DRAFT ENVIRONMENT IMPACT ASSESSMENT REPORT

ROPOSED 45 KLPD MOLASSES/SUGARCANE JUICE BASED DISTILLERY/ETHANOL PLANT & 20.5 MW COGENERATION PLANT

Amdapur, Tal. & Dist. Parbhani, Maharashtra

Proposed by

Shree Laxmi Narshinha Sugars LLP

Environment Consultant

MITCON Consultancy & Engineering Services Ltd., Pune
Environment Management and Engineering Division
QCI-NABET Accredited Consultant Accreditation No. NABET/EIA/1720/RA0075
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EME/CS/SLNSLLP/2020-21/101ROO dated 18.05.2020

DECLARATION

Proposed 45 KLPD Molasses/sugarcane Juice based & 20.5 MW Cogeneration Power Plant
Amdapur, Tal. & Dist. Parbhani, Maharashtra

DECLARATION BY EXPERTS INVOLVED IN PREPARATION OF EIA REPORT

I, hereby certify that I was a part of the EIA team in the following capacity that developed the above EIA.

EIA Coordinator
Signature & Date: Sep 2019

Name : **Dr. Hemangi Nalavade**
Period of involvement : Sep 2019 to till date
Contact information : MITCON Consultancy and Engineering Services Ltd.
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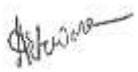
Functional Area Experts

Sr. No.	Name of expert	Functional Area	Involvement (Period & Task)	Signature & Date
1.	Dr. Sandeep Jadhav	EB,LU & SC	**Oct 2019** to till date, Interpretation of primary data and analysis of results and predicting impacts and providing mitigation measures. Analysis of soil interpretation of results. Impact predictions and suggesting of mitigation	
2.	Mr. Shrikant Kakade	EB	**Oct 2019** to till date to till date Field visit for study of flora and fauna in the 10 km area, study of rare endangers species. Primary data collection. Interpretation of primary data and analysis of results and predicting impacts and providing mitigation measures.	

Sr. No.	Name of expert	Functional Area	Involvement (Period & Task)	Signature & Date
3.	Dr. Hemangi N. Nalavade	AQ, AP, WP & SHW	**Oct 2019** to till date Baseline survey & preparation of EIA EMP. Air quality modeling for prediction of air pollution impact due to proposed project using ISCST-3 model. Computed the maximum GLC of pollutant over baseline environmental parameter. Identification for hazardous solid waste. Prediction of the	
4.	Mr. Ganesh Khamgal	SE	**Oct 2019** to till date Data collection, interpretation and impact assessment, suggestion to CSR activities	
5.	Pratik Deshpande	HG	**Oct 2019** Review and observation of hydrology and geology in the 10 km radius of the project area, data collection and interpretation; identification of impact and formulation of EMP	
6.	Mr. Aniket Taware	RH	**Oct 2019** to till date Assisting in Risk assessment and its report preparation	
7.	Mr. Nikhil Chavan	Noise Pollution	**Oct 2019** Identification of air pollution sources and impact assessment and mitigation measures.	

Declaration by the Head of the Accredited Consultant Organization

I, Dr. Sandeep Jadhav (Executive Vice President & Head, EME Division) hereby, confirm that the above mentioned experts involved in Environmental Impact Assessment of Proposed 45 KLPD Molasses/sugarcane Juice based & 20.5 MW Cogeneration Power Plant at Amdapur, Tal. & Dist. Parbhani, Maharashtra

I also confirm that I shall be fully accountable for any mis-leading information mentioned in this statement

Signature: 

Name Dr. Sandeep Jadhav
Designation Executive Vice President & Head, EME Division
EIA Consultant Organization MITCON Consultancy and Engineering Services Ltd

CONTENTS

CHAPTER I: INTRODUCTION

1.1 Purpose of the report

Shree Laxmi Narshinha Sugars LLP (SLNSLLP) has proposed new Distillery of capacity 45 KLPD. Considering the developments taking place in the field of ethanol and new Government policies favouring to increase the production of ethanol, SLNSLLP has decided to install latest technology for treatment of distillery spent wash i.e. biomethanation followed by standalone multiple effect evaporation followed by bio composting as a final treatment. The high-pressure steam generated in the boiler will run a Turbine to generate power thus saving in purchase cost of power. SLNSLLP will use Final molasses/B-Heavy molasses/ sugarcane juice in the same facility without any modification for ethanol production as per the Government new initiatives to promote ethanol production form B-heavy molasses/Sugarcane juice.

As per EIA notification 2006 and its amendment thereof, project requires environmental clearance and it is fall under Cat 'B' (<100 KLPD molasses based Distillery.) will be apprised at SEAC-SEIAA Maharashtra.

1.2 Identification of project and project proponent

Shree Laxmi Narshinha Sugars LLP (SLNSLLP), is located at Amdapur, Post. Singnapur. Tal. & Dist. Parbhani, 431402, recently operating was 2500 TCD and the first crushing season was conducted in the year 2017-2018.

Considering the developments taking place in the field of ethanol supply to Oil Companies and the increasing sugar stock in the country, the management of SLNSLLP has decided to install a modern distillery unit with MPR Distillation & MSDH to produce ethanol along with Biomethanation followed by multi effect evaporator followed by bio composting to achieve 'Zero Liquid Discharge' (ZLD) as per the norms of pollution control board.

Shree Laxmi narsinha Sugars LLP (SLNSLLP) is private limited companies vide registration no. IEM-43/STA/IMO/2011 under KM from company act 1956.

Board of directors of the factories are given below,

Sr. No.	Name and Address	Designation	Profession
1.	Mrs. Anuradha Rajendra Nagawade	Partner	Business
2.	Shri. Sanjay Dhankawade	Partner	Business
3.	Shri. Pramod Narharrao Jadhav	Partner	Business

To make the venture commercially viable and financially profitable, factory management have decide to install 45 KLPD distillery plant.

1.3 EIA Consultant

MITCON Consultancy and Engineering Services Ltd., (MITCON) is a rapidly growing, an ISO 9001-2015 certified Consultancy Company, promoted by ICICI, IDBI, IFCI, and State Corporations of Maharashtra and Public Commercial Banks. It was founded in 1982; with Head Office at Pune and with supporting offices spread over entire country including Mumbai, Delhi, Bangalore, Hyderabad, Chennai, Chandigarh, and Ahmadabad etc. With experience, expertise and track record developed over last almost three decades, MITCON provides diverse range of macro and micro consultancy services in the areas of Environment Management and Engineering (EME), Energy Efficiency, Biomass and Co-gen power, Agricultural Business and Bio-technology, Infrastructure, Market Research, Banking Finance and Securitization, Micro Enterprise Development, IT Training and Education. EME division of MITCON serves to various sectors like – GIS & RS, solid waste, infrastructure, power, sugar, engineering, chemical, real estate etc.

MITCON Consultancy and Engineering Services Ltd. is accredited from National Accreditation Board for Education and Training (NABET), Quality Council of India for the EIA consultancy services in 16 sectors.

1.4 Brief description of the project

SLNSLLP is currently operating 2500 TCD sugar and proposes 45 KLPD Distillery and 20.5 MW cogeneration power Plant. Based on availability of own molasses and due to increasing demand of Alcohol and current favourable Ethanol Blending Policy by government of India, SLNSLLP management has decided to install 45 KLPD distillery unit to produce rectified spirit or fuel ethanol.

1.4.1 Nature and size of the project

Size of the project is 45 KLPD Molasses/sugarcane juice based Distillery and 20.5 MW cogeneration power plant. As per EIA notification 2006 and its amendment thereof, project requires environmental clearance and it is fall under Cat 'B' (<100 KLPD molasses based Distillery.)

1.5 Project location

The proposed distillery location will be at Amdapur, and Post. Singnapur. Tal. & Dist. Parbhani. Present Sugar unit is geographically located at Lat 19°10'27.03"N & Long 76°45'55.14"Eat 422 m MSL.

The land requirement for proposed industry unit is already in possession. Proposed project will be within existing factory premises. Project site is connected to Parbhani-Gangakhed state highway 4.36 km away in W direction and adjacent Singnapur- Amadapur road 1.21 in in SW. Nearest town Pabhani 10 km in North. There are no Eco-sensitive zones like Tropical Forest, Biosphere Reserve, National Park, Wild Life Sanctuary, and Coral Formation Reserves within 10 km Influence Zone. River Godavari is flowing at a distance of 13.0 km in S and Purna River at 17.5 km in NE.

1.6 Importance to country region

The Government of India has announced a favorable policy for these projects, which includes mandatory mixing of ethanol from present 5% to 10% in next three years & up-to 20% thereafter, enhanced rate for selling ethanol to the petroleum companies.

1.7 Applicable Environmental Acts & Rules

As per the notification, proposed project falls under Activity 5 (j) and 5 (g) cat. A. The following are the some other acts and rules related to environment which will be applicable for the proposed project

- EIA Notification dated 14th September, 2006 and its sub sequent amendments. In addition to the above mentioned acts and rules, some of the rules which are of importance in context with this assignment include
- The Batteries (Management and Handling) Rules, 2001 & amendment rules 2010
- The Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules, 2000
- Hazardous and Other Wastes (Management and Trans boundary Movement) Rules, 2016
- Solid Waste Management Rules, 2016
- E-Waste Management Rules 2016
- E-Waste (Management & Handling) Rules, 2011

1.8 Chronology of the project

The chronology of the activities during initial stages of the environmental clearance work for the proposed project is given below

Table 1.1 : Chronology of the environmental clearance process

Sr. No.	Particulars	Date
1.	TOR Application	18.01.2020
2.	ToR granted	179th SEAC meeting dated 20.01.2020
3.	Baseline Monitoring	Oct- Dec 2019

1.9 Objective and scope of study

The proposed project was approved ToR in 179th SEAC meeting dated 20.01.2020. The baseline studies required for EIA report has been conducted as per the Office Memorandum issued by MoEF&CC dated 27.08.2017. Detail baseline study was undertaken during the month of Dec 2019 to Feb 2020. The objective of the study is to carry out Environmental Impact Assessment (EIA) for the proposed project, to meet the environmental compliances laid down by the Ministry of Environment and Forests (MoEFCC), Government of India.

1.9.1 The steps of EIA

- Collection of baseline data on water, air, noise, biological & socio-economic status, existing roads and railway lines, water bodies and ecological sensitive areas in the project region.
- Identification of potential impacts on various environmental components due to activities envisaged during preconstruction, construction, and operational phases of the proposed developments.
- Prediction and evaluation of significant impacts on the major environmental components.
- Preparation of environmental impact assessment statement based on identification, prediction, and evaluation of impacts.
- De-lineation of Environmental Management Plan (EMP) outlining preventive and control strategies for minimizing adverse environmental impacts.

With above view to assess the environmental impacts arising due to proposed project, the project proponent appointed MITCON Consultancy & Engineering Services Ltd., Pune to undertake Environmental Impact Assessment and prepare a detailed environmental management plan to mitigate the adverse impacts. The baseline data collected in pre monsoon season for air, noise, water, land, biological and socio-economic environment and presented in this report.

Draft EIA report has been prepared in accordance with the Standard TOR issued and as per the generic structure of the EIA mentioned in EIA notification dated 14th September 2006 and its subsequent amendments.

CHAPTER II: PROJECT DESCRIPTION

2.1 Type of Project

Proposed project is of new 45 KLPD Molasses/sugarcane juice based Distillery and 20.5 MW cogeneration power plant. As per EIA notification 2006 and its amendment thereof, project requires environmental clearance and it is fall under Cat 'B', Cogeneration activity-1(d) Category "B" and Distillery activity-5(g) (All molasses ≤100 KLPD based on distillery).

Shree Laxmi Narshinha Sugars LLP (SLNSLLP) is located at Amdapur, Post. Singnapur. Tal. & Dist. Parbhani, 431402 and recently operating 2500 TCD sugar. The first crushing season was conducted in the year 2017-2018.

Considering the development taking place in the field of ethanol supply to Oil Companies and the increasing sugar stock in the country, the management of SLNSLLP has decided to install a modern distillery unit with MPR Distillation & MSDH to produce ethanol along with Biomethanation followed by multi effect evaporator followed by bio composting to achieve 'Zero Liquid Discharge' (ZLD) as per the norms of pollution control board.

2.2 Need of the project

- The demand for Industrial alcohol, potable alcohol and fuel ethanol is increasing. Government of India is also planning to mix 10% fuel ethanol on petrol, once the 5% blending programme is implemented successfully.
- Also, Ethyl Alcohol is an important feedstock for the manufacture of chemicals. These chemicals are primarily the basic carbon based products like Acetic Acid, Ethyl acetates, Butanol, Butadiene, Acetic Anhydride, Vinyl Acetate, PVC etc.
- The different important chemicals that could be made from alcohol are acetic acid & butanol, which are needed in pharmaceuticals, paints & in many other areas are important industries as they are value added products.
- With latest technological development & taking into account the increasing cost of petrochemical raw material, it is now possible to produce Ethylene oxide, Mono-ethylene glycol etc. starting from ethanol.
- There is good market for Extra Neutral Alcohol for manufacture of good quality perfumes, homeopathic medicines, tonics and other pharmaceutical products and potable liquor.
- Fuel ethanol has a great future as renewable source of energy. The latest trend for a fuel in the world is use of fuel ethanol as an alternative for mineral fuel oil, which is depleting as far as fuel oil is concerned.
- Fuel-ethanol could be used in petrol as oxygenate. This reduces emission of carbon monoxide in the exhaust gases of vehicles, by taking combustion to completion. It is

necessary and advisable to reduce emission of carbon monoxide because it is toxic to human beings. Completion of combustion also reduces emission of particulate carbon matter, which could cause respiratory disorders. Oxygenate has 'in-built' oxygen molecule which helps in completing combustion in a better manner. Oxygenates are organic compounds having boiling point in the vicinity of the boiling point range of petrol. These compounds mix easily and thoroughly with petrol.

- Anhydrous alcohol is water free ethyl alcohol. The anhydrous alcohol denatured with 0.5 % Kerosene was used to blend with petrol in the production of power alcohol of 20 % alcohol and 80 % petrol composition. Power alcohol act made it compulsory to supply only such mixtures at certain places known as power alcohol zone.
- World ethanol production has increased at a steady rate in the last few years. In 2018, there was a production of 108.32 billion liters of fuel ethanol with the US accounting for about 60.80 billion litres (56.12 %) of this production followed by Brazil at 30.77 billion liters (28.41 %). About 85 % of the total ethanol produced was used for blending into petrol and only a small quantity was used for drinking and other purposes. Many countries from Asia, Africa, and Europe & South America are now entering into ethanol production and it's blending with petrol.
- Growth in export of alcohol is impressive during last decade. The policy of Central Government is to increase percentage of ethanol blending with petrol from the present 10% to 20% by the year 2022 as stated by Hon. Prime Minister of India, Mr. Narendra Modi.
- Therefore, it is important for all distilleries in the country to increase its ethanol production to meet the increasing demand. The technical performance of the SLNSLLP is extremely good. All efforts are made to increase the recovery and reduce losses of sugar. Based on availability of own molasses and due to increasing demand of alcohol, SLNSLLP management has decided to install 45 KLPD distillery unit to produce rectified spirit/ENA or fuel ethanol. Distillery will be based on the latest technology of Continuous/Fed-batch fermentation and multipressure distillation with standalone multiple effect evaporation & Molecular Sieve Dehydration system to produce Rectified spirit or Fuel (ethanol) alcohol.

(Source DPR given by client)

2.3 Project Location

The proposed distillery location will be at Amdapur, and Post. Singnapur. Tal. & Dist. Parbhani in the existing sugar factory premises. Proposed Distillery will be geographically located at Lat. 19°10'32.07"N & Long. 76°45'46.21"E 422 m MSL.

The land requirement for proposed industry unit is already in possession. Proposed project will be within existing factory premises. Project site is connected to Parbhani-Gangakhed

state highway 4.36 km away in W direction and adjacent Singnapur- Amadapur road 1.21 in in SW. Nearest town Parbhani 10 km in North. There are no Eco-sensitive zones like Tropical Forest, Biosphere Reserve, National Park, Wild Life Sanctuary, and Coral Formation Reserves within 10 km Influence Zone. River Godavari is flowing at a distance of 13.0 km in S and Purna River at 17.5 km in NE.

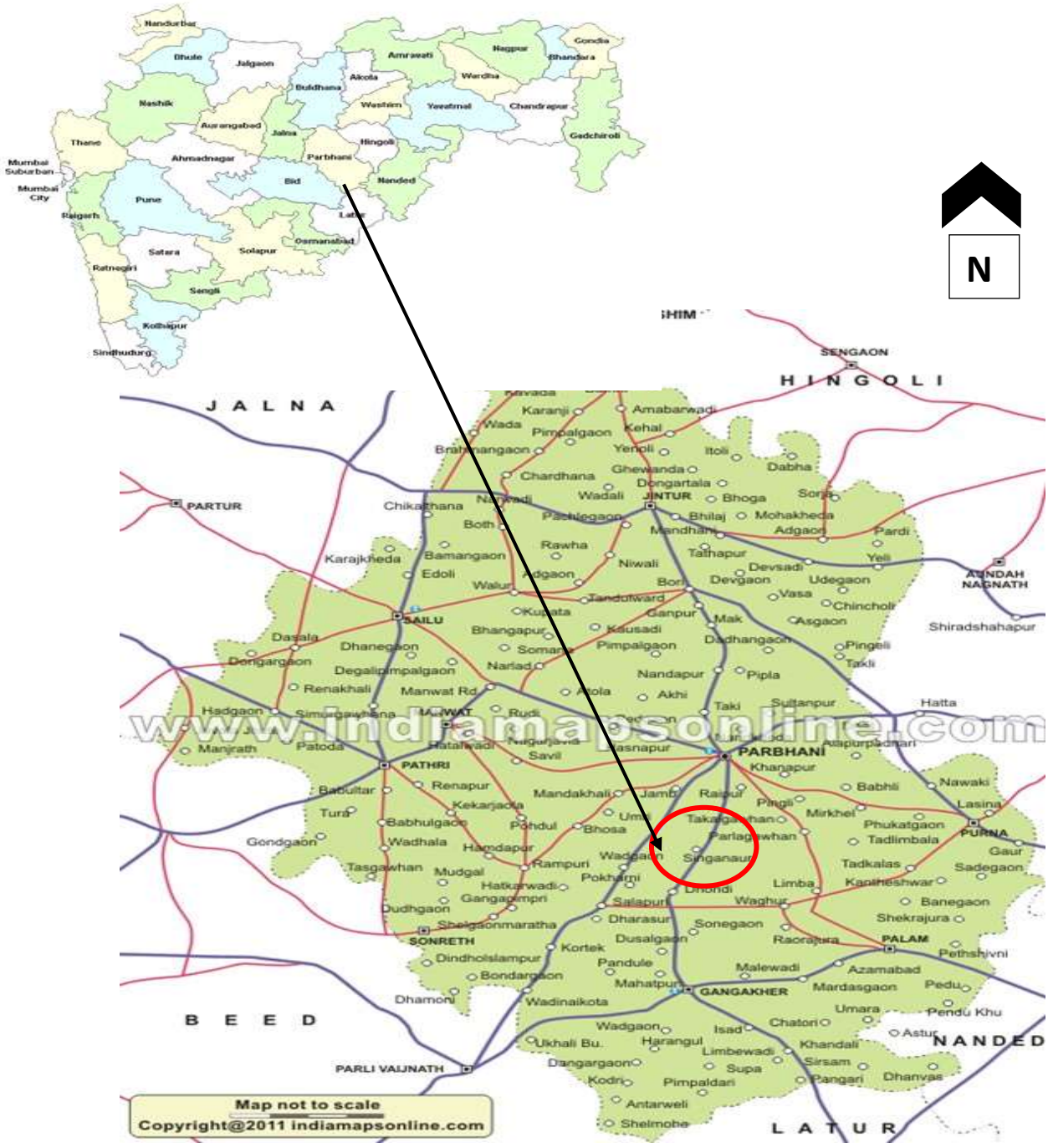


Figure 2.1: Map showing general location of the proposed project

Figure 2.2: Map showing general location of the proposed project

1. 19°10'36.36"N, 76°45'56.10"E
2. 19°10'31.90"N, 76°46'14.29"E
3. 19°10'21.75"N, 76°46'11.40"E
4. 19°10'19.42"N, 76°46'8.18" E
5. 19°10'18.48"N, 76°46'1.60"E
6. 19°10'16.92"N, 76°46'4.78"E
7. 19°10'12.70"N, 76°46'6.96"E
8. 19°10'15.23"N, 76°46'2.58"E
9. 19°10'10.65"N, 76°46'5.02" E
10. 19°10'11.91"N, 76°45'59.96"E
11. 19°10'11.65"N, 76°45'55.56"E
12. 19°10'11.31"N, 76°45'48.52"E
13. 19°10'16.59"N 76°45'43.98"E
14. 19°10'15.95"N, 76°45'39.59"E
15. 19°10'19.92"N, 76°45'39.47"E
16. 19°10'21.97"N, 76°45'40.71"E
17. 19°10'25.32"N, 76°45'44.94"E
18. 19°10'27.37"N, 76°45'37.91"E
19. 19°10'36.91"N, 76°45'42.93"E
20. 19°10'31.12"N, 76°45'53.98"E

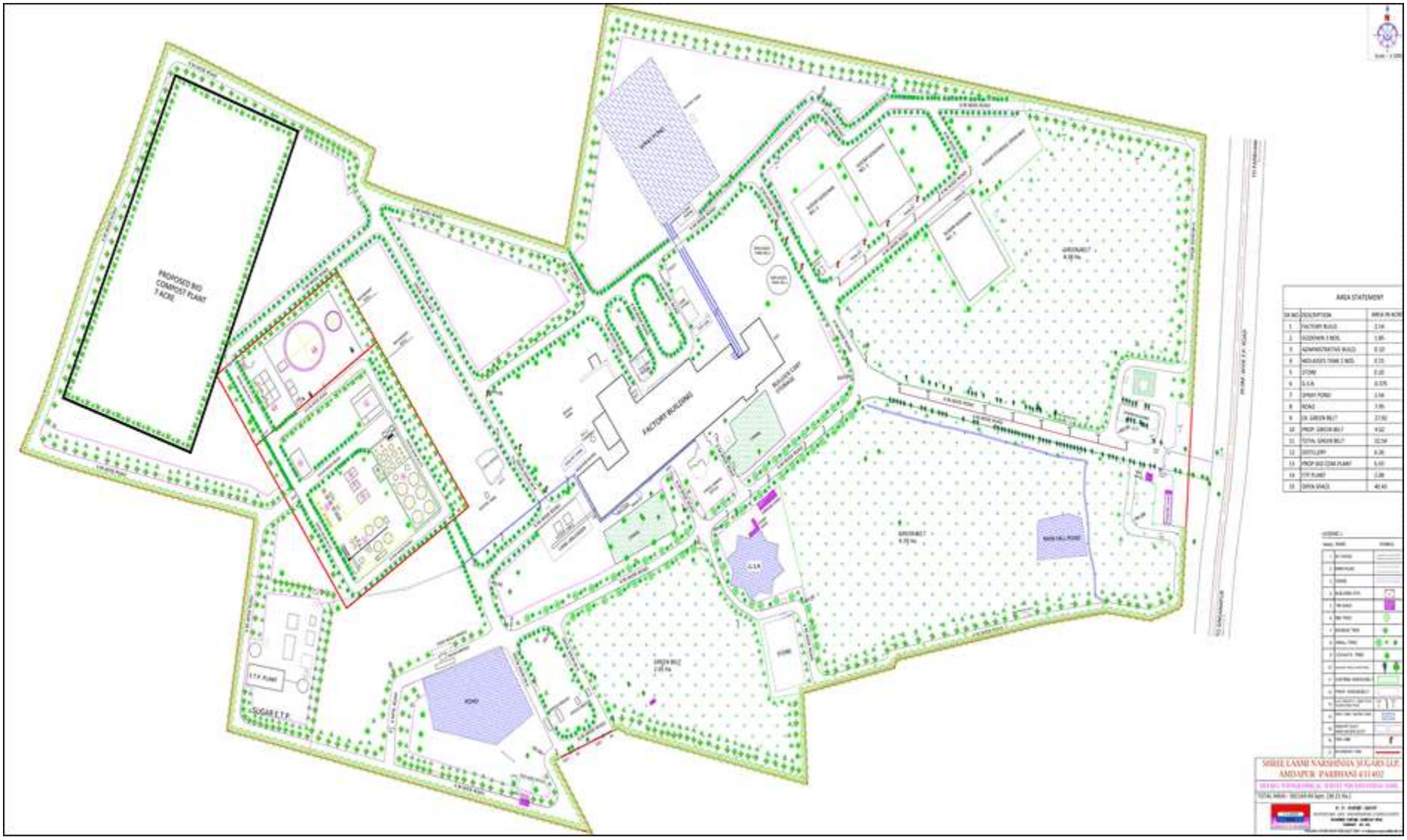


Figure 2.3: Plant Layout

Figure 2.4: Existing factory photographs

2.4 Land Details

The total area available with the factory is 70.96 acres out of that total 23.5 acres will developed under green belt.

