. Do not know	
36. If yes, what was that?		
37. Do you believe that the new industrial project may cause any sort of pollution?	1. Yes 2. No 3. Do not know	
38. If yes, what and how?		
39. What is your suggestion for overcoming that?		

ANNEXURE – XI (CONT.)**QUESTIONNAIRE FOR SOCIOECONOMIC STUDIES****40. Possession (Please tick the ones which the family owns):**

- * Television
- * Air conditioner/Air cooler
- * Refrigerator
- * Water purifier
- * Telephone
- * Cell phone
- * Fax
- * Bicycle
- * Motorbike/scooter/moped
- * Car
- * Computer
- * Washing machine
- * Music system
- * Other assets, specify.....

Full name of Investigator_____

Full name of Supervisor_____