Detailed area breakup is given below,

Total plot area 102.44 acres

Sugar factory built up area: 9.0 acres

Open space: 40.43 acres

Road area: 7.95 acres

Distillery: 13.19 acres

Existing green belt: 27.9 acres

Proposed greenbelt: 6 acres

2.5 Size and Magnitude of the Operation

The brief information of proposed expansion of integrated project details of sugar, distillery and cogeneration are given in Table 2.2.

Table 2.1 : Salient features of integrated project

#	Particulate	Description
1.	Project	Proposed 45 KLPD Molasses/Sugarcane Juice based Distillery/ Ethanol plant & 20.5 MW Cogeneration Plant of Shree Laxmi Narsinha Sugars LLP
2.	Product	Distillery: ENA/RS/AA/Ethanol of 45 KLPD (One at a time) Cogeneration: Proposed 20.5 MW
3.	Existing 2500 TCD Sugar (TPD) (13% on cane)	325
	Bagasse (TPD) (30%)	750
	Press mud (TPD) (4.0%)	100
	Molasses (TPD) (4.5%)	112.5
	B heavy molasses (6.5%) (TPD)	162.5
4.	Operation days	Sugar factory season: 160 days Cogeneration : 160 days, Distillery: Total 270 days
5.	Molasses requirement	Molasses generation(B-heavy) 162.5 TPD Sugarcane juice 800-1000 MTD **OR** Final molasses 166 TPD/ B-heavy molasses- 140 TPD
6.	Sugarcane juice (MTD) from Sugar cane 1000 TCD to	800-1000

	Ethanol production in season	
7.	Water requirement	Total fresh water for 45 KLPD Distillery 390 CMD
8.	Source of water	Own rainwater harvesting Tank of capacity 180000 CMD
9.	Boiler	**Existing Sugar** Existing boiler 2X32 TPH with T.G 2.5 MW power generation **Proposed 45 KLPD Distillery** Boiler 15 TPH **Proposed Cogeneration** Boiler 90 TPH with 18.0 MW TG Hence total Power generation at a time during season will be 20.5 MW
10.	TG	TG : 2.5 MW and 18.0 MW
11.	DG	Proposed 250 KVAX1
12.	Fuel	Bagasse : 950 TPD Biogas:15000 CMD
13.	Steam	Total steam requirement for project 13.19 TPH
14.	Total effluent generation	Sugar: 242 m^3/d Domestic: 13 Molasses based distillery: 880 m^3/d (spent wash, spent lees, condensate).
15.	Ash	• Existing Sugar Unit : Bagasse ash generation: 4.2 TPD • Proposed Bagasse ash generation: 20 TPD
16.	ETP sludge	The sludge from primary clarifies, settling tank and secondary clarifier will be sent to sludge drying beds. Sludge will be dried in natural heat of sunlight. The dried cakes will be can be utilized for as manure or in composting.
17.	Air pollution control measures	Proposed: Electrostatic precipitator for 90 TPH Cogen Boiler with 65 m stack Proposed Stack height: 45 m AGL for 15 TPH Distillery boiler with Existing Sugar boiler stack height: 40 M AGL with Wet Scrubber
18.	Man-power	Existing manpower: Permanent staff (skilled) 150 and Contract(unskilled) 170 For proposed project Skilled 40 and unskilled 77
19.	Total project cost	Sugar expansion: Rs 115.84 Cr
20.	EMP capital cost	Total Rs.~ 8.3 Cr
21.	CER Cost	Rs.1.7 Cr.

Environment Sensitivity		
22.	Nearest Village	Amdapur 1.4 km South
23.	Nearest Town / City	Parbhani 10 km in North
24.	Nearest National Highway	Parbhani-Gangakhed state highway 4.36 km in W and Singnapur- Amadapur road 1.21 in in SW
25.	Nearest Railway station	Singnapur : 3.0 km in West Parbhani : 9.0 km in North
26.	Nearest Airport	Shri. Guru Gobind Singhji Airport 60.0 km in East
27.	National Parks, Reserved Forests (RF) / Protected Forests (PF), Wildlife Sanctuaries, Biosphere Reserves, Tiger/ Elephant Reserves, Wildlife Corridors etc. within 10 km radius	No any in within 10 km of project area
28.	River / Water Body (within 10 km radius)	Water Canal 0.53 km in SE direction River Godavari is flowing at a distance of 13.0 km in S and Purna River at 17.5 km in NE.

2.5.1 Technical details of existing Sugar Factory

Table 2.2 : Design and operational details of sugar factory

Sr. No.	Design Parameters	Total
1.	Crushing capacity TPD	2500
2.	Number of crushing days/year (expected)	160
3.	Molasses(B) generation TPD	162.5
4.	Press mud Generation	100
5.	Boiler used TPH	2X32 TPH
6.	Steam generation from boiler, TPH	55
7.	Power generation capacity	2.5
8.	Power consumption, MW	
9.	For sugar plant	5.2
10.	Power plant auxiliaries, lighting	1.3
11.	Total	7.7
12.	Bagasse (at 30 % in cane) generation TPD	750
13.	Final disposal of treated effluent	
14.	Ash generation from existing plant TPD	20
15.	Final disposal of Ash	As is mixed with Press mud and utilized to make Bio-compost

Table 2.3 : Bagasse balance

Sr. No.	Particulates	Existing
1.	Bagasse Generation (TPD) (at 30 % in cane)	750
2.	Total Bagasse required as fuel for boiler	950
3.	Procured Bagasse TPD	200*

*Factory management proposed Sugar expansion in future, so there will not be Bagasse deficit.

Table 2.4 : Power Balance

Power Balance	
T.G set	2.5 MW + 18.0 MW
Power Generation from TG set	20.5
Captive Power Consumption (Season : Sugar + Cogeneration)	**20.5**
Off Season Distillery boiler	**2.5**
Existing	
For sugar plant	5.2
Power plant auxiliaries, lighting	1.3
Proposed Distillery	1.5
Power export	12.5 MW

2.5.2 Technical details of Distillery

Table 2.5 : Design and operational parameters of distillery

Sr. No.	Description	Proposed
1.	Sugar factory crushing capacity (TCD)	2500
2.	Distillery capacity (KLPD)	45
3.	No. of days of operation of distillery	270
4.	No. of hrs. per day	24
5.	No. of season days, sugar factory	160
6.	B Molasses % on cane (6.5 %)	162.5
7.	Molasses available after diverting B-Heavy molasses @160 day (MTD)	162.5
8.	Distillery operation during season by using cane juice in MTD or	800-1000
9.	Total molasses required per annum MTA	45000
10.	Total Molasses generation during season MTA	26000
11.	Procured molasses during off season	19000
12.	Ethanol recovery for one liters / MT of final molasses	250
13.	Fermentable Sugar	45-55
14.	Spent-wash generation per CMD of RS (Designed capacity)	450
15.	Total conc. spent wash generation (CMD)	70

2.6 Resource Requirement

2.6.1 Raw material

Raw material required is given below,

Table 2.6 Raw Material details

Sr. No.	Raw material	Existing	Storage	Source	Mode of Transport	Distance
1.	Sugarcane (TPD)	2500	Cane yard	Field	Trucks, tractor	50 km
2.	Sugarcane juice (TPD at 60 Brix) during season or	800-1000	Online utilization	Field	Through pipeline	-
3.	Molasses available after diverting B-Heavy molasses @ 160 day (MTD) (6.5%)	162.5	Steel Tank	Own Factory	Through. Pipeline	-
4.	F-Molasses (TPD) off season	166.0	Steel Tank	Own Factory	Through. Pipeline	~ Within 60-80 km
5.	Lime (TPD)	6.00	Godown	-do-	Truck	~100 km
6.	Sulphur(TPD)	1.8	Godown	-do-	Truck	~100 km
7.	Hydrochloric acid kg/day	11.25	Carboys	-do-	Tanker	~100 km
8.	Phosphoric acid kg/d	38	carboys	-do-	Truck	~100 km
9.	Lubricant Oil L/d	112	drums	-do-	Truck	~100 km

Table 2.7 : Storage tank details

Sr. No.	Material	Storage capacity
1.	Water	1,80,000 CMD
2.	Molasses	Storage tanks (2No.) of 4500 X 2 Proposed one MS tank of 10000 MTX 1
3.	Bagasse	Existing 3.0 acres For proposed expansion 5.0 acres
4.	Press mud	Press mud and Bio-compost yard 11 acres
5.	Proposed Coal	Shed of area 20 X 25 m
6.	Ash	Propose 2 silo – 1days Exiting ash pits Ash handling system will be provided
7.	Spent wash storage	Proposed -Storage lagoon 4500 CUM
8.	Alcohol	Rectified spirit receivers:50 m^3X3
		Impure spirit receivers:10 m^3X3
		Rectified spirit storage tank 600 m^3 X2
		Impure spirit storage tank 200 m^3X1

Sr. No.	Material	Storage capacity
		Fusel oil storage tank 10 m3 X1
9.	Other raw material storage	20 x 25 m. Shade proposed area

2.6.2 Fuel requirement

Bagasse will be used for 90 TPH Cogeneration boiler and 15 TPH Distillery Boiler. HSD diesel will be used in D.G sets (Existing 500 kVA) in case of power shut down or emergency. Fuel consumption details are given in below Table.

Table 2.8 : Fuel consumption

Sr. No	Fuel	Proposed
1.	Bagasse (Season) TPD	950
2.	Biogas	15000 CMD
3.	HSD per annum KL	10 KL
4.	Bagasse GCV	2,100 kcal/ Kg.
5.	Biogas GCV	5000 kcal/kg

2.6.3 Manpower

During construction phase 50 - 70 skilled and un-skilled labors will be required. Local labors will be engaged during construction phase. During operation phase around 117 skilled and unskilled employees will be needed. Existing sugar factory is having permanent staff 150 and contact staff 170.

2.6.4 Water

The total fresh requirement for the proposed project is 390 CMD which will sourced from own rainwater harvesting pond of total capacity 180000 CMD. Domestic water need will be 5 CMD. Existing Sugar unit is utilizing 270 CMD daily fresh water. Detail water requirement bifurcation is given below,

Table 2.9 : Total water requirement for proposed project

Description	Quantities
Initial water requirement	1137
Recycle water (CMD)	752
Fresh water (CMD)	385
Domestic	5

Table 2.10 : Effluent generation from Existing sugar and cogeneration unit

Effluent Source	Existing 2500 TCD
Spray pond overflow	100
Cooling tower, Boiler blow down	32
DM reject	10
Cleaning, leakages	100
Total	**242**
From domestic	12
Total	**254**

Table 2.11 : Effluent generation from distillery Unit

Effluent Source	45 KLPD molasses based CMD
Process condensate	320
Spent less	90
Spent wash	400
Cooling tower and boiler blow down	16.5
Total	**826.5**

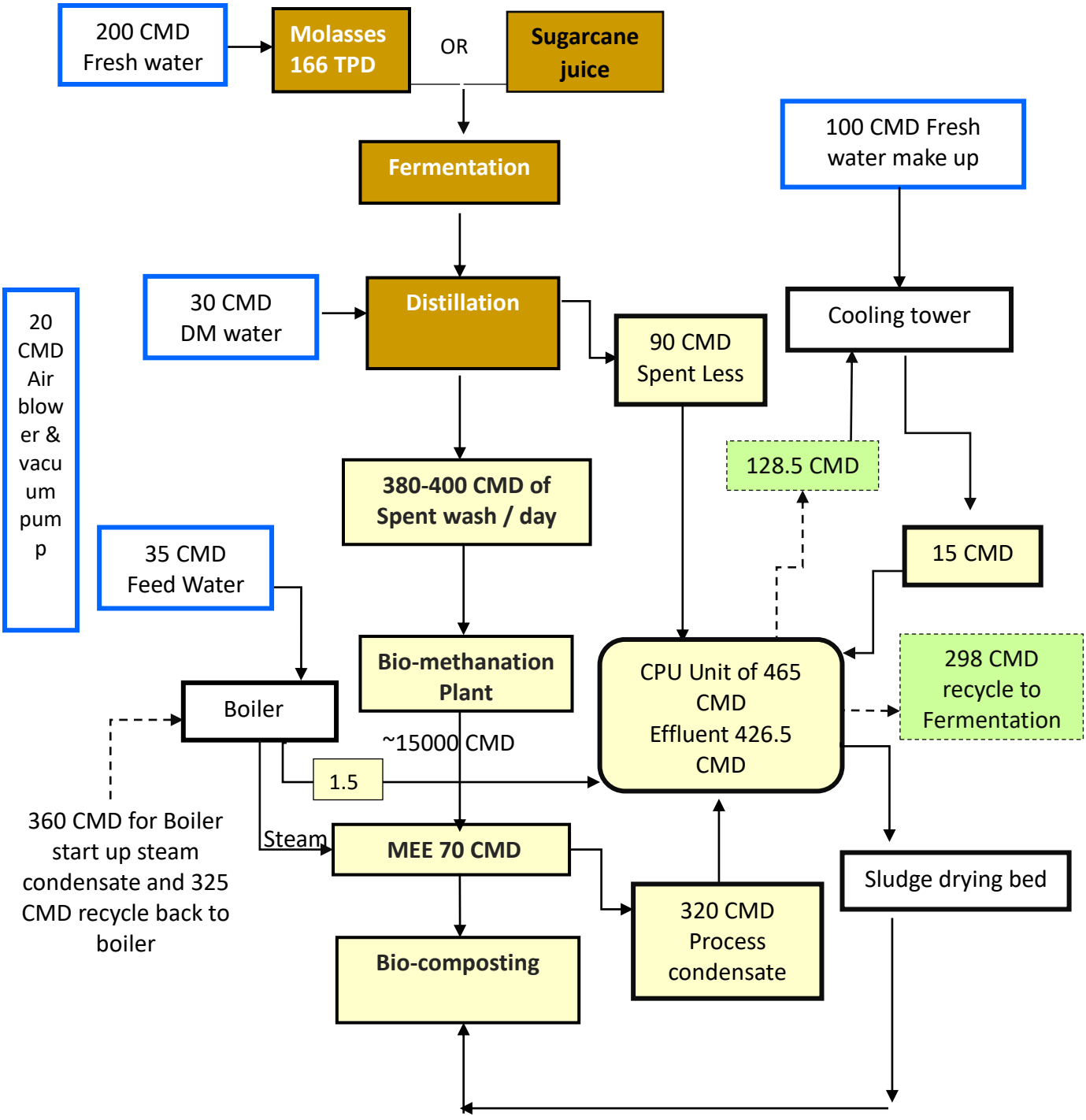


Figure 2.5: Water balance of proposed 45 KLPD Molasses/Sugarcane juice based Distillery

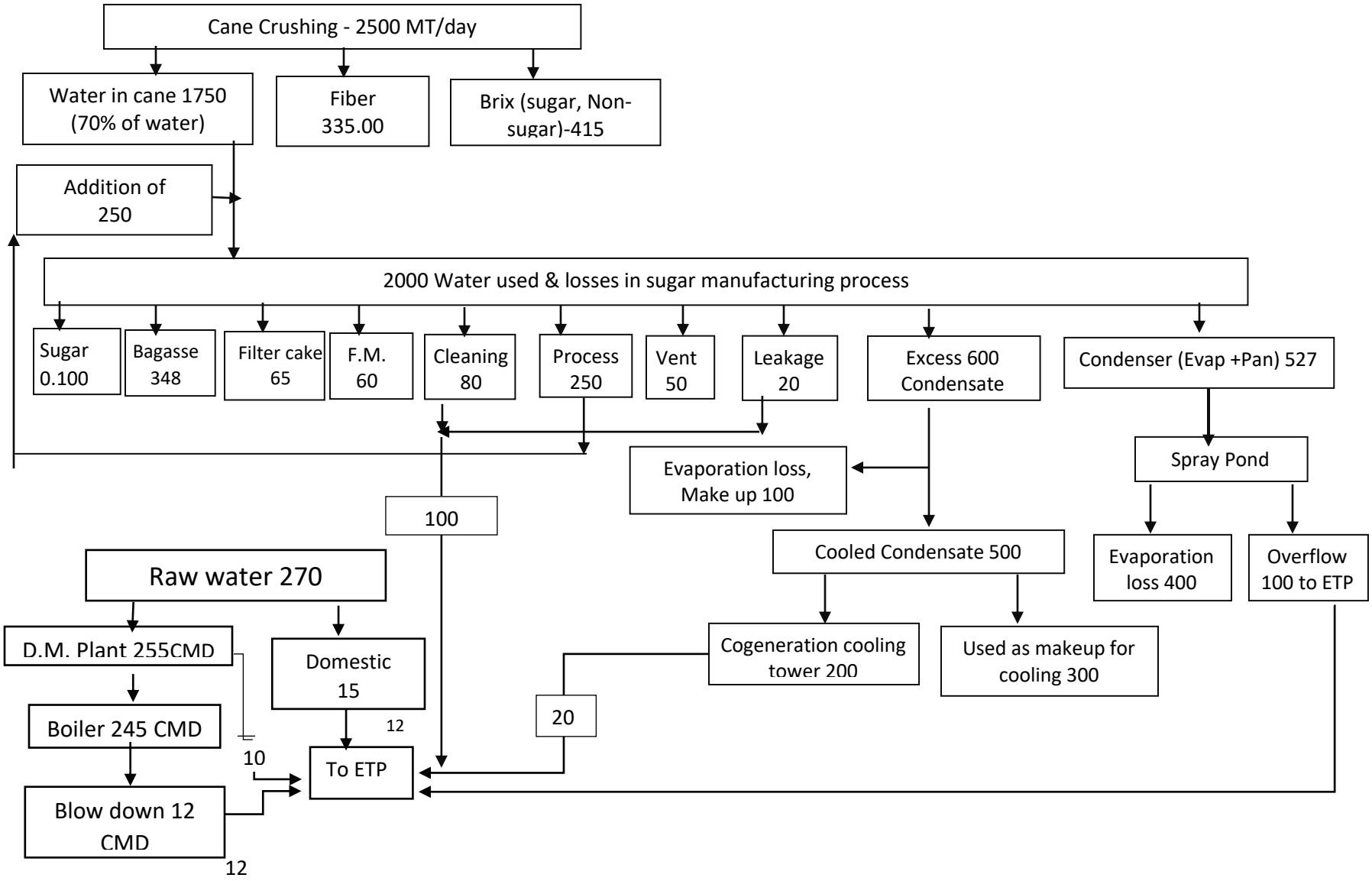


Figure 2.7: Water balance of existing 2500 TCD Sugar

2.6.5 Utilities details

List of Utilities required for proposed projects are given as below, technical details are given in Annexures

Sr. No.	Equipment Name
I. Fermentation Section	
1.	Molasses Day Tank
2.	Molasses Receiving Tank
3.	Molasses Transfer Pump From Day Receiving Tank
4.	Molasses Filters
5.	Automatic Molasses Weighing System With Tanks, Load Cells
6.	Weighing Tank (Molasses Receiving Tank)
7.	Weighed Molasses Transfer Pump
8.	Process Molasses Magnetic Flow Meter With Totaliser
9.	Bio-Culture Devlopment Section Consisting Of Series Of Vessels With Increasing Volumes
10.	Molasses Diluter For Yeast Vessels
11.	Bio-Culture Transfer Pump
12.	Continuous Mixed Bio-Reactors (Fermentors)
13.	Molasses Broth Mixer For Fermenter
14.	Yeast Activation Tanks
15.	Yeast Activation Vessel Transfer Pump With Motor
16.	Yeast Activation Coolers Plate Heat Exchangers
17.	Wash Holding Tank
18.	Distillation Feed Pump
19.	Fermented Wash Coolers Plate Heat Exchangers
20.	Fermented Wash Recirculation Pumps
21.	Air Sparging Assembly For Vessels & Fermentors
22.	Wash Settling Tank
23.	Sludge Settling Tank
24.	Sludge Transfer Pump
25.	Air Blower
26.	Air Filter
27.	Nutrient Tank
28.	Biocide Tank And Pump
29.	Defoam, Acid Tank
30.	Alcohol Vapors Recovery Column (Co2 Scrubber)
31.	Process Water Pump
II. Distillation Section	
32.	Analyzer column
33.	Degasifying column
34.	Aldehyde Column/ Pre-rectifier
35.	Rectifying column cum exhaust
36.	Fusel oil column
37.	MSDS
III. Condensers/Reboilers/Coolers	
38.	Rectifier PCV condenser

39.	Rectifier vent condenser
40.	Degasifying condenser
41.	Pre-rectifier condenser-I, II
42.	FOC condenser I, II
43.	Analyzer column reboiler, Analyser reboiler vent condenser
44.	Vent scrubber heat exchanger
IV. Miscellaneous	
45.	Fusel oil De-canter with sight and light glass and water sparger
46.	Degasifying Tank
47.	Plate heat exchangers 1. F. Wash heater 2. Rectifier feed heater 3. Spentwash cooler
48.	Jet mixer
V. Piping Fittings & Valves	
VI. Pumps with motors	
VII. Equipment/Instrumentation	
49.	Magnetic Flow Meter
50.	Glass tube Rotameter
51.	Metal tube Rotameter
52.	Pressure Gauges
53.	Temp Element
54.	Pressure Transmitter
55.	Level indicator with alarm
56.	Safe & tester for rectified spirit, impure spirit.
57.	Anti-vacuum/pressure relief valves (Distillation column)
58.	Timers
59.	Manometer
60.	Vibration switch for cooling tower
61.	Instrument air compressor for distillation plant
VIII. Electrical Work For Fermentation & Distillation House, Tank farm & Utility section	
IX. Pumps with flameproof motor & double mechanical seal:	
X. Utilities	
62.	Cooling tower with motor & cooling water circulation pump (1+1Nos.)
63.	Soft water unit with pump & Storage tank (1+1Nos
64.	DM water unit with Pumps (1+1Nos.) & DM Storage tank - New

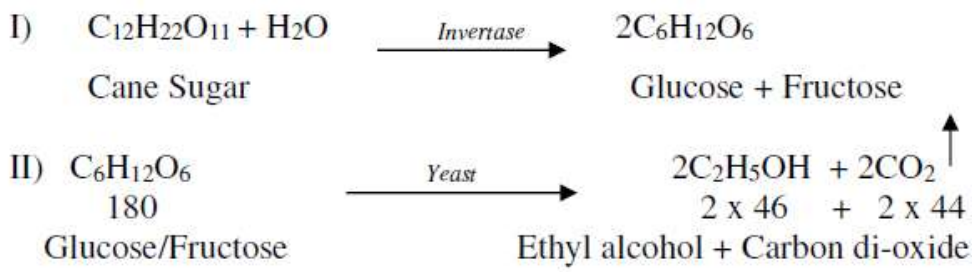
2.7 Technology and process description

2.7.1 Molasses based Distillery

Molasses is the chief raw material used for production of alcohol. Molasses contains about 50 % total sugars, of which 30 to 33 % is cane sugar and the rest are reducing sugars.

During the fermentation, yeast strains of the species *Saccharomyces Cerevisieae*, a living microorganism belonging to class fungi converts sugar present in the molasses such as sucrose or

glucose in to alcohol. Chemically this transformation for sucrose to alcohol can be approximated by the equation:



Thus 180 gm. of sugars on reaction gives 92 gm of alcohol. Therefore, 1 MT of sugar gives 511.1 kg of alcohol. The specific gravity of alcohol is 0.7934, therefore, 511.1 kg of alcohol is equivalent to 511.1 / 0.7934 = 644.19 liters of alcohol.

During Fermentation of other by-products like glycerin, succinic acids etc. also are formed from sugars. Therefore, actually 94.5% total fermentable sugars are available for alcohol conversion. Thus, one MT of sugar will give only 644 x 0.945 = 608.6 liters of alcohol, under ideal condition theoretically.

Main steps of Alcohol manufacturing are described as under,

Yeast propagation

Initially yeast is developed in the laboratory from the single cell yeast culture. In the laboratory, yeast is propagated in a test tube on 10 ml. Then it is transferred to a bigger flask of 500 ml. flask are transferred to 5 liter flask containing the sterilized molasses media solution. It is necessary to adjust the pH of the molasses solution in the range of 4.5 to 5.0 add necessary nutrients such as ammonium sulfate or urea, diammonium phosphate etc. On the plant side, there are again 3 stages of propagation namely 100 L, 500 L and 5000 L. All these equipment's are designed so as to facilitate boiling molasses solution in order to sterilize it and also cooling to bring it to the proper temperature of 33^0C and letting in culture and taking out culture.

Boiling, cooling, introducing culture etc. are done in aseptic manner, i.e. keeping the fermentation medium free from any kind of infection. Further stages of yeast propagation are done in open tanks. i.e. pre-fermenter requires about 8 hr. in order to build up necessary concentration of yeast in them.

Fermentation

Pre-fermenter is emptied in an empty fermenter, which is previously cleaned and kept ready. Dilute molasses solution is allowed to flow in this fermenter so as to fill it to its working capacity. Now a day, readymade compressed yeast is used directly in the pre-fermenters. Good quality of yeast is available for use in distillery.

The fermentation of molasses in fermenters take about 24 to 30 hr. for completely exhausting the sugars in molasses. The average efficiency of conversion of sugars from molasses to alcohol is

80 to 85 % of theoretical value in batch type distilleries. All the sugars are not converted to alcohol during the process or fermentation because chemicals like glycerin, succinic acid, etc. are also produced by yeast during their metabolic process. Therefore, it is not possible to have 100% efficiency of conversion of sugars to alcohol. The average yield of alcohol from molasses is about 230 liters from 1 MT of molasses in batch type distilleries.

New Developments in fermentation and distillation get high yield of 280 to 300 liters per MT of molasses.

Different technologies are classified

- High brix fermentation
- Multistage continuous fermentation
- Immobilized enzyme fermentation
- Continuous fermentation without yeast separators.

The continuous fermentation proposed is the latest and proven technology as compared to the old batch fermentation technology. It has many advantages like continuity of operation, higher efficiency and ease of operation. Continuous fermentation also results into consistent performance over a long period as compared to batch fermentation. Most modern ethanol production plants adopt this continuous fermentation technology.

A set of two/four fermenters is required for this process. This wort enters the first Fermenter and is allowed to overflow to the second fermenter and the wash from 2nd fermenter goes to 3rd to 4th fermenter. Nutrient solution and dilute acid is fed to the first fermenter by metering or dosing pumps. Temperature of the individual fermenters is maintained in the desired range of 30 to 32oC by re-circulating the fermenting wash through the individual plate heat exchangers. A separate cooling tower and pump are used for re-circulating the cooling water for fermentation.

The wash coming from the 4th fermenter, it contains 8 –9.5 % alcohol. Process water is also added to first one or two fermenters. Water ring blowers sparged fermentation air into first and second fermenters, carbon dioxide generated into the first and second fermenter is collected and it fed into the third fermenter for proper mixing of the fermented wash, while part of the carbon dioxide generated into the last fermenter is collected and it led into the CO_2 scrubber. The CO_2, which is liberated in fermentation, is scrubbed in water, with the help of CO_2 scrubber. This CO_2 contains ethanol, which is recovered by collecting CO_2 scrubber water fed into sludge trough.

The wash coming out from last fermenter goes to yeast separator (Yeast settling tank).

In the yeast separator yeast cream is separated by gravity settling from the wash and returned back to the first fermenter by acidic treatment to avoid the contamination, nutrient dosing as well mixing of molasses by broth mixer with yeast cream and sparging the air in yeast activation tank (YAT), therefore yeast activity will be increases and it is fed to the fermenter No.1. The top fermented wash overflow collected in the wash settling tank (WST).

Fermented wash settling Tank

In wash settling tank sludge is settled at the bottom while top supernatant wash over flow to the wash charger (wash holding tank), then it is pumped to Mash or Primary column for distillation system to recover the alcohol.

The sludge drain from the bottom of WST is fed in to sludge trough where it is diluted with CO_2 scrubber water. The diluted sludge is pumped into Sludge settling tank (SST). The traces of ethanol present in diluted sludge are separated at the supernatant, which is collected into wash charger through overflow and washed sludge from bottom is drained off.

Wash column

The wash column divided into two sections

i) Vaporizer
ii) Stripper.
iii) The wash is preheated by plate heat exchanger and outgoing stillage.

It enters the top plate of vaporizing section of wash column. The wash is boiled by vapours coming up from the stripper section. About 90 % of ethanol is removed from the top through vapour pipe of the column. The concentration of alcohol in the vapour is approx. 50 % v/v. About 70 % of weak wash is pumped from the bottom of vaporizer through the regeneration heat exchanger to return to the fermenter via a trim cooler in the form of heat exchanger. A minor stream of 30 % remaining weak wash flows to another section of distillation column called as stripping column.

Distillation Technologies

After fermentation the next stage in the manufacture of alcohol is to separate alcohol from fermented wash and to concentrate it to 95 % alcohol called as rectified spirit. For this purpose, method of distillation is employed.

The distillation column system consist of number of bubble cap plates where wash is boiled and alcoholic vapors are separated according to their boiling point and concentrated on each plate stage by stage.

Multi-pressure distillation system for production of Rectified Spirit consists of distillation columns namely

- Degasifying cum analyser column
- Rectification Column
- Fusel Oil Concentration column

For ENA mode

- Degasifying cum analyzer column
- Pre-rectifier column
- Extractive Distillation column
- Rectification Column
- Refining /simmering column
- Fusel Oil Concentration column

- Head Concentration column

Fermented wash is preheated in pre-heater and fed at the top of the Analyser column, Analyser column is fitted with thermosyphon reboiler. Top vapours of analyser column are sent to pre-rectifier column. Rest of the fermented wash flows down and is taken as spent wash from analyser column bottom.

- Pre-rectifier bottom liquid is preheated with spent-less and fed to rectifier cum exhaust column.
- Low boiling impurities are concentrated in the pre-rectifier column.
- A top draw is taken out as impure alcohol from the top of the pre-rectifier column.
- The bottom of pre-rectifier column is sent to rectifier feed tank.
- Rectifier exhaust is operated under pressure and heats analyzer column through re-boiler Alcohol is enriched towards the top and is drawn out as Rectified spirit.
- Fusel oil build-up is avoided in the Rectifier column by withdrawing outside streams of fusel oil.
- These are sent to fusel oil concentration column from where the fusel oil is sent to decanter for further separation. The fusel oil wash water is recycled back to the column.
- A top draw is taken out as impure alcohol from the top of fusel oil column & pre-rectifier column.

In the proposed project, ENA will be produced directly from wash. The concentrated vapours from the rectification/exhaust column will be fed directly to the ENA section of distillation columns (Extractive distillation and simmering column). The ENA-distillation columns will work on multi-pressure principle so that maximum heat economy can be achieved with improved quality of ENA.

Manufacturing Process for Fuel/Anhydrous Alcohol

Molecular Sieve

The feed (Rectified Spirit), pumped from the storage tanks, is heated through the heat exchanger by the dehydrated alcohol, then heated RS of 93% to 96% is fed to the top of the distillation column**.**

The liquid passes through the distillation column where ethanol is stripped of. The alcohol free liquid called spent lees is separated and discharged from the bottom of the distillation column and the ethanol stream, with strength of about 96% by volume, is removed as vapor, at the top section of the distillation column and feed to the molecular sieve unit after a super heating about 115^{o}C by steam in the heat exchanger.

Fuel oils are removed from an intermediate point of the column in order to avoid any risk of flooding of the column and feed to the static settling device where are separated from the weak water which are recycled to the column.

This solution shows following advantages,

- Total recovery of steam condensate which is recycled to the steam boiler at high temperature with consequent increasing of the efficiency of the re-boiler (higher production of steam per unit of fuel)

- Lower cost for softening of demineralization of raw water to be fed to the boiler as steam condensate does not need any treatment
- Lower quantity of stillage, potential source of pollution

The super-heated ethanol stream removed at the top of the distillation column feeds one of the two sieve beds is now in regeneration mode.

The second sieve bed when in regeneration mode (under vacuum) and receives a small amount of vapor from bed working in over pressure. As soon as regeneration is finished (a regeneration cycle lasts about 5 minutes), an automatic control system changes the operating conditions of the two sieve beds in order to have the first sieve bed in regeneration and the second one in dehydration mode.

The dehydration process releases a vapor ethanol stream with a very small amount of water (500 ppm or less), which is condensed in the condenser cooled in the heat exchangers and sent to the storage as dehydrated alcohol.

The regeneration process releases a certain amount of absorbed water and ethanol, which are condensed in the condenser and recycled to the column. Cooling media of the first cooling step of the dehydrated alcohol (condenser) is the regeneration stream recycled to the distillation column and cooling media of the second cooling step of the dehydrated alcohol (condenser) is the fed stock coming from the storage tanks, which is preheated as herein above described. Remaining vapors and liquid are condensed and cooled by cooling water in S &T or P&F heat exchangers.

The unit operation is fully automatic and all operations are governed by logics executed by a PLC Control system.

2.7.2 Sugarcane Ethanol

Sugarcane ethanol is an alcohol-based fuel produced by the fermentation of sugarcane juice and molasses. Because it is a clean, affordable and low-carbon biofuel, sugarcane ethanol has emerged as a leading renewable fuel for the transportation sector. Ethanol can be used two ways:

- Pure ethanol - It is a fuel made up of 85 to 100 percent ethanol depending on country specifications and can be used in specially designed engines
- Lower Petroleum Usage- Ethanol reduces global dependence on oil. Sugarcane ethanol is one more good option for diversifying energy supplies.

Diagrammatic representation of production of ethanol from Sugarcane juice and molasses is as given below,

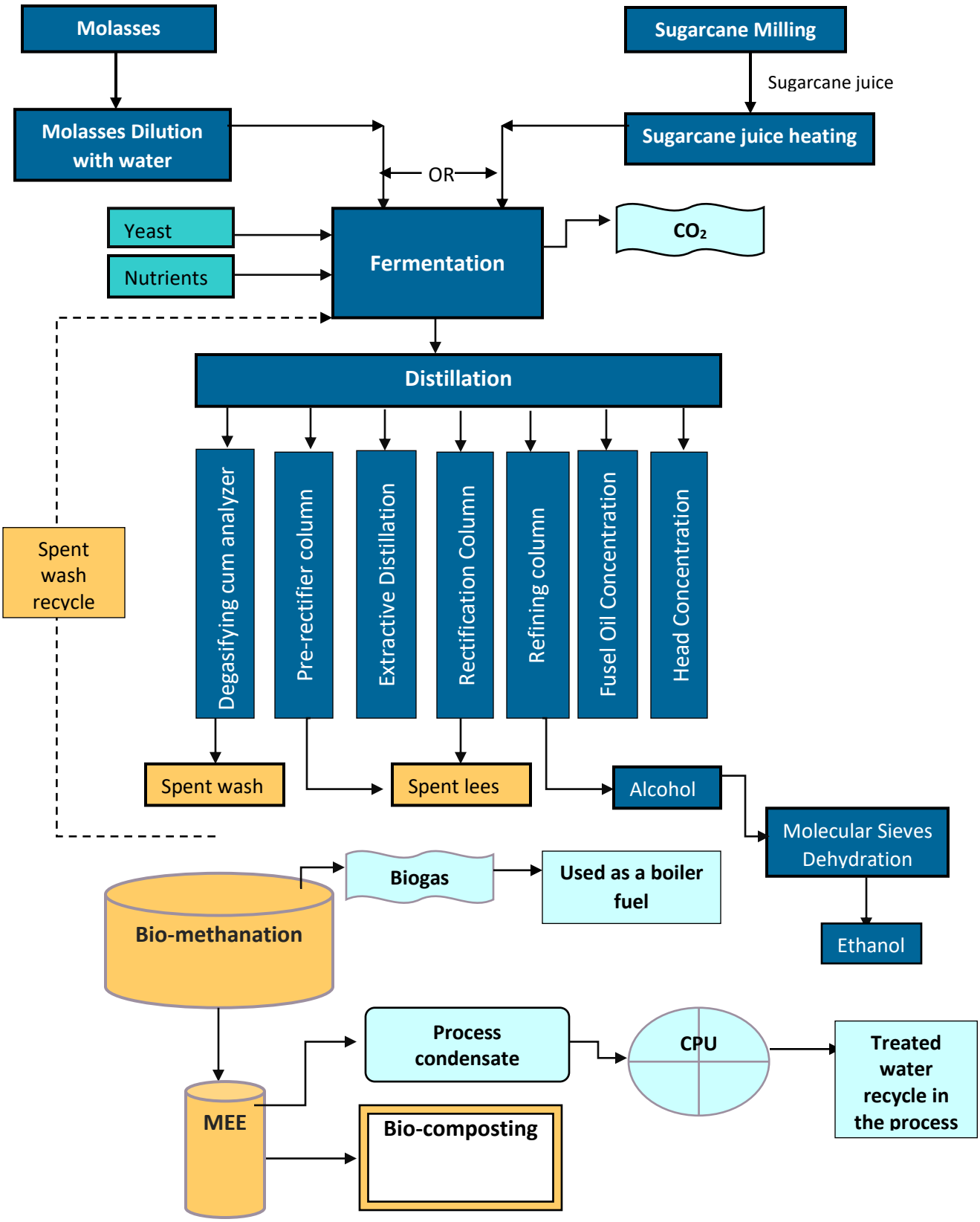


Figure 2.8: Alcohol/ethanol manufacturing process

2.7.4 Co-generation power plant process in brief

Cogeneration or combined heat and power is the use of a heat engine or power station to generate electricity and useful heat at the same time (*Wikipedia*). The process of manufacturing and MEE requires steam. However, by producing steam at higher pressure and higher temperature, electricity can be generated in addition to the main manufactured product. The fuel for the boilers of the cane sugar industry will be Bagasse. Superheated steam from boiler is fed to turbine generator.

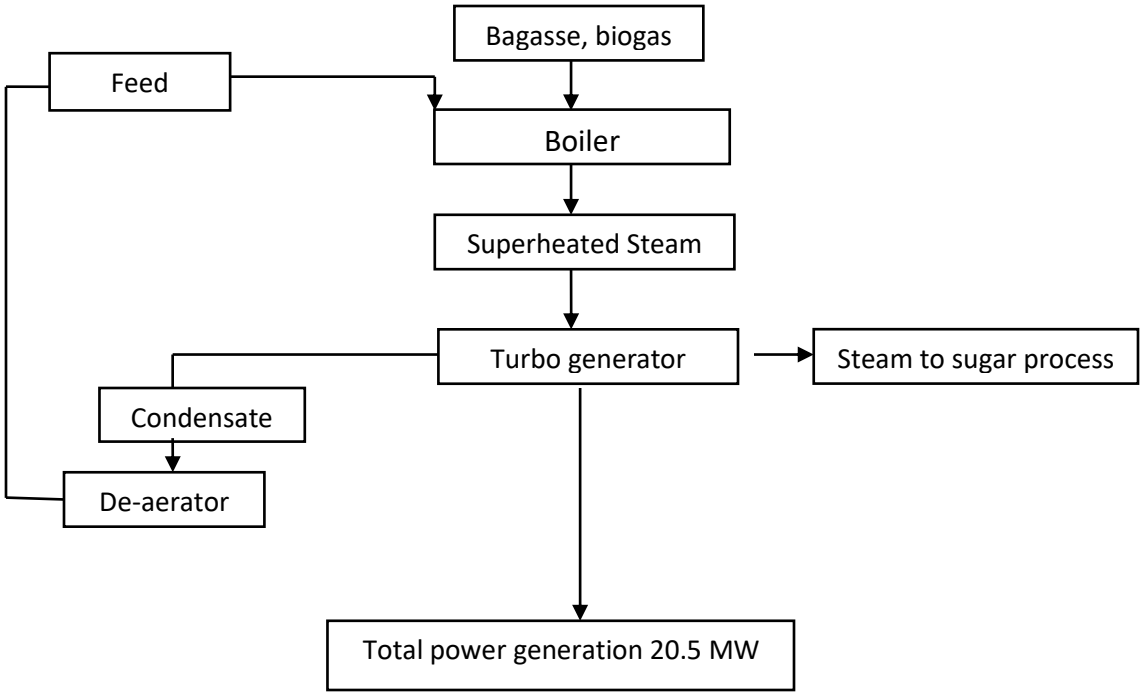


Figure 2.9: Cogeneration process flow chart

2.8 Pollution sources and its mitigation measures

Summary of major waste generation of the from sugar, cogeneration and distillery its disposal/ treatment mechanism is given below,

Table 2.12 : Major pollution sources and its proposed mitigation measures

Environment attribute	Sources	Pollutant /Quantity	Proposed mitigation measures
Air pollution	Stack, Fugitive emissions, material	PM_{10}, $PM_{2.5}$, NOx, SO_2	Proposed: Electrostatic precipitator to 90 TPH boiler Proposed Stack height: 65 m

	handling		Proposed 18TPH Boiler with Wet scrubber 45 m stack height Existing stack height: 40m with wet scrubber
Waste water Management	Blow down from boiler, cooling tower, floor washing, other cleaning activities and domestic, Spent wash, spent lees, process condensate.	Existing from Sugar unit: 240 CMD, Total domestic WW 42.5 CMD, Distillery effluent generation Molasses based: Spent wash 380-400 CMD, spent lees 90 CMD, Process condensate 320 CMD	Spent lees, blow down and condensate will be treated in CPU of capacity 465 CMD and treated water will be recycled. Treated water is recycled/reused in greenbelt development and ferti-irrigation. Total Spent wash generation will be 380-400 CMD. Spent wash will be treated trough Biogas unit followed by Multi effect evaporator (MEE) followed by Bio composting.
Solid waste management	ETP Sludge, ash and Press mud	Existing Sugar Unit - Bagasse ash generation: 4.2 TPD Proposed Bagasse ash generation: 20 TPD Yeast sludge 25-30 TPD CPU sludge 35-40 TPM	Bagasse ash collected will be mixed with Pressmud and utilize for Composting. The sludge from primary clarifies, settling tank and secondary clarifier will be sent to sludge drying beds. Sludge will be dried in natural heat of sunlight. The dried cakes will be scrapped off periodically and can be utilized for as manure or mixed with Press mud and utilized for composting

2.9 Details of anaerobic digestion and composting process details

2.9.1 Anaerobic digestion process

The anaerobic metabolism of a complex substrate, including suspended organic matter, can be regarded as a three-step process:

Step 1	Hydrolysis of suspended organic and soluble organic of high molecular weight.
Step 2	Degradation of small organic molecules to various volatile fatty acids, ultimately acetic acid.
Step 3	Production of methane, primarily from acetic acid but also from hydrogen and carbon dioxide.

Table 2.13 :Technical specifications for biogas plant to handle maximum 450 m3/day spent wash

Sr. No.	Particulars	Specification
1.	Digester with assembly	Type -CSTR Digester No. - 1 Capacity: - 11000 m^3 Material: MS with internal epoxy coating. Organic Loading rate – 5.0 Kg/M3/day Shell Thickness: As per IS –803-1976 Sampling ports provided at every 2m height. The gas zone of dome is to be sand blasted & epoxy coated & surface in liquid (1M below the liquid level) to be sand blasted & epoxy anticorrosive Painted. Moisture trap with drain line (MOC-SS-304)
2.	Central agitator	One for digester, motor flame proof
3.	Lateral agitators	3Nos. for digester
4.	Gas holder (1 No.) with basin	MOC: - MS with FRP epoxy coating inside and synthetic enamel paint outer side with pressure /vacuum relief valve. MOC-MS
5.	Degasser	MS, One for digester internal Sand blasting & epoxy coated inside and synthetic enamel paint outside.
6.	Lamella clarifier, shell and hopper	1No. MS with sand blasted & epoxy coated inside and synthetic
7.	Equalization or buffer tank	Capacity -250 M3 RCC or Masonry /brick work. Impervious type prepared using HDPE lining (250 micron) and sulphate resistant cement used.
8.	Spent wash Transfer pumps (1+1Nos.) and digester feed pumps (1+1Nos.) with valves & on line going from 5 days spentwash cooling tank to buffer tank and on line going from buffer tank to digester	Pump Type: Centrifugal non-clog type
9.	Sludge recirculation pumps (1+1Nos.)	Impeller & contact parts SS- 316, one set for digester

10.	Flow Meters	Magnetic flow meters with totalizers

(Source: Information from client: DPR prepared by VSI, Pune)

2.9.2 Composting process

Bio-compost process can be divided into the following stages –

Active Stage

After formation of windrows and spraying of inoculums active stage starts. During this stage rise in temperature takes place. This phase lasts for first 10-15 days.

Maturation Stage

Includes the greater part of maturation and extends to and beyond the period of temperature decline, which consists of the next 14 days when the temperature is maintained and the next 10 days when the temperature starts to decline.

Ripening or Curing Stage

Allow the compost to age for 4 weeks, until the moisture stabilizes at 30% to 35%.

Windrow Size

Windrow Size – 3.5 M Width x 1.5 M Height

Distance between two windrows – 1M (by using self-propelling machine).

Formation of windrows

Press-mud should be formed in windrow size of 3.5M x 1.5M. The windrows should be formed straight and have correct size.

Inoculum application

After running the machine for a day, spray inoculum. Inoculum acts both as an odor reducing agent and an activator to hasten the process of raising the temperature. Normally for every MT of press mud 0.5 to 1.0 kg of inoculum is applied. It is diluted 100 times with effluent and sprayed on the windrows spreading over 3 days for effective results (in the 3^{rd} , 5^{th} and 10^{th} day) immediately after the application of inoculum, windrow should be aerated with mixing machine to spread the inoculum uniformly to all parts of windrow.

Aeration

Normally aerotiller/ mixing machine is used for mixing up the windrow, loosen the same and create a situation congenial for natural aeration. When the moisture content reduces below 40% an addition of effluent should restore it to 65 %. If the press-mud is wet (more than 70 % moisture) there is lower supply of oxygen. Moisture content should be brought down to about 40 % by giving proper aeration. Microorganisms make use of nitrogen and carbon for their metabolic activities. The energy required for this process is derived by aerobic decomposition. Aeration should be given to raise the bio-compost temperature

and establish an aerobic condition. The temperature should be 60-650C in the windrow. Continue spraying and aeration till the completion of bio-composting cycle.

Effluent Spraying

Spraying is done either before aeration or during the mixing/ aeration process. The quantity of effluent to be applied should be strictly controlled so that the windrows always have proper moisture content, which is optimum for aerobic composting.

Merging of Windrows

Once the hard material or lumps is broken by the mixing machine and is loosened, it gets compacted and the windrow height gets reduced due to proper degradation of organic matter with proper aeration. After about 15 days of initial composting the windrow height is likely to be reduced to about 0.5 meter. At this point it may be required to merge 2 windrows into one and continue further processing.

Curing in Heaps

After completing the spraying, aerate the windrows for 2 or 3 days without spraying effluent. After reducing the moisture to about 30 % to 35 % heap the compost in the corner to a height of about 2 meter to have anaerobic process for about 15 days and also to make the space free for fresh windrow formation. A distinctive black loamy, free flowing and baggable compost, which has a pleasant earthy smell and moisture content of 30-35 %, should be produced.

(Source of Information from client: DPR prepared by VSI, Pune)

Composting specifications

- Press mud production @4% : 100TPD
- Moisture content of Press mud: 70%
- Distillery capacity 45 KLPD
- Days of operation : 270
- Raw Spent wash production: 1, 08, 000 m^3
- Spent wash generation after Bio-methanation and evaporation- 70-75 m^3/d
- Ratio Press mud: Spent wash, (60 days cycle): 1:1.6
- Press mud requirement (in MT per annum) : 11813
- No. of composting cycles : 4
- Press mud per composting cycle MT: 6328
- Microbial culture MT @0.5 Kg per MT of press mud: 12. 66
- Required composting area considering press mud per acre per cycle: 6.93acres
- Total concentrated biomethanated spentwash generation per annum:
  = 270 days X 75 M3/day = 20250 M3/annum.
- Spent wash Holding Tank designed details and drawing attached
- Compost yard designed (concrete lining, HDPE lining)

For construction of compost yard, the ground will be properly leveled and Compacted by using heavy-duty roller to get 95 % C.F compaction and the compost yard will be prepared layer by layer as follows.

- First Layer – Well compacted soil layer to achieve 95% C.F compaction
- Second Layer – 50 mm of fine sand layer
- Third Layer – HDPE liner of 250 Micron
- Fourth Layer – Fine Sand Layer thickness 50 mm
- Fifth Layer – 100 mm thick self-finishing reinforced concrete (1:4:8) using 8mm dia. Tor steel 300 mm apart both ways

Compost cycle

Week 1. (Inoculation)	Collection & handling of press mud, formation of windrow of dimension 3.5 X 1.5 X as per Lenght M & first pass of Aero tiller to reduce the moisture Content in windrow from 70% to 50%. Inoculation with mixed population microbial culture containing fungi, Bacteria and Actinomycetes (30% Suspension in water) & Aerotilling for proper mixing of inoculants.
Weeks 2-5 (Processing)	Spent wash spraying & Aerotilling, maintenance of moisture between 50 to 65 % is done by Spent wash spraying. Aerotiller is passed after every spent wash spray. Trimming of windrow after every Aerotilling operation to reshape the windrow in triangular position. During this period the temperature of the composting windrow increases up to 65^0C.
Week 6 (Curing & Drying)	Curing, Aging & Drying: Optimum moisture content is maintained. No effluent is applied during this stage. Leachate BOD & COD is get reduced. Aero tilling is continued twice a week till the compost is stabilized and finally dispatched to end user -member farmers as manure.

Features of the composting process

- This is a zero pollution process.
- The BOD of effluent is destroyed.
- All the degradable organic material is oxidized to humus.
- There is no odor nuisance.
- There is no fly nuisance.
- The product is dry, baggable and has a high nutritional value for all crops, and is applicable on all types of soils.
- Compost is free from weed seeds and pathogens.
- The composting process is carried out on scientifically designed concreted compost yard and no ground water pollution/percolation envisaged.

2.10 Project Implementation Schedule

Project action will start after getting Environment Clearance from EAC, MoEFCC. Estimated time schedule of project implementation will be around 100-120 weeks

2.11 Project Cost Estimate

Project cost and Environment Management cost is depicted as under,

Table 2.14 : Project Cost

Sr. No	Description	Cost (Rs. Lakhs)
1.	Buildings and Civil works	1380.60
2.	Plant and Machinery including GST	4702.80
3.	Miscellaneous Fixed Assets	70.80
4.	Machinery Stores/Spares	5.00
5.	Preliminary & Pre-operative and other expenses	358.18
6.	Contingencies @ 2%	92.16
7.	Margin Money	25.00
8.	**Cogeneration equipment and machineries**	4949.0
	Total	**11584.0**

Table 2.15 : Environment Management Cost

Sr. No	Description	Capital Cost (Rs. Cr.)	Recurring Cost (Rs. Cr.)
1.	Air Pollution Control (ESP and stack, Ash handling system)	6.3	0.01
2.	Water Pollution Control (CPU)	**1.5**	**0.05**
3.	Solid waste Management	0.05	0.05
4.	Environmental Monitoring and Management	0.05	0.03
5.	Rainwater Harvesting	0.15	0.05
6.	Occupational Health	0.05	0.05
7.	Green belt development	0.2	0.05
8.	**Total**	**8.3**	**0.29**

CHAPTER III: DESCRIPTION OF THE ENVIRONMENT

3.1 Environmental Parameters

Field monitoring was done for primary data collection of various environment components such as air quality, water quality, soil quality, noise, micrometeorology, flora & fauna, socio-economic, hydro-geological study, traffic study etc.

Secondary data from authenticated sources was used as a guideline and reference material. The entire data has been collected through actual physical surveys and observations, literature surveys, interaction with locals, government agencies, and departments.

The baseline study begins with site visits and reconnaissance survey in the study area. During these visit the locations were fixed for the monitoring and collection of primary data. The guiding factors for the present baseline study are the requirements prescribed by the guidelines given in the EIA Manual of the MoEFCC and methodologies mentioned in Technical EIA Guidelines Manual for Distilleries by IL&FS Ecosmart Ltd., Hyderabad approved by MoEFCC.

3.2 Study Period

1. The studies were conducted in winter season for the period of Oct 2019 to Dec 2019

3.3 Frequency of Monitoring

Frequency of environment monitoring considered is given in Table 3.1.

Table 3.1: Environmental Parameter & Frequency of Monitoring

Components	Parameters	Frequency	Methodology adopted
Ambient air quality	$PM_{2.5}$, PM_{10}, SO_2, NO_x	Ambient air quality samples are monitored at 9 locations for 24 hours twice a week for the study period	PM_{10}/$PM_{2.5}$: Gravimetric method SO_2: Modified West and Gaeke Method. (IS : 5182, Part II) NOx: Jacobs & Hochheiser Method. (IS 5182 Part VI)
Meteorology	Surface : Wind speed & direction, temperature, relative humidity and rainfall	Secondary data collected IMD	Monitoring data for primary data IS: 8829

Water quality	Physical, Chemical and Bacteriological parameters.	Primary data Ground water samples were collected from 8 locations and 3 surface water samples were collected from one locations	Standard methods for Examination of Water and Wastewater' published by American Public Health Association (APHA)
Ecology	Terrestrial fauna and flora and River ecology	Field survey conducted in 10 km study area, once during the study period	Listing of floral and faunal species.
Noise	Noise levels in dB(A)	Continuous 24 – hourly monitoring at 9 locations once during the study period	IS: 4954 as adopted by CPCB.
Soil	Physico-chemical	Sampling at 9 locations around project site once during the study period.	BIS specifications
Socioeconomic Data	Socio-economic characteristics of the affected area	General in 10 km radial study area and data collected around the project site through field visits	-
Land use pattern	Land use for different categories	10 km radius, Based on data published in Primary Census Abstract and satellite imagery LISS –III	Topo-sheets Satellite imageries
Geology and hydrogeology	Type, drainage etc.	Field Observations in 10 km study area and from secondary data	Authenticate published data.

3.4 Study area

The project study area is located in at Amdapur, Tal. & Dist. Parbhani, Maharashtra. Brief of environment setting is given in Table 3.2.

Table 3.2: Environmental setting

Sr. No.	Particulates	Description
1.	Project Location Geographical Coordinates	19°10'32.07"N & Long. 76°45'46.21"E
2.	Toposheet number	56A/11, 56A/12, 56A/15, 56A/16,
3.	Nearest IMD station	Parbhani 10 KM (North)
4.	Nearest Town	
5.	Nearest airport	Shri. Guru Gobind Singhji Airport 60.0 km in East
6.	Nearest Road	Parbhani-Gangakhed state highway 4.36 km in W and Singnapur- Amadapur road 1.21 in in SW
7.	Nearest Railway station	Singnapur : 3.0 km in West Parbhani : 9.0 km in North
8.	Nearest Village	Amdapur 1.4 km South
9.	Nearest densely populated area	Parbhani 10 KM (North)
10.	No. of Villages in 10 km	39
11.	Climate	Dry tropical climate with hot summer and moderate winter
12.	Nearest Water body	Water Canal 0.53 km in SE direction River Godavari is flowing at a distance of 13.0 km in S and Purna River at 17.5 km in NE.
13.	Eco-sensitive area	No any in within 15 km of project area
14.	Average Annual rainfall (mm)	962.8 mm
15.	Temperature	Lowest recorded Temp ^{0}C: 4.4 Highest recorded Temp ^{0}C: 46.6 °
16.	Humidity	Annual mean Relative humidity: 44-62%
17.	Wind Direction	Dominant during study period: North East, East & ENE Annual average dominant wind : From West, South West & North West.
18.	Soil Type	Heavy black soil –Black cotton soil

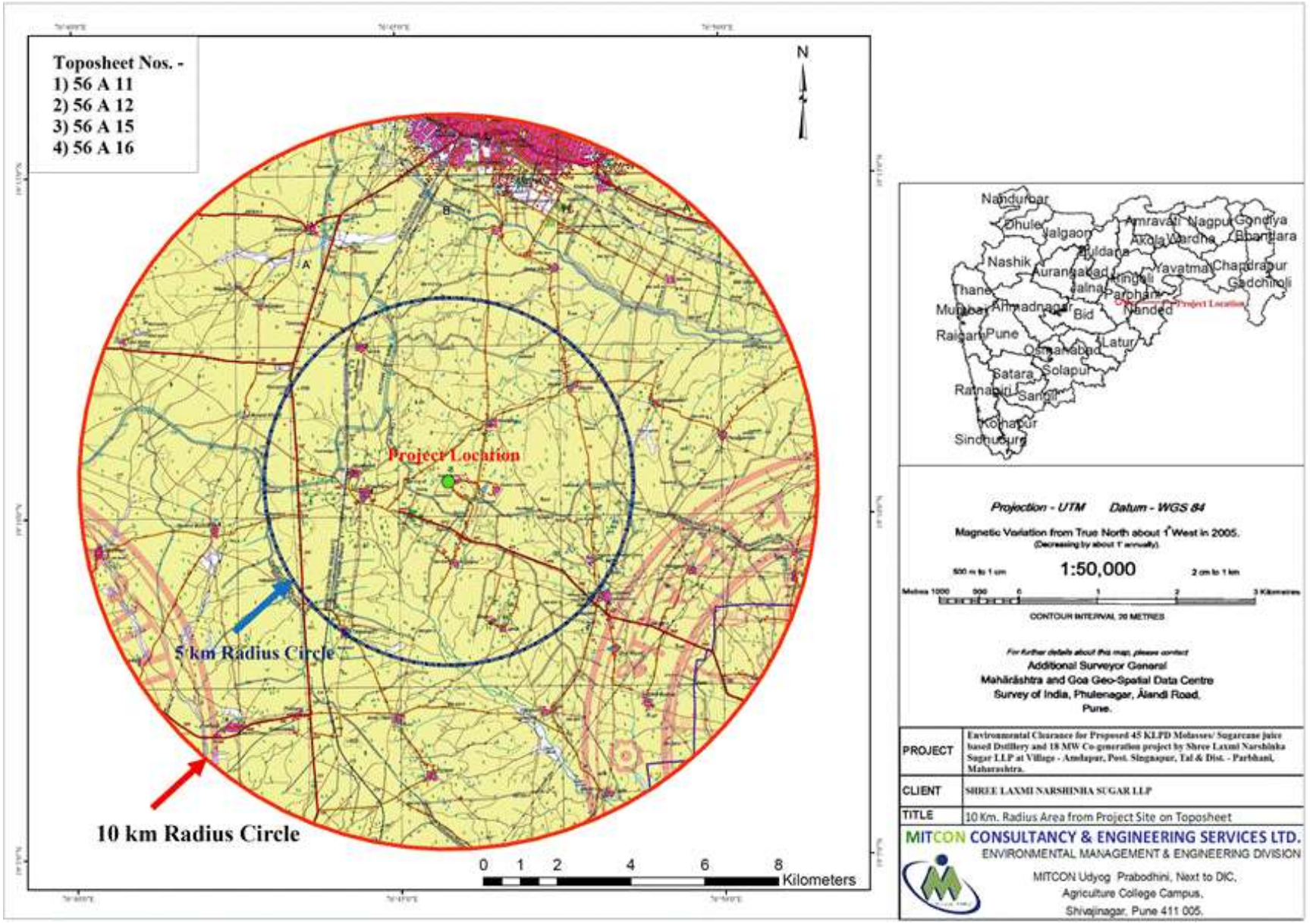


Figure 3.1: Toposheet of the 10 km study area

Google Image 2010 **Google Image 2020**

Figure 3.2: Google image historical and present image

3.5 Geomorphology

Parbhani has a general elevation of about 457.50 metres above the sea level, its highest and lowest levels being 579.73 meters in the Jintur range, about 12.87 km north of Charthana and 366.0 meters above sea level on the Godavari bank near the point where the river crosses over the district boundary. Pathri, Partur (except its northern part), Gangakhed and Parbhani talukas have plain topographically.

The district as a whole belongs to the Godavari peninsular drainage, but the area of the district mainly belongs to two river systems, one in the north and north-east: the Penganga, and the other the Marathwada Purna and other immediate tributaries of the Godavari flowing in this district.

The prevailing tone of the landscape in Parbhani is that of plateau forms having eroded scarps and detached remnants. In places, the plateau ranges succeed one another to attain higher elevations. Where ever the plateau is wide, it assumes the appearance of an undulating remnant plain, with its scarp face overlooking broad river basins. These scarp lands present a much eroded appearance and so intense is the erosive action of streams that their deeply entrenched valley courses are flanked by broken and bare scrub-lands as in the region north and east of Kalamnuri.

The landscape of Parbhani district has two contrasting features: the undulating agricultural plains and the residual plateau features with deeply eroded sides covered with scrub and occasional stony wastes. The scarp-lands lying to the north of the Purna area are counterparts of the Jintur hills, but they are more continuous and have an undulating plateau extension towards the north.

(Ground Water Information Parbhani District, Maharashtra_1786/Dbr/2013)

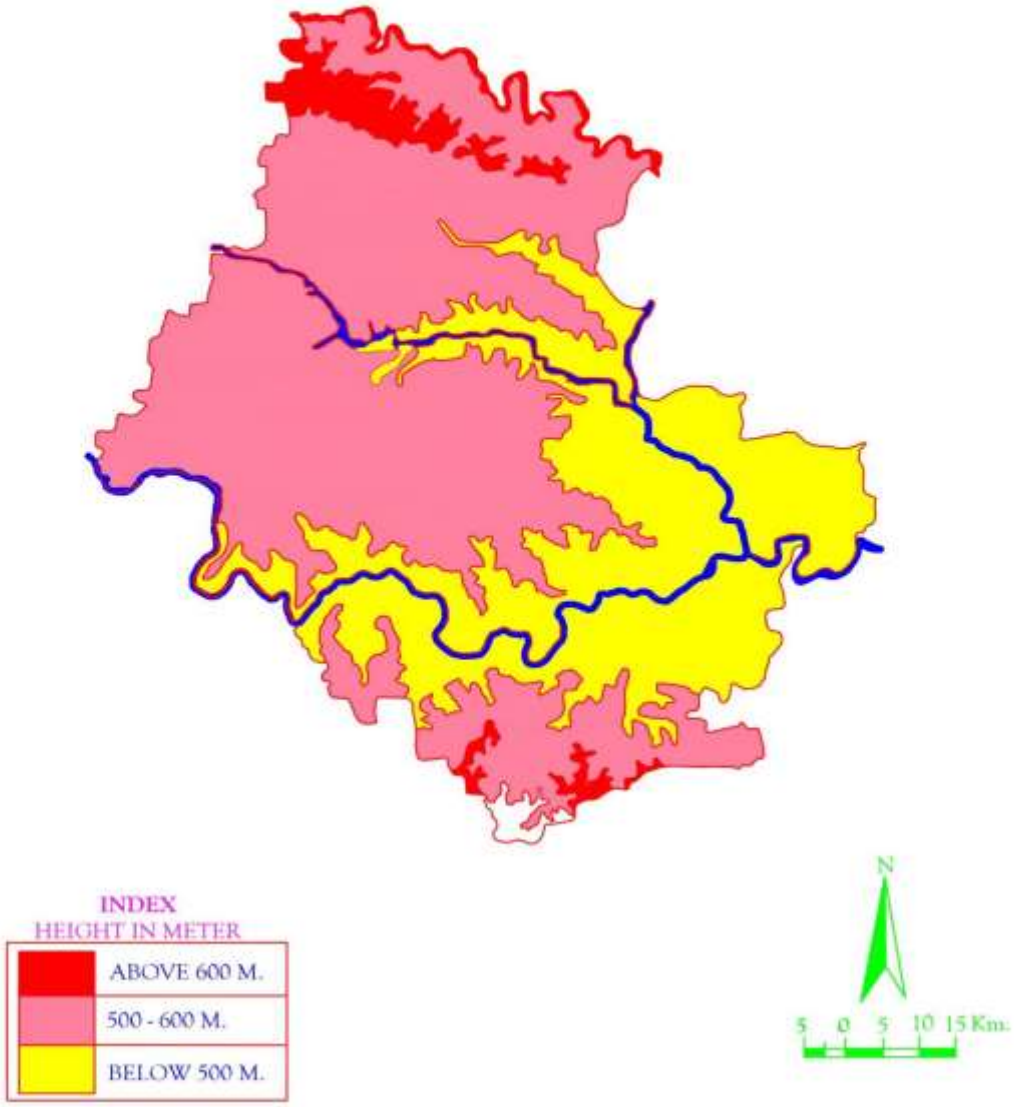


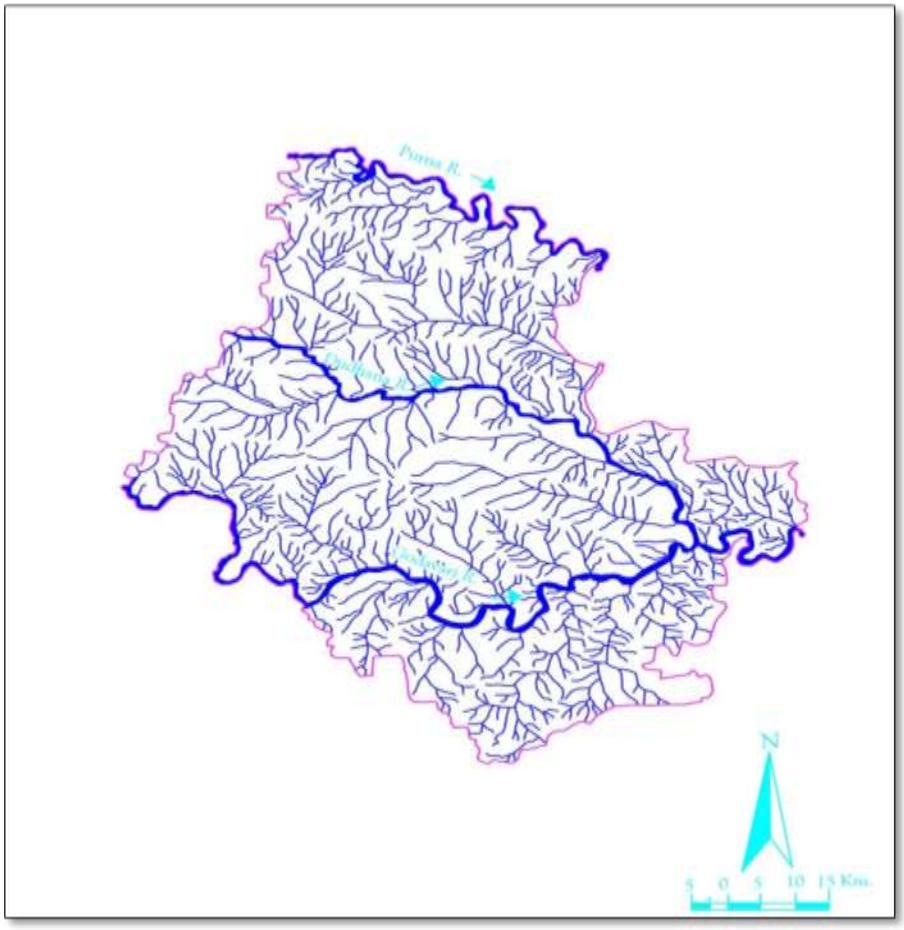
Figure 3.4: Parbhani district physiography
(Ground Water Information Parbhani District, Maharashtra_1786/Dbr/2013)

Soil

The types of Soils are seen in the district are:

1. Light and medium soil is seen in the northern part wherein the soil horizon is shallow. The soil is also seen in southern part of the Gangakhed taluka.
2. Heavy black soil exists in the central part of the district viz in parts of Parbhani talukas. The soil horizon is thick. This soil is called Regur which is rich in various plant nutrients. The soil horizon is very thick in valley portions.

Due to rolling and undulating topography, soil of varying thickness has developed. The soil varies from clayey to clayey loamy in valleys and sandy loamy on hills and slopes.



(Ground Water Information Parbhani District, Maharashtra_1786/Dbr/2013)

Figure 3.4: Hydrology map of Parbhani District

Hydrology

Groundwater occurrence and movement in the area is influenced by its rock formations. Groundwater potentially depends upon porosity and permeability (both primary and secondary) of rock formations. Parbhani district is underlain by basaltic lava flows and alluvium only.

The regional Static water level in the area varies from 20 mbgl to 25mbgl. Ground water extraction in the area is done mainly through dug wells and bore wells. The average depth range of dug wells in the area is 15.00 m to 30.00 m. The average depth range of bore wells in the area is 60.00to 80.00 m.

Deccan Trap Basalt: The entire district is underlain by a series of Deccan lava flows that came out as effusive flows through openings during the period from Upper Carboniferous to Cretaceous period. An overall study of the district, based on the field surveys has recorded maximum 10 flows. The flows were demarcated on the basis of contact zones marked by red bole beds and in

their absence the chilled fine grained basalt containing amygdules resting on structurally different basalt say zeolitic or vesicular basalt. The red boles are as thick as few centimetres to 2 metres. The flows are either horizontal or generally dipping towards west. They are weathered, jointed, fractured vesicular basalt and the vesicles are filled with green earth. The columnar joints are predominant in basalts. Each flow mainly consists of upper vesicular basalt and a lower massive unit below which bole beds occur.

Intertrappean Beds: Intertrappean beds are also occurring in the district and they are limited to a few meters thickness. They are generally clayey or calcareous when met within the wells. They form good aquifers.

Alluvium: Alluvium is extremely limited in the district and is present along the Godavari, the Purna, the Dudhna, the Galati, the Dhond and Karpara rivers. They are more than 10 meters in width and yield appreciable quantities of ground water. However they are broader and of mappable size at places along the banks of rivers and 1 to 2 kms broad south of Chikhalthana and western boundary of the district towards Beed.

Water Level Scenario

Central Ground Water Board periodically monitors National Hydrograph Network Stations (NHNS) stations in the district, four times a year i.e. in January, May (Premonsoon), August and November (Post monsoon). The data on premonsoon and post monsoon water levels along with fluctuation during 2011 is given in **Table 3.3**

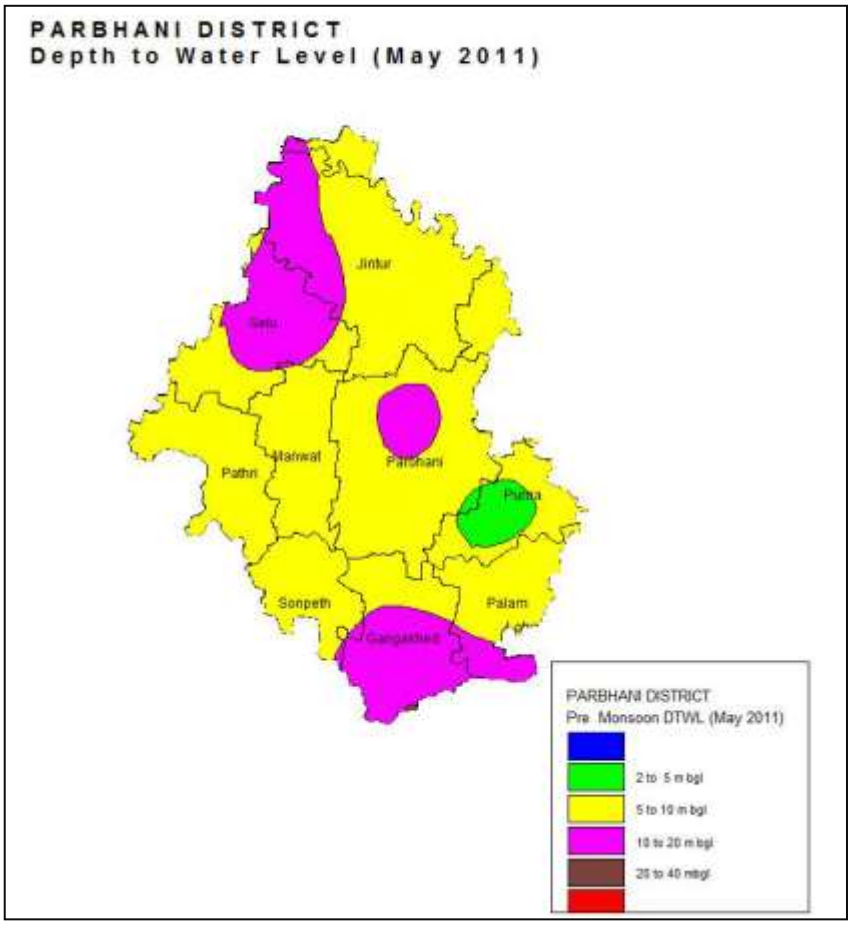
Table 3.3: Pre-monsoon and post-monsoon water levels

Sr.no	Location	Premonsoon WL (m bgl)	Postmonsoon WL (m bgl)	Fluctuation (m)
1	Chikhalthana	13.51	6.85	6.66
2	Manwat	8.01	5.9	2.11
3	Gojegaon	6.53	1.6	4.93
4	Singanapur	6.54	5.25	1.29
5	Kerwadi	8.68	4.4	4.28
6	Mankeswar	8.85	5.4	3.45
7	Todkalas	3.55	1.3	2.25
8	Selu	8.49	4.17	4.32
9	Hadgaon (PZ)	7.96	6.05	1.91
10	Pedgaon2	6.62	4.55	2.07
11	Narwadi	6.82	4.2	2.62
12	Kausdi	8.61	6.65	1.96
13	Dharmapuri 2	13.01	14.85	-1.84

(Ground Water Information Parbhani District, Maharashtra_1786/Dbr/2013)

Depth to Water Level – Premonsoon (May-2011)

The depth to water levels in the district during May 2011 ranges between 3.55 (Tadkalas) and 13.51 (Chikhalthana) m bgl. Shallow water levels within the range of 2 to 5 m bgl are seen at one NHNS i.e. Tadkalas. Water level within 5 to 10 m bgl are seen almost in entire district. The NHNS located at Gojegaon, Singnapur,Pedgaon, Narwadi, Hadgaon, Manwat, Selu, Kausdi, Kerwadi, Mankeshwar .are showing this particular range of water level. The water levels in the range of 10 to 15 mbgl are seen in the form of patches on the district, the NHNS at in Dhrmapuri2 and Chikhalthana are falling in this range. The Taluka wise extent of depth to water levels during premonsoon (May 2011) of the district has been depicted in **Figure-3.5**.



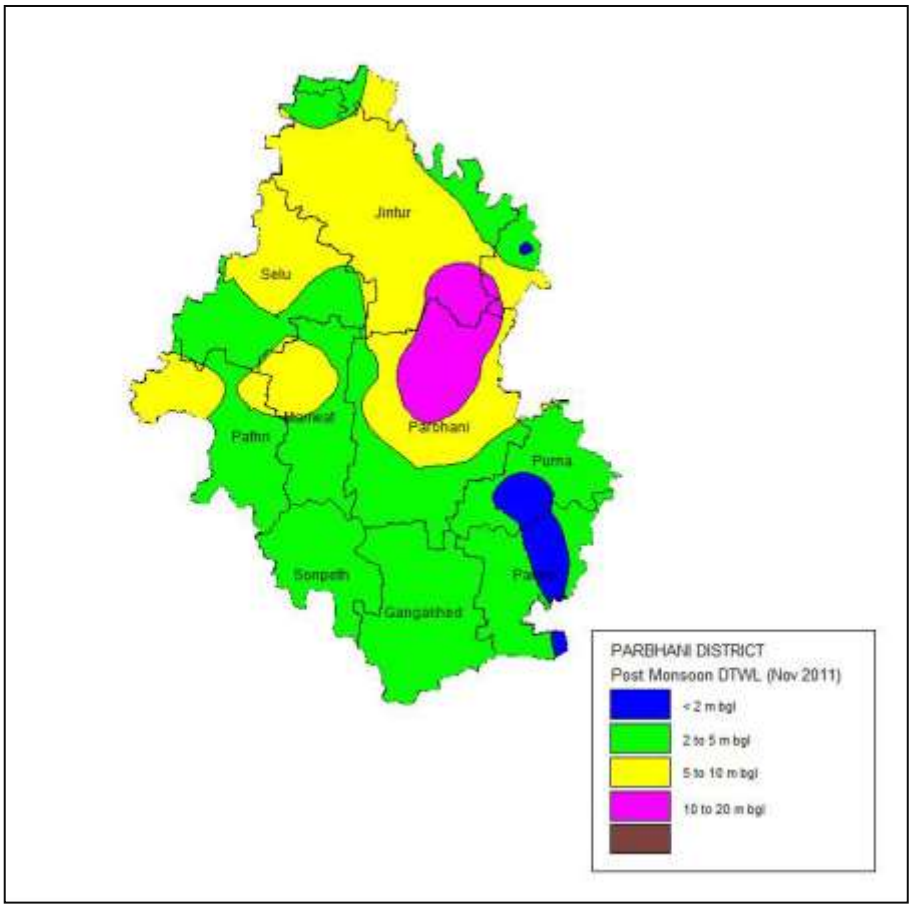
(Ground Water Information Parbhani District, Maharashtra_1786/Dbr/2013)

Figure 3.7(a): Parbhani district Pre-monsoon DTWL

Depth to Water Level – Post monsoon (Nov-2011)

The depth to water levels during post monsoon (Nov. 2011) ranges between 1.30 (Tadkalas) and 14.85 (Dhrmapuri 2). The NHNS at Tadkalas, Anjanwadi, Gojegaon is

showing the shallowest depth to water level i.e. less than 2 mbgl. The shallow water levels within the range of 2-5 m bgl are observed at 7 NHNS i.e. at Kotamwadi, Babhulgaon, selu, Narwadi, Kerwadi, Pedgaon, Walur. Water level within 5 to 10 m bgl are observed in the major part of the district. 7 NHNS located at Shingnapur, Mankeshwar, Jintur, Manwat, Hadgaon, Kausdi, Chikhalthana are showing this particular range of water level. The water levels in the range of 10 to 20 mbgl are seen in the form of patch in the central part of the district. The NHNS at Asegaon and Dharmapuri are falling in this range. The Talukawise spatial variation of the water level in the district in Postmonsoon (November 2011) period is shown in **Figure 3.6**



(Ground Water Information Parbhani District, Maharashtra_1786/Dbr/2013)

Figure 3.7(b): Post monsoon in Parbhani district

3.6 Topography

The study area is mostly plains.

3.7 Land use pattern

Land use is characterized by the arrangements, activities and inputs people undertake in a certain land cover type to produce, change, or maintain it. Definition of land use in this way establishes a direct link between land cover and the actions of people in their environment.

"Grassland" is a cover term, while "rangeland" or "tennis court" refer to the use of a grass cover; and "Recreation area" is a land use term that may be applicable to different land cover types: for instance sandy surfaces, like a beach; a built-up area like a pleasure park; woodlands; etc.

3.7.1 Land Cover of the study area

Land cover is the observed (bio) physical cover on the earth's surface. When considering land cover in a very pure and strict sense, it should be confined to the description of vegetation and man-made features. Consequently, areas where the surface consists of bare rock or bare soil are land itself rather than land cover. Also, it is disputable whether water surfaces are real land cover. However, in practice, the scientific community usually includes these features within the term land cover.

Land Use/Land cover for 10 km radius from project site of were delineated based on the Landsat ETM + satellite data; the land use/Land cover classes are categorized based on the ground trothing and site visit. The land is classified in vegetation, barren land, Built up area and water body etc. classes, detailed distribution of units showing in the below map, table and graph.

These images provide the information about the land use pattern of the study area. The different color represents the settlement or built up land Vegetation (include Agriculture and forest) area, barren Land and water bodies.

3.8 Seismology

Bureau of Indian Standards (BIS) has prepared a seismic zoning map of India based on tectonic features and records of past earthquakes. Approx. 59% of the land area of India is liable to seismic hazard damage. In India, seismic zones are divided into four zones i.e. II, III, IV and V.

Zone – V: Very High Risk Zone
Zone – IV: High Risk Zone
Zone – III: Moderate Risk Zone
Zone – II: Low Risk Zone

The site is located in Zone-II (Least active zone) as per the seismic map given below

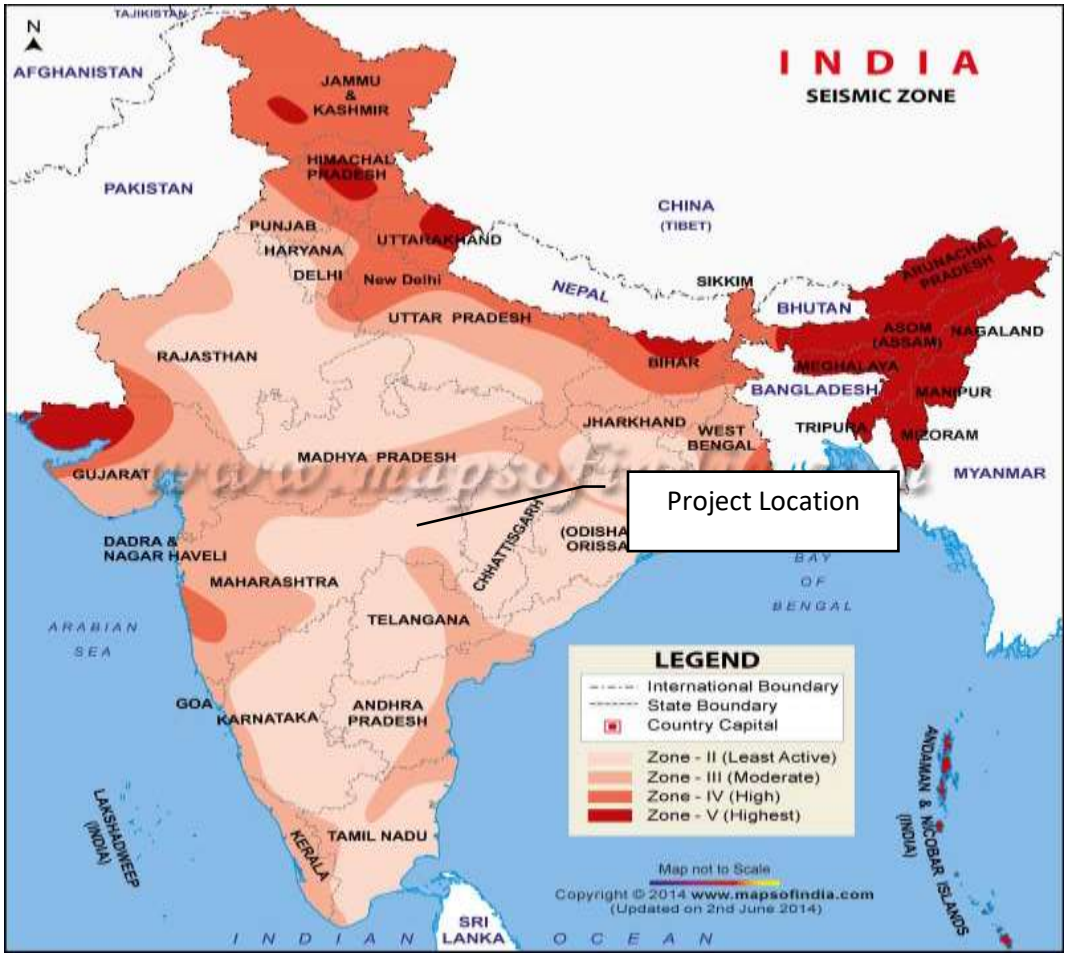


Figure 3.10: Seismic Zone map

3.9 Climatic Condition & Meteorology

Parbhani climate is classified as warm and temperate. The district experience semi-arid climate with extreme summer.

3.9.1 Methodology

Secondary data from already published literature of National Data Centre of Indian Meteorological Department, have been utilized to establish the general meteorological pattern.

3.9.2 Average Meteorological Condition (Source: IMD)

The IMD observatory is installed in the compound of the Divisional Engineer's residence, Parbhani. Surrounding area is flat, open land. Wind instruments are located on a masonry tower; exposure good. It is at an approx. aerial distance of 25 km towards the North east direction from the project site. The height of installation is 664 m above MSL and 11 m from ground. The

average of meteorological data of IMD observatory is presented in **Table 3.3.** The wind rose diagram of the study period is given as **Figure 3.10.**

Table 3.3: Average of meteorological data

Month	Temperature (°C)		Relative Humidity (%)		Pre-dominant Wind Direction	Mean Wind Speed (Kmph)	Precipitation (mm) Monthly total
	High.	Low	Max.	Min.			
January	33.2	9.7	63	38	NE,SW, W, NW	2.2	8.3
February	36.4	12.1	50	29	NE,SW, W, NW	3	3.3
March	40.3	15.7	41	24	NW,W,SW,NE	3.5	14.3
April	43.1	19.9	36	21	NW,W,SW,NE	4.5	6.1
May	44.3	22.7	43	23	NW,W,SW,NE	6.5	20
June	42.3	21.9	69	48	SW,W,NW,NE	7.9	163
July	35.3	21.3	80	65	SW,W,NW,N	6.3	245.6
August	33.9	21.2	83	69	W,SW,NW,NE	5.4	240.1
September	34.8	20.9	81	66	W,SW,NW,N	4	159.7
October	35	15.5	70	53	NE,W,NW,SW	2.7	81.7
November	33	11.9	63	58	NE,E,SE,SW	2.4	15.4
December	31.8	9.6	62	44	NE,E,SE,SW	2	5.3
Annual Total mean	44.4	8.8	62	44	W,SW,NW,NE	4.2	962.8

(IMD climatological normal 1981 - 2010)

3.9.3 Temperature

The summer season from March to May is one with continuous increase in temperatures which decreases during monsoon, increases slightly during the post monsoon season and again decreases during the winter. Highest recorded max temp in history was 46.6 °C and highest recorded minimum temperature was recorded at 4.4°C in the month of January.

3.9.4 Relative Humidity

The climate of the region is characterized by general dryness except during south west monsoon season. Humidity is usually high during the monsoon months, with average relative humidity 21-83 %. Humidity decreases gradually during the post monsoon months and for rest of the year.

3.9.5 Precipitation

The annual rainfall is received during the southwest monsoon season i.e. from June to October, August being the month with highest rainfall. The total monthly annual rainfall observed from the IMD data is 962.8 mm (***IMD climatological table***).

3.9.6 Wind Speed and Wind Direction

Data obtained from the project site are in agreement with the data of previous years available from secondary source.

The wind rose diagram reveals that wind was blowing predominantly from West, East and ENE direction having speed in the range of 2-3 m/s during the monitoring period with frequency of calm winds. Wind rose graphically shown in Fig 3.9.

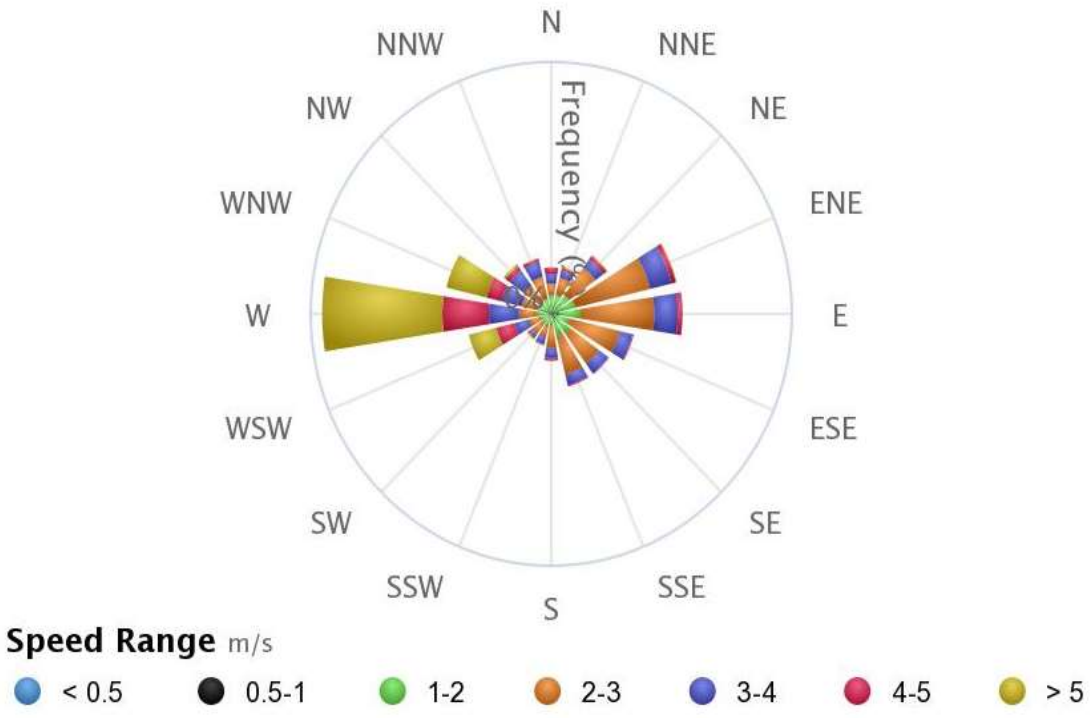


Figure 3.11: **Wind rose diagram (Annual wind rose)**

3.10 Ambient Air Quality

Samples were collected in the 10 km study area to observe pollution trends throughout the region. It helps in providing a data base for evaluation of effects of a project activity in that region. The various sources of air pollution in the present area are nearby industries and agricultural land.

Methodology

- The air quality monitoring study was conducted keeping the following points into consideration.
- Meteorological conditions on synoptic scale; i.e. after considering the pre-dominant wind direction
- Two locations in the upwind direction
- Two locations in the downwind direction
- Population zone and sensitive receptors

Table 3.4: Methodology for AAQM

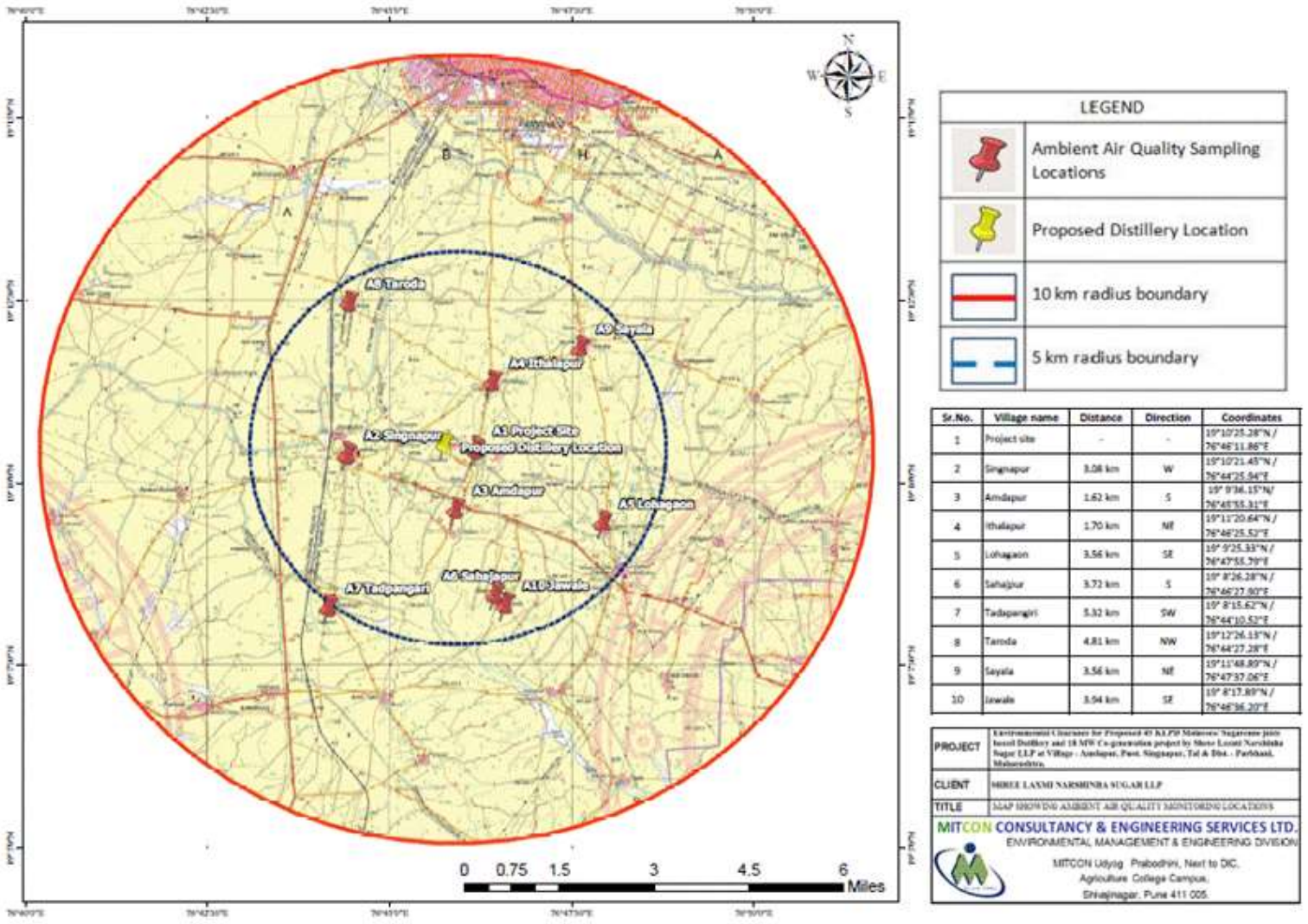
Parameter	Monitoring Equipment's	Analytical Method	Min. Detectable limit	Technical Protocol
PM_{10}	Fine Dust sampler	IS 5182 (Part 23) :2006, RA-2012	10 µg/m^3	Reparable Suspended Particulate Matter (PM 10) gravimetric method
$PM_{2.5}$	Fine Dust sampler	Guidelines for the measurement of Ambient Air pollutant Vol. I,2011(CPCB Guidelines)	10 µg/m^3	Reparable Suspended Particulate Matter (PM 2.5) gravimetric method
NO_x	Gaseous sampler	IS 5182 (Part VI) : 2006, RA-2012	5 µg/m^3	Modified Jacob & Hochheiser (Na-Arsenate) method
SO_2	Gaseous sampler	IS 5182 (Part II) : 2001, RA-2012	5 µg/m^3	Improved West and Geake method

Sampling location & frequency

Ambient air quality of the study area has been assessed during winter period of Oct 2019 to Dec 2019 through a network of 19 ambient air quality stations within an area of 10 km region around the project site and including the project site. The sampling was done continuously for 24 hours for SO_2, NOx, and PM_{10} & $PM_{2.5}$ with a frequency of twice a week for three months (24 observations for one location). The air monitoring locations are shown in **Figure 3.11** and **Table 3.5** and the results have been shown in **Table 3.6**

Table 3.5: Air sampling locations

Sr.No.	Village name	Distance	Direction	Wind type	Coordinates
1.	Project site	-	-		19°10'25.28"N 76°46'11.86"E
2.	Singnapur	3.08 km	W	DW	19°10'21.45"N 76°44'25.94"E
3.	Amdapur	2.12		CW	19° 9'17.39"N, 76°45'51.72"E
4.	Ithalapur	1.70 km	NE	CW	19°11'20.64"N , 76°46'25.52"E
5.	Lohagaon	3.56 km	SE	CW	19° 9'25.33"N , 76°47'55.79"E
6.	Sahajpur	3.72 km	S	CW	19° 8'26.28"N , 76°46'27.90"E
7.	Tadapangiri	5.32 km	SW	CW	19° 8'15.62"N , 76°44'10.52"E
8.	Taroda	4.81 km	NW	CW	19°12'26.13"N , 76°44'27.28"E
9.	Sayala	3.56 km	NE	CW	19°11'48.89"N , 76°47'37.06"E
10.	Jawale	3.94 km	SE	CW	19° 8'17.89"N , 76°46'36.20"E



Sr.No.	Village name	Distance	Direction	Coordinates
1	Project site	-	-	19°10'25.28"N / 76°46'11.86"E
2	Singnapur	3.08 km	W	19°10'21.45"N / 76°44'25.94"E
3	Amdapur	1.62 km	S	19° 9'36.15"N/ 76°45'55.31"E
4	Ithalapur	1.70 km	NE	19°11'20.64"N / 76°46'25.52"E
5	Lohagaon	3.56 km	SE	19° 9'25.33"N / 76°47'55.79"E
6	Sahajpur	3.72 km	S	19° 8'26.28"N / 76°46'27.90"E
7	Tadapangiri	5.32 km	SW	19° 8'15.62"N / 76°44'10.52"E
8	Taroda	4.81 km	NW	19°12'26.13"N / 76°44'27.28"E
9	Sayala	3.56 km	NE	19°11'48.89"N / 76°47'37.06"E
10	Jawale	3.94 km	SE	19° 8'17.89"N / 76°48'36.20"E

Figure 3.12: Air quality sampling location

Table 3.6: Ambient Air analysis results

Statistical parameter	$PM_{2.5}$ ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	CO mg/m^3	Total HC ppm
A1- Project Site						
Minimum	15.1	45.3	9.2	11.8	ND	ND
Maximum	22.2	58.3	12.7	16.2	ND	ND
Average	18.3	52.3	11.1	14.2	ND	ND
98th Percentile	21.3	57.4	12.7	16.1	ND	ND
A2- Singnapur						
Minimum	14.7	45.3	9.0	12.6	ND	ND
Maximum	20.9	55.8	15.0	18.7	ND	ND
Average	17.9	50.4	11.2	15.6	ND	ND
98th percentile	20.8	55.5	14.3	18.5	ND	ND
A3- Amdapur						
Minimum	17.0	43.6	9.0	12.6	ND	ND
Maximum	22.5	54.9	15.0	18.7	ND	ND
Average	19.3	50.0	11.2	15.6	ND	ND
98^{th} percentile	22.4	54.6	14.3	18.5	ND	ND
A3- Ithalapur						
Minimum	15.5	42.2	7.4	11.3	ND	ND
Maximum	21.8	58.7	11.3	17.6	ND	ND
Average	17.9	50.2	9.3	14.0	ND	ND
98^{th} percentile	21.7	58.1	11.3	17.5	ND	ND
A4- Lohagaon						
Minimum	16.1	39.8	8.6	10.8	ND	ND
Maximum	23.6	56.3	12.3	16.1	ND	ND
Average	19.3	49.0	10.5	13.1	ND	ND
98^{th} percentile	23.1	56.2	12.2	15.8	ND	ND
A5- Sahajapur						
Minimum	16.1	42.7	6.9	10.2	ND	ND
Maximum	20.3	52.5	11.5	15.6	ND	ND
Average	18.5	48.6	9.2	12.9	ND	ND
98^{th} percentile	20.3	52.5	11.3	15.4	ND	ND
A6- Tadpangari						
Minimum	15.9	40.7	7.2	9.6	ND	ND
Maximum	21.7	54.2	11.7	16.4	ND	ND
Average	17.8	45.4	9.4	12.9	ND	ND
98^{th} percentile	20.9	51.7	11.4	16.4	ND	ND
A7- Taroda						
Minimum	15.6	39.5	6.4	9.3	ND	ND
Maximum	22.5	52.6	11.0	14.3	ND	ND
Average	17.8	45.4	8.8	12.0	ND	ND
98^{th} percentile	22.0	51.2	10.9	14.3	ND	ND
A8- Sayala						

Minimum	14.2	37.4	6.1	10.5	ND	ND
Maximum	18.6	49.0	13.3	16.8	ND	ND
Average	16.7	43.5	10.6	14.2	ND	ND
98th percentile	18.6	47.9	12.9	16.5	ND	ND
A9- Jawale						
Minimum	14.7	40.7	7.6	11.4	ND	ND
Maximum	20.9	50.7	12.4	15.5	ND	ND
Average	18.6	46.4	9.7	13.2	ND	ND
98th percentile	20.9	50.2	12.2	15.3	ND	ND
NAAQS standards 2009, Ministry of Environment & Forest, Gov. of India						
Industrial, Residential and Rural Areas	**60 (24 hr.)**	**100 (24 hr.)**	**80 (24 hr.)**	**80 (24 hr.)**	**4 (1 hr.)**	-

Interpretation

Particulate matter emission (PM_{10}& $PM_{2.5}$): After completion of baseline survey it was found that all ambient air quality parameters are within the NAAQ standards of Central Pollution Control Board. At project site found that high percentage of particulate matter as compared to other monitoring locations as it Is densely populated area and vehicular movement and local activity are higher compare to other.

SO_2 emission: SO_2 emission was high at Project site and **Singnapur** due to flow of vehicles.

NO_x emission: NOx values are high at Project site and **Singnapur** At all monitoring location NOx is within the NAAQ standards Nitrogen dioxide is a large scale pollutant, with rural background ground level concentrations in some extent.

3.11 Ambient noise monitoring results

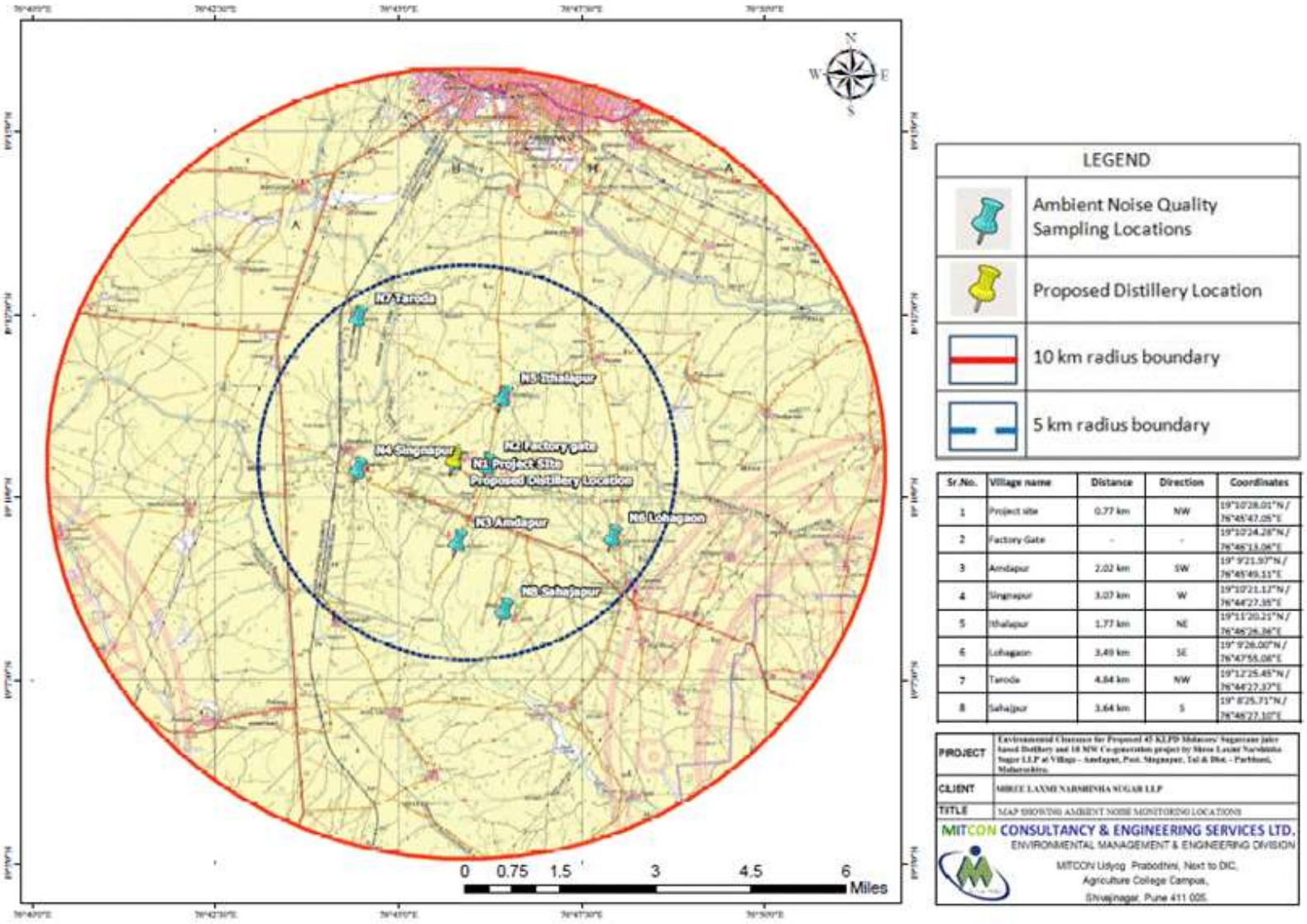
Ambient noise standards are prescribed for residential, commercial and industrial areas and silence zone vide 'The Noise Pollution (Regulation and control) Rules, 2000, notified by the MoEF&CC on February 14, 2000 and amended thereof. The ambient noise standards have been stipulated during day time (6 am to 9 pm) and night time (9 pm to 6 am) keeping in the view the different sensitive and the resultant impacts at community level during these periods. The ambient noise levels were monitored at selected villages within the study area during day and night time covering residential, commercial/industrial and silence zones. Background noise levels were measured at the project site and surrounding villages by standard- noise- level- meter for 24 hours. Equivalent noise levels during day (0800-2100 hrs) Ld, night (2100-0700 hrs) Ln and the equivalent noise levels for day & night, the Ldn values were calculated.

- Site visit and identification of sources of noise
- Identifying monitoring locations and conducting noise monitoring
- Determining possible impacts of noise on the environment from proposed activities
- Suggestions of mitigation measures of noise and to reduce noise of sources exceeding the allowable limits

The Noise quality monitoring Station presented in Figure 3.11 & observed noise level is described in Table 3.7.

Table 3.7: Noise level monitoring locations

Sr.No.	Village name	Distance	Direction	Coordinates
1.	Project site	0.77 km	NW	19°10'28.01"N, 76°45'47.05"E
2.	Factory Gate	-	-	19°10'24.28"N, 76°46'13.06"E
3.	Amdapur	2.02 km	SW	19° 9'21.97"N, 76°45'49.11"E
4.	Singnapur	3.07 km	W	19°10'21.12"N, 76°44'27.35"E
5.	Ithalapur	1.77 km	NE	19°11'20.21"N, 76°46'26.36"E
6.	Lohagaon	3.49 km	SE	19° 9'26.00"N, 76°47'55.08"E
7.	Taroda	4.84 km	NW	19°12'25.45"N, 76°44'27.37"E
8.	Sahajpur	3.64 km	S	19° 8'25.71"N, 76°46'27.10"E



Sr.No.	Village name	Distance	Direction	Coordinates
1	Project site	0.77 km	NW	19°10'28.01"N / 76°45'47.05"E
2	Factory Gate	-	-	19°10'24.28"N / 76°46'13.06"E
3	Amdapur	2.02 km	SW	19° 9'21.97"N / 76°45'49.11"E
4	Singnapur	3.07 km	W	19°10'21.12"N / 76°44'27.35"E
5	Ithalapur	1.77 km	NE	19°11'20.21"N / 76°46'26.26"E
6	Lohagaon	3.49 km	SE	19° 9'26.00"N / 76°47'55.08"E
7	Tarodi	4.84 km	NW	19°12'25.45"N / 76°44'27.37"E
8	Sahajpur	3.64 km	S	19° 8'25.71"N / 76°46'27.10"E

PROJECT	Environmental Clearance for Proposed 45 KLPD Molasses/ Sugarcane juice based Distillery and 18 MW Co-generation project by Shree Laxmi Narshinha Sugar LLP at Village - Amdapur, Post. Singnapur, Tal & Dist. - Parbhani, Maharashtra.
CLIENT	SHREE LAXMI NARSIMHA SUGAR LLP
TITLE	MAP SHOWING AMBIENT NOISE MONITORING LOCATIONS

MITCON CONSULTANCY & ENGINEERING SERVICES LTD.
ENVIRONMENTAL MANAGEMENT & ENGINEERING DIVISION
MITCON Udyog Prabodhini, Next to DIC, Agriculture College Campus, Shivajinagar, Pune 411 005.

Figure 3.12: Noise sampling locations

Results

The results of all eight noise monitoring stations are summarized in the below Table 3.8.

Table 3.8: Results of noise monitoring

Station codes	Location	Equivalent noise level, Leq in dB (A)		CPCB permissible limits	
		Day Time	Night Time	Day Time	Night Time
N1	Project site	62.8	61.2	75	70
N2	Factory Gate	65.7	61.8	75	70
N3	Amdapur	48.2	44.1	55	45
N4	Singnapur	49.2	41.3	55	45
N5	Ithalapur	46.1	40.8	55	45
N6	Lohagaon	44.5	40.1	55	45
N7	Taroda	50.1	41.4	55	45
N8	Sahajpur	47.4	39.8	55	45

Interpretation

The above results are within the CPCB Standards. The minimum noise level 39.8 dB (A) and the maximum noise level 50.1 dB (A) were observed in rural residential area. The relative high values of noise recorded in factory premises i.e. 65.7 dB (A).

3.12 Water Quality

The surface and ground water quality of the project area may get affected due to various factors like sediment and natural organic materials, Nutrients, Bacteria, Toxic substances. These contaminants can contribute to water by either point or non-point sources. Point sources contribute contaminants at a discrete site, such as the outflow from a pipe, ditch, well, leakages in storage lagoon, storage of solid waste etc. These sources can be controlled to by treatment at or before the point of discharge. Non-point sources include the atmosphere, agricultural areas, golf courses, residential developments, roads, parking lots, and contributions from groundwater along lengthy reaches of streams.

Assessment of baseline data on water environment (surface and ground) includes

- Identification of surface water sources
- Identification of ground water sources
- Collection of water samples
- Analyzing water samples for physio-chemical and biological parameters

Methodology

Assessment of water quality in the study area includes the water quality testing and assessment as per the Indian standard IS 10500:2012 (drinking water standard).

3.12.1 Surface Water

Sampling location & frequency

Surface water samples were collected from two different locations within the study area as shown in Table 3.9 and Figure 3.13 once in December 2019.

Table 3.9: Surface water sampling locations

Stations	Location	Dist. km	Dire.	Geo Coordinates	Type
SW1	Lake adjacent to Factory	0.22	SE	19°10'21.39"N , 76°46'16.71"E	Lake
SW2	Canal near Factory	1.15 km	SW	19°10'16.76"N , 76°45'32.81"E	Canal

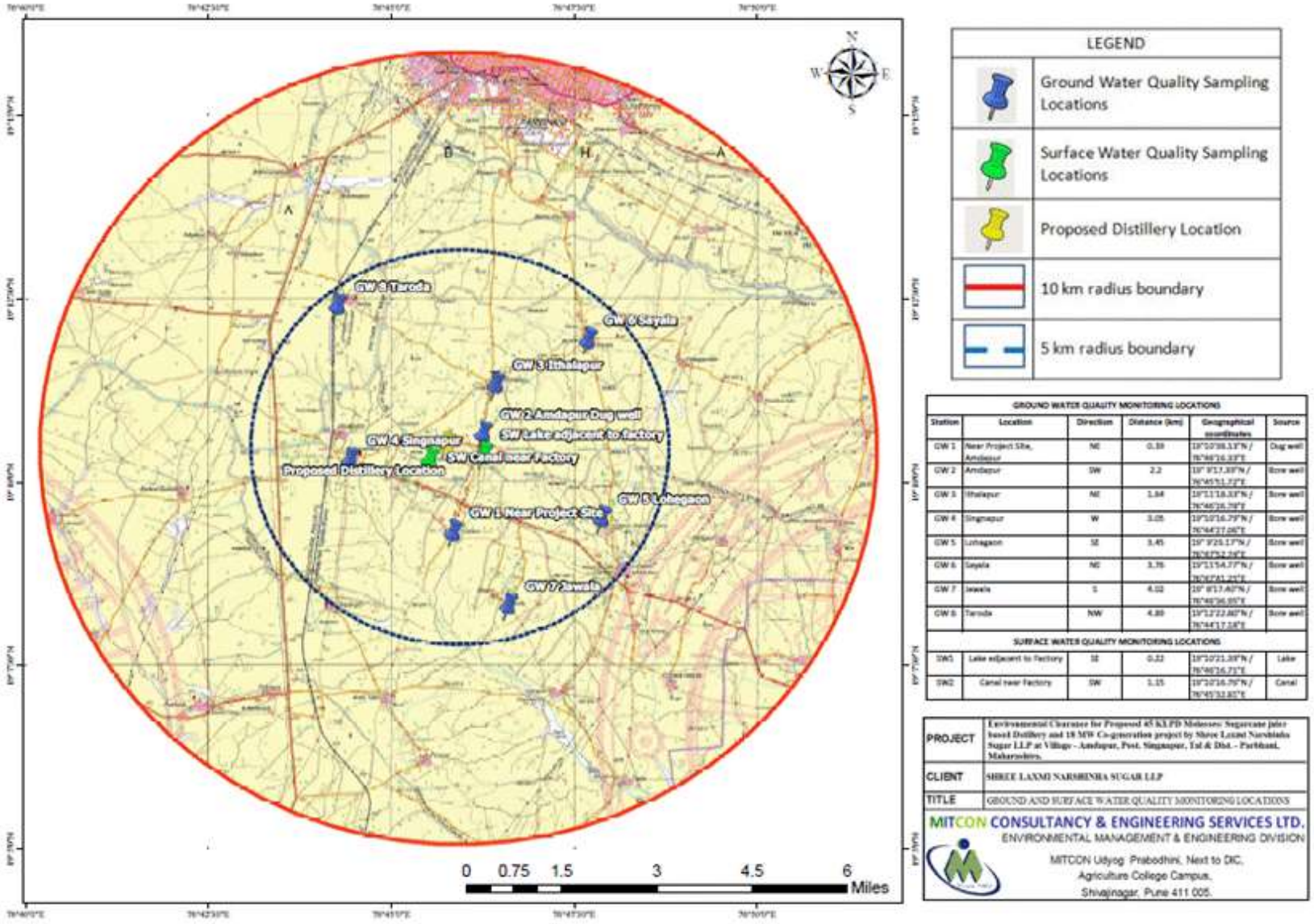


Figure 3.14: Water sampling location

Results

Surface water quality analysis report

The result of the surface water monitoring station is summarized below

Table 3.10 Surface water analysis

Sr.No.	Parameters	SW1	SW2	Unit	IS 10500:2012
	Chemical Potability			**Unit**	
1.	pH at 25 °C	7.27	7.09	-	6.50 to 8.50
2.	Electrical Conductivity at 25 °C	26.1	26.0	µS/cm	N.S.
3.	Turbidity	242.0	282.0	NTU	≤ 1
4.	Total Dissolved Solids	<1	<1	mg/l	≤ 500
5.	Total Solids	157.0	184.0	mg/l	N.S.
6.	Acidity as $CaCO_3$	158	186	mg/l	N.S.
7.	Total Alkalinity as $CaCO_3$	<5	<5	mg/l	≤ 200
8.	Total Hardness as $CaCO_3$	88	92.0	mg/l	≤ 200
9.	Calcium as Ca	90.07	95.07	mg/l	≤ 75
10.	Magnesium as Mg	14.42	18.43	mg/l	≤ 30
11.	Chloride as Cl^-	13.12	11.91	mg/l	≤ 250
12.	Sulphates as SO_4	24.63	15.27	mg/l	≤ 200
13.	Nitrate as NO3	20.0	11.95	mg/l	≤ 45
14.	Ammonical Nitrogen as NH_4-N	6.94	7.65	mg/l	N.S.
15.	Total Kjeldahl Nitrogen as NH3-N	<0.1	<0.1	mg/l	N.S.
16.	salinity	<1	<1	ppt	N.S.
17.	Fluoride as F	0.044	0.027	mg/l	≤ 1.0
18.	Total Phosphorous	<0.1	<0.1	mg/l	N.S.
19.	Silica as SiO_3	<1	<1	mg/l	N.S.
20.	Sodium as Na	1.43	2.54	mg/l	N.S.
21.	Potassium as K	03	09	mg/l	N.S.
22.	Hexavalent Chromium (as Cr6+)	01	03	mg/l	N.S.
23.	Iron (as Fe)	<0.02	<0.02	mg/l	≤ 0.3
24.	Copper (as Cu)	<0.05	<0.05	mg/l	≤ 0.05
25.	Nickel	<0.04	<0.04	mg/l	≤ 0.01
26.	Zinc as Zn	<0.01	<0.01	mg/l	≤ 5
27.	Manganese	<0.05	<0.05	mg/l	≤ 0.1
28.	Chromium	<0.1	<0.1	mg/l	≤ 0.05
29.	Lead	<0.03	<0.03	mg/l	≤ 0.01
30.	cadmium	<0.01	<0.01	mg/l	≤ 0.003
31.	Phenol	<0.003	<0.003	mg/l	≤ 0.001
32.	Biochemical Oxygen Demand	<0.001	<0.001	mg/l	N.S
33.	Chemical Oxygen Demand	<1	<1	mg/l	N.S
34.	Dissolved Oxygen	<5	<5	Mg/l	N.S
35.	Boron	4.8	5.3	Mg/l	≤ 0.5
1.	Total Coliforms	<0.5	<0.5	MPN/100 ml	Absent
2.	Fecal coliform	125	110	MPN/100 ml	Absent

Inference

The pH were observed to be in the range of (7.0- 7.2). Total dissolved solids, total hardness and alkalinity was found to be within the permissible limit. The above chemical analysis reveals that water from lake water and canal contain total coliforms and fecal coliform hence is not suitable for not drinking purpose. Rest all the constituents are within the permissible limits prescribed for drinking water standards promulgated by Indian Standards (10500: 2012).

3.12.2 Ground water sampling location & frequency

Ground water samples were collected from nine different locations within the study area as shown in Table 3.11 and Figure 3.13 in Dec 2019.

Table 3.11 Ground water sampling location

Sampling Stations	Location	Dire.	Aerial distance (km)	Geographical coordinates	Sample source
GW 1	Near Project Site, Amdapur	NE	0.39	19°10'38.13"N / 76°46'16.33"E	Dug well
GW 2	Amdapur	SW	2.20	19° 9'17.39"N / 76°45'51.72"E	Bore well
GW 3	Ithalapur	NE	1.64	19°11'18.33"N / 76°46'26.78"E	Bore well
GW 4	Singnapur	W	3.05	19°10'16.79"N / 76°44'27.06"E	Bore well
GW 5	Lohagaon	SE	3.45	19° 9'29.17"N / 76°47'52.74"E	Dug well
GW 6	Sayala	NE	3.76	19°11'54.77"N / 76°47'41.25"E	Bore well
GW 7	Jawala	S	4.02	19° 8'17.40"N / 76°46'36.95"E	Bore well
GW 8	Taroda	NW	4.89	19°12'22.80"N / 76°44'17.18"E	Dug well

Table 3.12: Results of ground water sampling

Parameters	Unit	IS 10500:2012	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
pH at 25 ^oC	-	6.50 to 8.50	7.08	7.39	7.29	7.12	7.54	7.19	7.31	7.63
Electrical Conductivity 25^oC	µS/cm	N.S.	358	702.1	737.0	767.4	603.1	488.0	802.4	490.0
Turbidity	NTU	≤ 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Dissolved Solids	mg/l	≤ 500	252.0	445.0	464.0	495	370.0	324	494	349.0
Total Solids	mg/l	N.S.	254	447.0	466.0	434	373	325	432	352.0
Total Suspended Solids	mg/l	N.S	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Acidity as $CaCO_3$	mg/l	N.S.	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total Alkalinity as $CaCO_3$	mg/l	≤ 200	104	128.0	132	140.0	130.0	112.0	145.0	115.0
Total Hardness as $CaCO_3$	mg/l	≤ 200	113.09	170.13	175.14	180.14	174.13	116.09	195.15	130.10
Calcium as Ca	mg/l	≤ 75	22.44	36.87	40.08	50.1	50.1	16.83	47.69	25.65
Magnesium as Mg	mg/l	≤ 30	13.85	18.96	18.23	13.37	11.91	17.98	18.47	16.04
Chloride as Cl^-	mg/l	≤ 250	25.62	35.47	52.23	40.4	32.02	39.42	58.14	30.55
Sulphates as SO_4	mg/l	≤ 200	23.47	45.0	47.93	55.43	35.0	30.97	48.04	29.45
Nitrate as NO_3	mg/l	≤ 45	7.30	10.15	10.68	11.93	8.01	5.69	12.82	7.48
Ammonical Nitrogen as NH_4-N	mg/l	N.S.	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Total Kjeldahl Nitrogen NH3-N	mg/l	N.S.	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Salinity	ppt	N.S.	0.046	0.064	0.094	0.072	0.057	0.071	0.10	0.055
Fluoride as F	mg/l	≤ 1.0	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.01
Total Phosphorous	mg/l	N.S.	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Silica as SiO_3	mg/l	N.S.	2.23	9.36	10.81	10.27	2.15	2.15	13.60	2.07
Sodium as Na	mg/l	N.S.	14.0	18	24	22	11	29	26.0	17
Potassium as K	mg/l	N.S.	4.0	01	3.0	02	02	03	2.0	01
Hexavalent Chromium (Cr6+)	mg/l	N.S.	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Iron (as Fe)	mg/l	≤ 0.3	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Copper (as Cu)	mg/l	≤ 0.05	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Nickel	mg/l	≤ 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Zinc as Zn	mg/l	≤ 5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Manganese	mg/l	≤ 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chromium	mg/l	≤ 0.05	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Lead	mg/l	≤ 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cadmium	mg/l	≤ 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Phenol	mg/l	≤ 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Total Coliforms	MPN/100 ml	Absent	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Faecal coliform	MPN/100 ml	Absent	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2

Results

The results of all 8 ground water monitoring stations are summarized in the above Table 3.12.

Inference

- Total dissolved solids at all sampling location GW1-GW8 is found in the range of 252-495 mg/l.
- Total alkalinity is in the range of 104-145 mg/l.
- Heavy metals are not detected in all the samples.

3.13 Soil Environment

Soil is the unconsolidated material on the earth surface that serves as a natural medium for plant growth. Medium black and deep black soil is observed in the project area.

Methodology

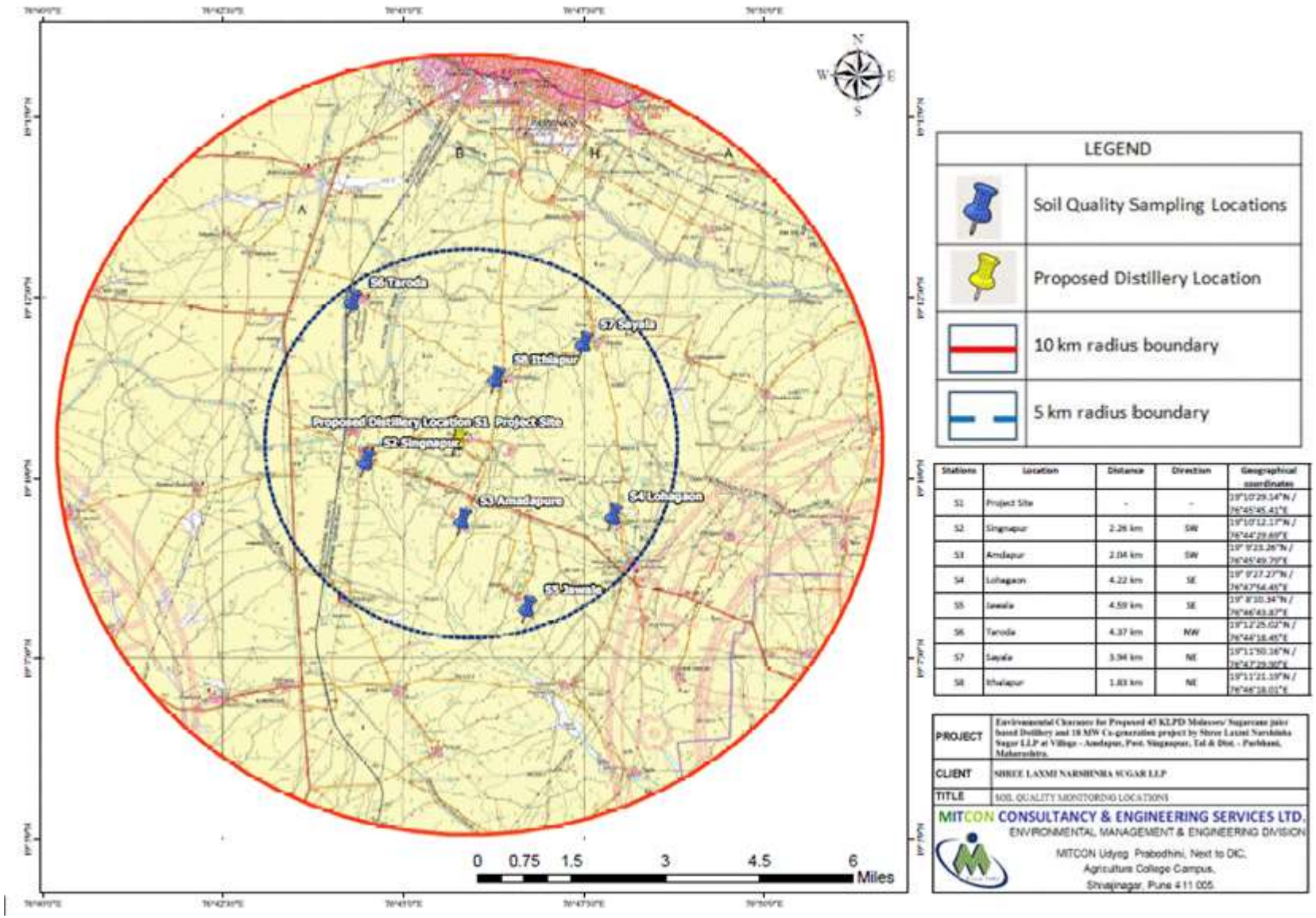
- Site visit and collection of soil sample
- Manual sample collection using hammer and container bags for collecting undisturbed top soil.
- Sample was taken from the surface to plough depth 0-22 cm
- Recently fertilized, old bunds, marshy spots, near trees, compost heaps and farm sheds etc. these locations are avoided at the time of sampling.
- Each Sample collected was a uniformly thick 2 cm slice of soil from the exposed soil face V in shaped hole.

Sampling location & frequency

Soil samples were collected from eight different locations within the study area as shown in Table 3.13 and Figure 3.14 in Dec 2019.

Table 3.13: Soil sampling locations

Stations	Location	Distance	Direction	Geographical coordinates
S1	Project Site	-	-	19°10'29.14"N / 76°45'45.41"E
S2	Singnapur	2.26 km	SW	19°10'12.17"N / 76°44'29.69"E
S3	Amdapur	2.04 km	SW	19° 9'23.26"N / 76°45'49.79"E
S4	Lohagaon	4.22 km	SE	19° 9'27.27"N / 76°47'54.45"E
S5	Jawala	4.59 km	SE	19° 8'10.34"N / 76°46'43.87"E
S6	Taroda	4.37 km	NW	19°12'25.02"N / 76°44'18.45"E
S7	Sayala	3.94 km	NE	19°11'50.16"N / 76°47'29.90"E
S8	Ithalapur	1.83 km	NE	19°11'21.19"N / 76°46'18.01"E



Stations	Location	Distance	Direction	Geographical coordinates
S1	Project Site	-	-	19°10'29.14"N / 76°45'45.41"E
S2	Singnapur	2.26 km	SW	19°10'12.17"N / 76°44'29.69"E
S3	Amdapur	2.04 km	SW	19° 9'23.26"N / 76°45'49.79"E
S4	Lohagaon	4.22 km	SE	19° 9'27.27"N / 76°47'56.45"E
S5	Jawala	4.59 km	SE	19° 8'10.34"N / 76°46'43.82"E
S6	Tarodа	4.37 km	NW	19°12'25.02"N / 76°44'18.45"E
S7	Sayala	3.94 km	NE	19°11'50.16"N / 76°47'29.30"E
S8	Ithalapur	1.83 km	NE	19°11'21.19"N / 76°46'18.01"E

Figure 3.15: Soil sampling location

Results

The results of all eight soil monitoring stations are summarized in the below Table 3.14.

Table 3.14: Results of soil sampling

Characteristics	Unit	S1	S2	S3	S4	S5	S6	S7	S8
Texture	-	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Sandy loam	Sandy loam	Silty loam	Clay Loam
Percentage of different components									
Sand	%	27	25	30	33	25	32	28	32
Silt	%	33	37	35	28	30	35	35	25
Clay	%	40	38	35	39	45	33	37	33
Soil Moisture	%	6.18	7.13	8.02	7.55	6.74	7.54	9.23	9.02
Bulk Density	g/cm^2	1.37	1.14	1.27	1.54	1.32	1.28	1.24	1..29
Water Holding Capacity	%	39.4	36.3	37.1	35.2	34.7	35.9	36.9	37.6
pH	--	8.02	8.13	7.98	8.23	8.33	8.15	8.20	8.27
Conductivity	µs/cm	712.8	1013.2	941.6	989.4	868.3	1090.8	1500.8	1326.3
Organic Carbon	%	0.42	0.30	0.36	0.46	0.54	0.50	0.38	0.52
Calcium (as Ca)	mg/kg	128.4	137.6	145.5	133.3	117.2	121.5	141.6	139.4
Magnesium (as Mg)	mg/kg	60.2	44.3	55.1	40.1	38.7	41.6	50.2	48.6
Available Nitrogen	kg/ha	120.1	112.5	115.7	128.4	136.5	126.9	126.4	113.2
Phosphorous (as P)	kg/ha	18.7	22.2	25.2	16.9	20.2	23.2	18.1	16.5
Potassium (as K)	kg/ha	200.4	198.3	187.5	191.5	104.2	189.8	178.5	164.7
Iron (as Fe)	mg/kg	4.23	5.02	3.18	2.72	4.97	3.10	5.10	4.12
Zinc (as Zn)	mg/kg	0.54	0.68	0.72	0.46	0.70	0.55	0.43	0.39
Copper (as Cu)	mg/kg	0.53	0.47	0.39	0.60	0.50	0.38	0.25	0.42
Sodium	mg/kg	45.3	42.4	40.8	38.1	39.6	41.7	43.2	44.2
Manganese (as Mn)	mg/kg	0.59	0.72	0.83	0.64	0.45	0.39	0.60	0.55
Total Chromium (as Cr)	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel (as Ni)	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cadmium (Cd)	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lead (as Pb)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sodium Adsorption Ratio	-	4.66.	4.44	4.07	4.09	4.48	4.61	4.41	4.56

Inference

- All the samples having pH in range of 7.5 to 8.0
- Conductivity of the samples is I n between 712.8 to 1500.8 µmho/cm.
- NPK concentration in all the soil samples are in the range of 112.5 to 136, 16.5 to 25.2, 104.2 to 200.4 kg/ha respectively.
- Heavy metals like Copper, Cadmium, Lead, Boron, Chromium, Manganese, and Molybdenum are not detected in all the samples.
- Overall it is observed that the soils of the region are good for agriculture.

3.14 Traffic Survey

Traffic survey has been conducted for peak and non-peak hours Amdapur village road near to sugar factory. Monitoring was performed in Dec 2019 to predict the future traffic growth and the load on the plant road and surroundings due to the proposed project.

Table 3.15: Traffic Scenario- existing sugar project in crushing season

Time	Type of Vehicle				Total Vehicle
	Cycle, motor cycle or scooter	Passenger car, tempo, Cars, auto rickshaw	Agri. Tractor/ Truck	Bullock cart	
Peak Hours					
9.00 -10.0 am	35	15	85	37	172
10.00-11.0 am	35	10	71	35	151
4.00 -5.0 pm	27	17	82	32	158
5.00 - 6.00 pm	41	14	46	15	116
2.00-3.00 pm	24	7	12	10	53
8.00–9.00 pm	20	5	10	7	42

Table 3.16: Expected Traffic Scenario- due to proposed Project

Time	Type of Vehicle			Total Vehicle
	Cycle, motor cycle / scooter	Passenger car, tempo, Cars, auto rickshaw or agricultural tractor	Agricultural Tractor/ Truck/ Dempo/ Tanker	
Peak Hours				
9.00 -10.00 am	50	35	35	275
10.00-11.00 am	44	40	35	205
4.00-5.00 pm	40	35	35	163

3.15 Ecology Biodiversity

3.15.1 Flora

The floral and faunal studies were conducted in the month of Dec 2019 for the entire project area covering 10 km radial distance from the project site.

Methodology

- Site visit to study the floral and faunal communities within the study area.
- The methodology adopted for faunal survey involves random survey, diurnal bird observation, active search for reptiles and review of previous studies.
- Preparation of Checklist of plant species observed in the area and referring this checklist during site visit
- Visual assessment of the diversity pattern of the floral species.
- Observation for endemic species, threatened species, if any present in the study area.

Terrestrial Ecology - Phytosociological Studies

- For the vegetation study, stratified quadrat sampling method is applied in the project area. The vegetation sampling was carried out at 12 different locations. And each location 3 to 4 quadrat of size 10 X 10 m was taken. The qualitative and Quantitative information such as species richness and diversity, abundance and density and diversity indices were obtained
- References used to identify the representative spectrum of threatened species, population and ecological communities listed by Indian wild Life Protection Act, 1972, ENVIS Database, IUCN Database, Red Data Book. The status of individual species was assessed using the revised IUCN/SSC category system.
- Field reference book namely Common Indian Wild Flower by Issac Kehimkar, Flowers and Further Flowers of Sahyadri by Shrikant Ingalhalikar, Flowers of India (http://www.flowersofindia.net) and Birds of Indian Subcontinent by Richard Grimmett are used for the identification of flora and birds.

Monitoring location & frequency

The baseline study, for the evaluation of the floral and faunal biodiversity of the study area, within 10 km radius from the proposed project has been conducted during Dec 2019.

Observations during site visit

Biogeographic zone of this district falls under the Deccan Peninsula Zone. No Wildlife Sanctuaries or National parks areas exist in 10 km radius of the proposed area.

Based on the survey conducted and during monitoring no any endangered or threatened as per the IUCN Red list have been observed. Tree species name recorded during the site visit and while interacting with local people which are presented in **Table 3.17.**

Table 3.17: Phytosociological Studies of the Project Area (10 km)

SI	Species name	Freq Class	Freq	Den	Abund	IVI
1	*Acacia nilotica* (L) Willd.	C	44	0.44	1	19.01
2	*Prosopis juliflora* (SW.) DC.	D	68	0.68	1	32.59
3	*Azadirachta indica* Linn.	D	64	0.64	1.1	48.56
4	*Acacia catechu* (L.f.) Willd.	B	36	0.36	1.2	14.66
5	*Pongamia pinnata* (L.) Pierre	B	36	0.36	1	12.91
6	*Mangifera indica* L.	B	24	0.24	1	20.31
7	*Acacia leucophloea* (Roxb.) Willd.	B	24	0.24	1	17.24
8	*Ficus religiosa* L.	A	12	0.12	1	10.89
9	*Samanea saman* (Jacq.) Merr.	B	24	0.24	1	9.08
10	*Polyalthia longifolia (Sonn.) Thw.*	A	20	0.2	1.2	7.68
11	*Butea monosperma* L.	B	24	0.24	1	8.62
12	*Ailanthus excelsa* Roxb.	A	16	0.16	1	5.88
13	*Gliricidia sepium* (Jacq.) Kunth.	A	20	0.2	1	6.97
14	*Syzygium cumini* (L.) Skeels	B	36	0.36	1	15.11
15	*Alstonia scholaris* (L.) R.Br	A	8	0.08	1	4.69
16	*Eucalyptus globulus* Labill.	A	8	0.08	1	3.40
17	*Tamarindus indica* L.	B	24	0.24	1	18.46
18	*Ficus racemosa* L.	A	12	0.12	1.3	5.19
19	*Vitex negundo* L.	A	8	0.08	1.5	3.52
20	*Dalbergia latifolia* Roxb.	A	8	0.08	1.0	3.32
21	*Cocos nucifera* L.	A	8	0.08	1.0	4.24
22	*Delonix regia (Hook.) Ref.*	A	20	0.2	1.0	8.19
23	*Ficus benghalensis* L.	A	12	0.12	1.0	6.45
24	*Tectona grandis* L.f.	A	8	0.08	1.0	3.75
25	*Ziziphus jujuba* L.	B	24	0.24	1.2	9.25

The phytosociology study are shows 25 species. The most abundant species is *Prosopis juliflora* (SW.) DC. And *Azadirachta indica* Linn. Shows the 68 % & 64 frequency respectively in the study area and listed under the frequency class D. Next frequent or abundant species is *Acacia nilotica* (L) Willd. having 44 % frequency and categorized under class C, while the others are class A & B having the frequency between 8 to 36 % .

Importance Value Index (IVI)

The IVI is describing the importance of the analyzed species. The results displayed in **Table 3.18**shows that *Azadirachta indica* Linn.is the most important tree species. Since it is mostly found in plant the study area, their relative basal area dominance is leading to an overall high importance. Second most important tree species is *Prosopis juliflora* (SW.) DC. Further more important tree species are *Acacia nilotica* (L) Willd., *Acacia catechu* (L.f.) Willd. *Pongamia pinnata* (L.) Pierre, *Mangifera indica* L., *Acacia leucophloea* (Roxb.) Willd., *Syzygium cumini* (L.) Skeels and *Tamarindus indica* L.

Diversity Index:

Normally, the Shannon index range between 1.5 to 3.5 and rarely goes to 4.5. On the other hand Simpson's Index ranges from 0 to 1 wherein values near 0 indicates fewer species and higher abundance while values closer to 1 indicates many species with low abundances. In the study area the Simpson's Index (D) is 0.05 whereas Shanon Index (H) is 2.22.

Since, it is concluded that the Simpson Index is close to value zero, It indicates that more species & low abundance of species.

3.15.1.1 Farm lands Vegetation

Sorghum, Redgram, Bengalgram, Soyabean, Black gram, Kapus, Greengram, Sugarcane, Sun flower, Kardai/ Saffflower, Wheat are the major crops of the district. Onion, Tomato, Mango, Brinjal, Tamarind, Ginger etc. are horticultural crops.

3.15.2 Faunal Studies

Faunal studies were restricted to major groups such as reptiles, birds, and mammals. For preparation of the checklist of fauna of the project area, direct sightings during various baseline studies, discussion with local communities regarding presence or absence of species and literature studies were taken into consideration. The areas reported for the presence of the species were visited during the day as well as night. Apart from the direct sightings of the animals during visits, indirect signs such as dry skin, pugmarks, calls, and droppings were also considered as an indicator for the presence of the species. Field reference book namely 'Birds of Indian Subcontinent' by Richard Grimmett.

Fauna observed in the study area are domestic animals, reptiles and birds. No any rare, threatened, and endangered species are found in the study area. The list of major fauna species observed in the study area are given in below table.

Table 3.18: Faunal species observed during field visit

A. Mammals: The checklists of mammals, which are present in the study area, are enumerated in the table below.

Table 3.18: Checklist of Prominent Mammals in the Study Area

Sr. No	Scientific Name	Common Name	IWPA Status	IUCN Status
	Family: Sciuridae (Squirrels)			
1	*Funambulus paimarum* (Linnaeus, 1766)	Indian Palm Squirrel		LC
	Family: Muridae			
2	*Mus booduga* (Gray, 1837)	Little Indian Field Mouse	Schedule V	LC
3	*Mus musculus* Linnaeus, 1758	House Mouse	Schedule V	LC
	Family: Hystricidae (Old world porcupines)			LC
4	*Hystrix indica* Kerr, 1792	Indian Crested Porcupine	Schedule IV	LC
	Family: Leporidae (Hares and Rabbits)			LC
5	*Lepus nigricollis* F. Cuvier, 1823	Indian Hare	Schedule IV	LC
	Family: Herpestidae (Mongooses)			LC
6	*Herpestes edwardsii* (t.Geoffroy Saint-Hilaire, 1818)	Grey Mongoose	Schedule IV	LC

Table 3.19: Check List of Birds recorded in the Study Area during study period (Primary Survey List)

Sr. No.	Scientific Name	Common Name	IWPA Status	IUCN Status
	Family - Phalacrocoracidae			
1	*Phalacrocorax niger* (Vieillot, 1817)	Little Cormorant	Schedule IV	LC
	Family - Ardeidae			
2	*Egretta garzetta* (Linnaeus, 1766)	Little Egret	Schedule IV	LC
3	*Casmerodius albus* (Linnaeus, 1758)	Large Egret	Schedule IV	-
4	*Bubulcus ibis* (Linnaeus, 1758)	Cattle Egret	Schedule IV	LC
5	*Ardeola grayii* (Sykes, 1832)	Indian Pond-Heron	Schedule IV	LC
	Family - Accipitridae			
6	*Milvus migrans* (Boddaert, 1783)	Black Kite	Schedule IV	LC
	Family - Phasianidae			
7	*Coturnix coturnix* (Linnaeus, 1758)	Common Quail	Schedule IV	LC
	Family - Rallidae			
8	*Amaurornis phoenicurus* (Pennant, 1769)	White-breasted Waterhen	Schedule IV	-

9	*Gallinula chloropus* (Linnaeus, 1758)	Common Moorhen	Schedule IV	LC
	Family - Charadriidae			
10	*Vanellus indicus* (Boddaert, 1783)	Red-wattled Lapwing	Schedule IV	-
	Family - Columbidae			
11	*Columba livia* Gmelin, 1789	Blue Rock Pigeon	Schedule IV	LC
12	*Streptopelia senegalensis* (Linnaeus, 1766)	Little Brown Dove	Schedule IV	-
	Family - Psittacidae			
13	*Psittacula krameri* (Scopoli, 1769)	Rose-ringed Parakeet	Schedule IV	LC
	Family - Cuculidae			
14	*Centropus sinensis* (Stephens, 1815)	Greater Coucal	Schedule IV	LC
	Family - Apodidae			
15	*Cypsiurus balasiensis* (J.E. Gray, 1829)	Asian Palm-Swift	Schedule IV	LC
16	*Apus affinis* (J.E. Gray, 1830)	House Swift	Schedule IV	LC
	Family - Alcedinidae			
17	*Halcyon smyrnensis* (Linnaeus, 1758)	White-breasted Kingfisher	Schedule IV	-
	Family - Meropidae			
18	*Merops orientalis* Latham, 1801	Small Bee-eater	Schedule IV	LC
	Family - Upupidae			
19	*Upupa epops* Linnaeus, 1758	Common Hoopoe	Schedule IV	LC
	Family - Hirundinidae			
20	*Hirundo rustica* Linnaeus, 1758	Common Swallow	-	LC
21	*Hirundo tahitica* Gmelin, 1789	House Swallow	-	LC
22	*Hirundo daurica* Linnaeus, 1771	Red-rumped Swallow	-	LC
	Family - Pycnonotidae			
23	*Pycnonotus cafer* (Linnaeus, 1766)	Red-vented Bulbul	Schedule IV	LC
	Family - Laniidae			
24	*Lanius vittatus* Valenciennes, 1826	Bay-backed Shrike	-	LC
	Family - Muscicapidae Subfamily - Turdinae			
25	*Saxicoloides fulicata* (Linnaeus, 1776)	Indian Robin	Schedule IV	-
26	*Copsychus saularis* (Linnaeus, 1758)	Oriental Magpie-Robin	-	-
	Family - Muscicapidae Subfamily - Timaliinae			

27	*Turdoides malcolmi* (Sykes, 1832)	Large Grey Babbler	Schedule IV	LC
	Family - Nectariniidae			
28	*Nectarinia minima* (Sykes, 1832)	Small Sunbird	Schedule IV	LC
29	*Nectarinia asiatica* (Latham, 1790)	Purple Sunbird	Schedule IV	LC
	Family - Passeridae Subfamily - Passerinae			
30	*Passer domesticus* (Linnaeus, 1758)	House Sparrow	-	LC
	Family - Passeridae Subfamily - Ploceinae			
31	*Ploceus philippinus* (Linnaeus, 1766)	Baya Weaver	Schedule IV	LC
	Family - Sturnidae			
32	*Acridotheres tristis* (Linnaeus, 1766)	Common Myna	Schedule IV	LC
	Family - Dicruridae			
33	*Dicrurus macrocercus* Vieillot, 1817	Black Drongo	Schedule IV	LC
	Family - Corvidae			
34	*Corvus splendens* Vieillot, 1817	House Crow	Schedule V	LC

Conclusion:
As per the ecological studies conducted it can be seen that the study area shows extreme species diversity. No endangered species of flora is reported in the study area.

Azadirachta indica Linn.is the most important tree species.. Second most important tree species is *Prosopis juliflora* (SW.) DC. Further more important tree species are *Acacia nilotica* (L) Willd., *Acacia catechu* (L.f.) Willd. *Pongamia pinnata* (L.) Pierre, *Mangifera indica* L., *Acacia leucophloea* (Roxb.) Willd., *Syzygium cumini* (L.) Skeels and *Tamarindus indica* L.

Animals, which are found within the project area and categorized under schedule I to Schedule IV of Wild Life Protection Act 1972 & subsequent amendment respectively are strictly protected and there is a complete ban for their exploitation for any purpose. Care should be taken not to disturb their habitats. In addition, most of them have wide habitat ranges, and therefore the impacts envisaged would be minimal.

The majority of bird species found would be least impacted because their habitat requirements are too general and will be met easily from the adjoining areas.

3.16 Socio-economic Environment

This discusses the baseline scenario of the socio-economic environment in the study area. The issues under focus in this topic are demographic pattern, economic activity, education and literacy profile, etc. The assessment attempts to predict and evaluate the future impacts of the proposed project on socio-economic environment.

Field survey and observations

Field survey and observations were made at sampling village of that region is studied. The census data is collected from census department. A thoughtful questionnaire is prepared and during survey the questions were asked to the respondents and given information is recorded.

Observations recorded during survey in the study area

Majority of the respondents are engaged in cultivation activity while near about 50% of the population are engaged in agricultural and its allied activities.

- The main crop grown in the study area is Sorghum, Redgram, Bengalgram, Greengram, Sugarcane, cotton, vegetables.
- Sanitation facilities are satisfactory in the study area. There are open drains from where the domestic waste water is disposed.
- Power supply facility is available in almost villages and town in the study area mostly for domestic purpose.
- Drinking water sources is mostly from wells and hand pump. As regard to the drinking water facility
- Medical facilities in terms of primary health center and primary health sub centers in the rural areas are good.
- Transportation facility is seen very satisfactory in the study area because the road conditions are very good and satisfactory.
- Almost all the people use Kerosene, LPG as a main source of fuel and few people use wood for cooking purpose
- Sufficient communication facility are available in the study area
- Educational facilities are available in the form of primary and middle schools. In some villages, it is extended up to high school. For higher studies people avail the facility from the nearest town
- Houses of the region are mostly puccha house
- Some people are aware with the existing factory working and proposed project. Awareness among the majority of people regarding proposed distillery is poor.
- After informing them for the project, majority of people were welcome the Industry development/expansion in the form of distillery, except industry shall not do water

and air pollution.

3.16.1 Demography of the Taluka

Parbhani Taluka of Parbhani district has total population of 537,810 as per the Census 2011. Out of which 275,285 are males while 262,525 are females. In 2011 there were total 101,500 families residing in Parbhani Taluka. The Average Sex Ratio of Parbhani Taluka is 954.

As per Census 2011 out of total population, 57.1% people lives in Urban areas while 42.9% lives in the Rural areas. The average literacy rate in urban areas is 81.6% while that in the rural areas is 70.8%. Also the Sex Ratio of Urban areas in Parbhani Taluka is 962 while that of Rural areas is 942.

The population of Children of age 0-6 years in Parbhani Taluka is 73578 which is 14% of the total population. There are 38732 male children and 34846 female children between the age 0-6 years. Thus as per the Census 2011 the Child Sex Ratio of Parbhani Taluka is 900 which is less than Average Sex Ratio (954) of Parbhani Taluka.

The total literacy rate of Parbhani Taluka is 77.02%. The male literacy rate is 72.7% and the female literacy rate is 59.97% in Parbhani Taluka.

Table 3.20: Demography of the Taluka

Total Population	537,810
Sex Ratio	954
Literacy (%)	77.02

Table 3.21: Village's wise demography at a glance within 10 km Study Area

Sr. No.	Village Name	No. of House holds	Population (in Numbers)						Total Workers (Main + Marginal)
			Total	Male	Female	Scheduled Castes	Scheduled Tribes	Literate	
1	Parbhani	361130	1836086	942870	893216	247308	40514	1157814	822797
2	Nagapur	166	613	328	285	291	0	397	321
3	Narsapur tarf Parbhani	233	1343	684	659	178	0	812	530
4	Ujalamba	149	730	378	352	92	0	441	416
5	Bramhapuri tarf Lohgaon	95	467	231	236	14	0	319	250
6	Borwand Kh.	309	1607	819	788	232	0	991	928
7	Borwand Bk.	429	2251	1160	1091	304	4	1284	1224
8	Singnapur	906	5016	2555	2461	360	14	2910	2340
9	Kuotamwadi	276	1404	706	698	71	155	799	614
10	Pokharni	830	4481	2250	2231	674	12	2761	2170

Sr.	Village Name	No. of	Population (in Numbers)						Total
11	Ambe takli	298	1646	857	789	11	0	949	982
12	Kailaswadi	110	597	302	295	76	192	308	270
13	Dhondi	198	948	505	443	96	0	703	555
14	Tadpangari	301	1610	841	769	155	25	1032	832
15	Dampuri	259	1420	735	685	192	8	884	752
16	Sirsi Kh.	142	712	384	328	65	233	455	437
17	Sirsi Bk.	191	916	478	438	199	0	559	517
18	Ithalapur Mali	64	304	158	146	6	10	186	172
19	Dastapur	266	1296	657	639	94	3	774	804
20	Jawala	129	658	332	326	75	0	485	399
21	Sahajpur	98	512	259	253	65	10	333	283
22	Amadapur	348	1590	825	765	378	4	910	843
23	Lohagaon	780	4406	2328	2078	404	265	2681	1889
24	Zadgaon	256	1403	692	711	277	0	865	814
25	Pathra	254	1325	677	648	37	0	813	744
26	Tadlimbla	388	2016	1071	945	250	0	1220	1010
27	Paralgavhan	199	1072	558	514	206	4	680	510
28	Sayala	276	1465	752	713	20	0	961	796
29	Takalgavhan	227	1266	656	610	332	18	772	568
30	Ithalapur Deshmukh	317	1670	859	811	398	0	979	746
31	Balsa Kh.	203	1314	711	603	184	12	931	435
32	Sendra	364	1526	792	734	461	0	923	748
33	Raipur	267	1442	765	677	435	87	949	617
34	Taroda	556	2886	1464	1422	234	1	1593	1496
35	Porwad	321	1747	882	865	113	0	1163	867
36	Thola	237	1348	707	641	273	2	800	759
37	Pandhari	103	649	332	317	75	8	409	371
38	Bramhangaon	583	3004	1582	1422	641	10	1852	1576
39	Malsonna	494	2014	1019	995	229	9	1173	1153

(Source: http://censusindia.gov.in/2011census)

Cultural and aesthetic attributes: Villagers celebrate Dasara, Diwali, Ganpati and village yatras etc. Proposed project will not be disturbed any cultural and aesthetic environment in study area.

Infrastructure resource base: The infrastructure resources base of the study area with reference to education, medical facility, water supply, post and telegraph, transportation and communication facility and power supply etc are available in the area.

Education: Parbhani have public and private schools and colleges for higher secondary education.

Drinking Water: The water supply in the region is mostly through wells and hand pumps. For drinking purpose people are using only ground water supply, but very few hand pumps are available for drinking water.

Communication and Transportation: Transportation is to the satisfactory level in the villages. Bus service is available in all most all villages. The roads condition is good and also properly maintained. Most of the villages in the study area have the communication facility i.e. post office at village. Private telephone connections in most of the villages.

Power Supply: Almost all villages are electrified in the region and electricity is available for domestic purpose in all the villages while power supply used for agricultural purpose is rare.

Medical/Primary Health Care: Medical facilities in terms of; primary health center and primary health sub centers are adding medical facility in the villages. Primary Health Centre in the study area is available in the villages & primary health sub centers are also available in most of the village. Community Health worker & doctors visit villages periodically & provide health facilities to the people. Vaccination & health camps are also organized by PHC to aware the people about family planning, hygiene, & health care.

Figure 3.16 : Photographs during bassline data collection

CHAPTER IV: ANTICIPATED ENVIRONMENT IMPACT AND MITIGATION MEASURES

4.1 Identification of the Impact

Environmental Impact is the alteration of environmental conditions or creation of a new environmental conditions, it may be adverse or beneficial, caused or induced by the action or set of actions under consideration. Both the beneficial (positive) and adverse (negative) impacts on various components of environment due to proposed Project are identified, based on the nature of the various activities associated with the proposed project operations. Environment impact analysis gives an indication of ways to consider modeling the project to mitigate adverse impacts through best practicable environmental option or alternate processes.

Based on the present environmental scenario and baseline data, an exercise has been done to identify and evaluate the impact on the environment of the study area due to the proposed project.

The proposed project may influence the environment of the area in two phases:

Phase I: During the Construction period, the impact may be temporary or short term

Phase II: During the Operation Phase which may have long term effects.

Phase I: During construction

The construction phase of the project is expected to last for about one year. Hence, all construction impacts on the environment can be considered short term as compared to the operational impacts. During construction stage, excavation, material storage and movement, vehicular movement, mixing operation etc. will generate fugitive dust pollution and vehicular emissions at the project site. However, by taking appropriate measures as described in EMP, such impacts will be minimized.

The following activities among others are likely to contribute towards impacts on the surroundings during construction phase:

- Site preparation and development
- Civil construction work
- Vehicular movement
- Loading and unloading civil items and plant machineries
- On site storage of civil items & plant machineries.
- Erection of plant and civil structures
- Maintenance of construction machinery

- Disposal of solid wastes
- Accommodation for construction workers.

Phase II: During operation

The important activities contributing to environmental impacts are as follows:

- Fuel bagasse, biogas & other raw material consumption
- Handling of Molasses (to be used as raw material)
- Storage and transportation of raw material and Alcohol
- Fermentation and distillation process
- Solid Waste like Ash, yeast sludge generation (Solid and hazardous waste): handling, storage and disposal
- Air emission through stack and Material handling, transport and storage its control
- Spent wash generation and its disposal

Impact criteria will be

Type of Impact	Criteria
Adverse	• Effects on biota health • Effects on rare or endangered species • Reductions in species diversity • Habitat loss • Transformation of natural landscapes • Effects on human health • Effects on current use of lands and resources for traditional purposes by aboriginal persons; and • Foreclosure of future resource use or production
Significant	• Extensive over space or time • intensive in concentration or proportion to assimilative capacity • Exceed environmental standards or thresholds • Not comply with environmental policies, land use plans, sustainability strategy • Seriously affect ecologically sensitive areas • Seriously affect heritage resources, other land uses, community lifestyle and/or indigenous peoples traditions and values
Likelihood	• Probability of occurrence • Scientific uncertainty
Negligible Impacts	• It signifies that the actions have some effect, but it will not cause any harmful quantifiable damage or benefit to the environmental

	parameters concerned.
Moderate Impacts	• The activities and their environmental impacts are to be slightly potential significant or significant but for short term

(TGM Distillery Industry by IL &FS)

4.1.3 Environmental parameters to be consider

Below mentioned environmental parameters are considered while identifying the impact.

- **Environmental impacts due to project location**
  Disruption of Surface and Groundwater, rehabilitation, land use, ecological sensitive area other sensitive receptor (highway, airport, habitation, Archeological site),
- **Air/Odor Environment**
  Sources, ambient air quality, emission control, environment and health effects
- **Water Environment**
  Sources, water & wastewater quality, environment, and health effects
- **Noise Environment**
  Sources, control measures, environment and health effects
- **Soil/ Land Environment**
  Land use, change in land use pattern, pollution sources, soil quality change, environment and health effects
- **Biological Environment**
  Flora and fauna of the study area, vegetation, and habitat change and control measures
- **Socioeconomic Environment**
  Demographical details, economic status, employment status, infrastructure availability, environment and health effects
- **Occupational health and Safety Environment**
  Identification of health hazard due to operation, material handling, exposure of hazardous chemical, health and safety plan and disaster management.

4.2 Identification of Impact due to project location

Project location Impacts are anticipated as disruption of Surface and Groundwater, rehabilitation, land use, ecological sensitive area other sensitive receptor (highway, airport, habitation, Archeological site), Impact and its mitigation measures due to project locations are given below in Table 4.1

Table 4.1 Impact due to project location

Impact on	Status/ Mitigation measures
Disruption of Surface and Groundwater	Proposed project location do not cross any surface water body. A small water canal is running parallel to the factory. Waste water from proposed distillery will be treated through zero discharge treatment scheme. Hence, no surface water or ground water pollution envisaged.
Rehabilitation	As proposed distillery location is in the existing sugar factory premises, there will no rehabilitation.
Land use change	Present land use is under industrial activity, hence there will not be any major change in land form. 33% Greenbelt will be developed around whole factory premises.
Ecological sensitive area	No any river is occurred within 10 m study area. No any National Parks, Wildlife Sanctuaries, Biosphere Reserves, Tiger/ Elephant Reserves, Wildlife Corridors etc. are occurred within 10 km radius
Other sensitive receptor	Nearest state highway is 4.36 km in W, Nearest Railway station is 3 km away from the site and Airport does not occurred in 10 km radius. There is no major human habitation nearby. Hence, there is impact is envisaged on other sensitive receptors.

4.2 Impact Identification during Construction and Commissioning phase

The construction phase of the project is expected to last for about one year. During construction stage, activities like excavation, material storage and movement, vehicular movement, mixing operation etc. could be affected environment components. Impact assessment and its mitigation measures have been discussed in below given table.

Table 4.2 Impact Identification during Construction and commissioning phase

Environment Aspects	Project Activities	Anticipated Pollutant	Impacts prediction	Mitigation measures
Air Environment	• Movement of vehicles and construction equipment at site, • Dust emitted during leveling, foundation works, • Transportation of construction material, loading and unloading of construction materials • leveling, grading, earthworks, foundation works and other construction related activities • Resources utilization	PM, SO_2, NOx and CO	• Dust accumulation on leaf retard the photosynthesis rate of plant which affect growth of plants • Health problems to construction workers Ex. eye irritation, coughing & sneezing. • Dust generation. Continuous exposure causes respiratory dieses	• Temporary impact within factory premises. • Precautions like water sprinkling, ppes to worker • Covered transportation, regular • Maintenance of vehicles, • PUC check, avoiding • Overloading, minimize idling of vehicles
Noise Environment	• leveling, grading, earthworks foundation works and other • Excavation • Loading and unloading, fabrication etc. • Equipment and materials Handling	Noise Nuisance	• High noise level leads to disturbance to immediate surrounding i.e. workers, biological and social environment. • Birds, reptiles are sensitive to high noise level. Continuous exposure of high noise	• Ear muffs and Ear plugs shall be provided to workers. • Regular maintenance of vehicles. • Temporary walls around construction will acts as noise barrier. • Night time construction activity shall be prohibited.

Environment Aspects	Project Activities	Anticipated Pollutant	Impacts prediction	Mitigation measures
			level sometimes leads to hearing defects and physical • Increasing in road traffic disrupts social environment i.e. residential, hospital, and school religious places in the area.	• Peak hour traffic shall be avoided. Regular maintenance of vehicles. Internal village road shall be avoided.
Water Environment	• Runoff from construction activity during rainy season • Stagnation of sewage and construction waste water if any • Sewage disposal surface and ground water contamination due to percolation of leachate generated during construction	Effect on water quality i.e. pH, EC, BOD, COD. Soil parameter	Disposal of sewage, runoff, & percolation of leachate causes water pollution and deterioration of water quality i.e. pH, EC, BOD, COD.	• Existing Sugar factory provide the sanitation facility to the construction workers • Construction materials shall be stored on tarpaulin sheets • Leachate from storage shall not be allowed to runoff into natural water body. Separate drain will be provided to avoid surface runoff.
Soil/Land Environment	• Excavation, land clearance	Change in land use, Untreated	• Loss of fertility of top soil and will change the	• Excavated soil will be reused for backfilling

Environment Aspects	Project Activities	Anticipated Pollutant	Impacts prediction	Mitigation measures
	• Waste water and solid waste from construction activity	sewage and garbage disposal on land may alter physical and chemical properties of soil change in soil like PH, EC, Organic matter, etc.	natural terrain. Fertile soil and nature of terrain supports associated living of organisms. Change in land cover affects the specific niche of the organism. • Excavated top soil will be reused for backfilling and in green belt development. • There will be tree no cutting as proposed land is vacant land plot with scrubby vegetation. • Construction debris pollute aesthetics environment & human health. • Spillage & leakage of fuel spill on land may alter the soil property and wash away with the surface runoff. • Open dumping or improper disposal of sewage and garbage provides breeding ground for pathogenic	and landscape development. • Spillage & leakage of fuel will be prevented by providing well lined/paved area for the works having potential of leakage/ spillage of fuel or material. Hence contamination of land due to spillage/ leakage of fuel or construction material with soil would not arise. • Sewage generation will be very minor and will not cause harmful effect on land. Infrastructure facilities like use of toilet, canteen are available with existing factory. • The packaging materials like wooden boxes and jute wrappers will be stored and disposed of properly.

Environment Aspects	Project Activities	Anticipated Pollutant	Impacts prediction	Mitigation measures
			bacteria and other creatures which may spread diseases.	
Biological Environment	Transportation, leveling, grading, earthworks, foundation works and other construction related activities	PM and Soil erosion	• Impacts on ecology due project on immediate surrounding is not envisaged. • Particulate matter emission affect impacts on flora & fauna in the area and may hindered the growth. Particulate matter hindered • Loss of scrubby vegetation • Soil Erosion	• Development of thick green belt. • Indigenous, local, nesting, tress while development of green belt
Social Environment	Proposed Distillery establishment in the sugar premises	Socioeconomics	• Increase in floating population. • Increase in demand of ancillary services. • Economic upliftment of the area	• Local people shall be given preference for employment depending on their qualification
Occupational health and safety	• Storage of hazardous material/ chemicals ex. diesel, petrol etc. • Working at height • Site sanitation • Working without	Dust, Working Risk and hazard	• Accident like falling, improper safety • Fire & explosion causes risk to human health	• Use of personal protective equipment's. • Safety trainings will be conducted • Safety instructions will be placed.

Environment Aspects	Project Activities	Anticipated Pollutant	Impacts prediction	Mitigation measures
	protective equipment and/or safety belt			• Emergency preparedness plan will be implemented from construction phase • Sign boards such as safety, isolated area, risk prone area will be placed

4.3 Identification of impact during operation phase

During operation phase major impacts are anticipated from Storage, transportation, manufacturing processes. In absence of mitigation measures effluent generation deteriorates the water quality, which ultimately affect other environmental parameters.

Table 4.3: Impact Identification during Operation phase

Environment Aspects	Project Activities and pollutants	Anticipated Pollutant	Impacts prediction	Mitigation measures
Air Environment	• Utility emissions from boiler stacks, DG set. • Existing boiler 2X32 TPH Proposed distillery boiler 15 TPH and cogen boiler 90 TPH • D.G. set of 500 kVA Exist. DG for emergency power failure. • Types of pollutant emission from Sugar, cogeneration and distillery unit are given in below,			
	Vehicular movement, material and product transportation, generation of	PM, SO_2 and NOx	• **Health impact on like** Short-term effects include irritation to the eyes, nose and throat, and upper respiratory infections such	During the operation phase of the proposed project, movement of goods vehicles, loading and unloading operations may contribute to air emission.

Environment Aspects	Project Activities and pollutants	Anticipated Pollutant	Impacts prediction	Mitigation measures
	Fugitive emissions due Storage and handling of raw materials & products	PM, SO_2, NO_X, minor VOCs from storage of raw material and products	as bronchitis and pneumonia. • Others include headaches, nausea, and allergic reactions. • Short-term air pollution can aggravate the medical conditions of individuals with asthma and emphysema. • Long-term health effects can include chronic respiratory disease, lung cancer, heart disease,	**Fugitive emissions** from raw material storage yards, loading and unloading operations will be controlled water sprinkling system, whenever necessary. • For existing sugar factory, water sprinkling system is provided in strategic area for control of fugitive emissions. • In existing factory premises Bullock carts, trucks, and tractors are used for transportation. • All internal roads shall be constructed as tar roads and regular water sprinkling shall be carried out on all the Kaccha roads for preventing fugitive dust emissions. • Tree plantation will be carried out around plant area for minimizing environmental impacts of the proposed activities over a period of time. Greenbelt will be developed on 33.9 acres (33% of the total land area i.e 102.4 acres).
	Process emissions & Utility Operations	CO_2 and VOCs		• Major source of air pollution will the boiler stack. Height of the proposed stack will be **65** m with

Environment Aspects	Project Activities and pollutants	Anticipated Pollutant	Impacts prediction	Mitigation measures
				Electro Static Precipitator (ESP) for 90 TPH boiler and stack height 45m with wet scrubber to 15 TPH Distillery boiler. Stack height designed on the basis of CPCB guidelines to ensure proper disposal of gas emissions. • Online monitoring system shall be installed. • Since Bagasse will be used as fuel to generate steam in the boilers, SO_2 and NO_X are negligible. • Incremental GLC for PM, SO2 and NOx has been done and the same has been discussed in Section 4.4. • CO_2 will use in bottling/ dry ice/ Sodium Carbonate
	System break down,	PM, SO_2, NOx, CO & VOC		• Emergency shutdown will be done in case of system failure.
Noise Environment	**Sugar and cogeneration:** Mill house, boiling house, sugar house, bagasse & ash handballing, power house, steam turbines and, transportation etc. **Distillery:** Fans, blowers and	-	• Existing quality of noise in the sugar and cogeneration area are given below, • Steam turbines : 80.5 dB • Milling : 90.2 dB • Pan boiling: 85.2 dB • Factory main	• Vibrating pads & acoustic enclosure will be provided • Lubrication of moving/rotating part or component of machineries will be done. • The insulation provided for prevention of loss of heat • Personnel safety gears to workers

Environment Aspects	Project Activities and pollutants	Anticipated Pollutant	Impacts prediction	Mitigation measures
	compressors, steam turbines etc.		gate: 60.8 dB • Noise health effects are the health consequences of regular exposure to consistent elevated sound levels. • Elevated workplace or environmental noise can cause hearing impairment, hypertension, ischemic heart disease, annoyance, and sleep disturbance.	• Design and layout of building to minimize transmission of noise, segregation of particular items of plant. • The operator's cabins (control rooms) will be properly (acoustically) insulated with special doors with observation windows. • The operators working in the high-noise areas will be provided with ear-muffs or plugs. • Acoustic enclosures and silencers will be provided to the Equipment wherever necessary. • Proper green belt will be developed to reduce the noise level.
Traffic density	The transportation shall be carried out by tempos, trucks, and tractors. Hence, additional impact on air due to vehicular emission for incoming raw material is anticipated.	PM, Noise Nuisance, increase in traffic density	• Fugitive emissions will be increased • Noise Nuisance	• During season, approx. 150-200 additional vehicles will be running. • Due to proposed project additional 60-80 no of vehicle will be increased. • Present road condition is good with width of 8.5 m and capacity to carry the number of vehicle during season.

Environment Aspects	Project Activities and pollutants	Anticipated Pollutant	Impacts prediction	Mitigation measures
	The site is well connected by pacca internal village roads. Project site is connected to Parbhani-Gangakhed state highway 4.36 km away in W direction and adjacent Singnapur-Amadapur road 1.21 in in SW			• The trucks carrying coal will be covered, alcohol will be transported in tankers hence there will not be any fugitive dust/ VOC generation during transportation of raw materials, fuel, and products. • Good traffic management system will be developed and implemented for the incoming and outgoing vehicles so as to avoid congestion on the public road. • Sufficient parking area has been provide for staff and transportation vehicles.
Odor management	• Typical compounds generating odor in sugar industry bacterial decomposition of organic matter (stale cane smell) & bacterial decomposition of sulfur compounds (H_2S), NH_3. • Causes of odor are stale cane, bad mill	Release of foul odors are due to creation of anaerobic condition in waste which releases of hydrogen sulfide, other volatile compounds, such as Indole, Skatole and Mercaptans, may cause odours far more unpleasant than H_2S. Some	• Nausea, insomnia, and discomfort. • Nasal irritation; trigger symptoms in individuals with breathing problems or asthma.	• Better cane management to avoid staling of sugar. • Use of mill sanitation bio-cides to minimize the growth of aerobic / anaerobic micro–organisms. • Steaming of major pipe lines • Proper cleaning of drains • Efficient operation of ETP. • Regular cleaning to avoid growth of Sulphur decomposing micro-organisms to control H_2S

Environment Aspects	Project Activities and pollutants	Anticipated Pollutant	Impacts prediction	Mitigation measures
	sanitation, bacterial growth in the interconnecting pipes & unattended drains etc. • Typical odor compounds in distillery are molasses storage tank, spent wash, alcohol, iso amyl & iso butyl alcohol (fuel oils), acetic acid, Sludge from fermentation, DDGS/DWGS and ETP • Causes of odor are bad management of fermentation house, long retention of fermented wash, unattended drains, CPU unit, & ETP.	other gases, such as carbon dioxide resulting from the decomposition of organic matter or nitrogen dissolved from the atmosphere, are also responsible for odour. *Pradeep Kumar Poddar & Omprakash Sahu (2015) Quality & management of wastewater in sugar industry. Applied Water Science volume*		generation. • Use of efficient bio-cides to control bacterial contamination. • Better housekeeping by regular steaming of all fermentation equipment's • Control of temperature during fermentation to avoid in-activation / killing of yeast. • Avoiding staling of fermented wash. • Spent wash storage lagoon has capacity of 5 days; however spent wash is usually consumed within 2-3 days. • Maintain proposer aeration during Bio composting process.

Environment Aspects	Project Activities and pollutants	Anticipated Pollutant	Impacts prediction	Mitigation measures
Water Environment	• Effluent generation from distillery, sugar and cogeneration unit • Run off storm water.	Undesirable changes in surface and ground water quality i.e change in pH, COD, BOD, EC,DO etc.	• No negative impacts are envisaged on surface water availability as proposed water source is factories own rainwater harvested pond. The factory has constructed rainwater storage reservoir of for use of fresh water. • Distillery will generate ~380-400 CMD spent wash. • Discharge of waste water within & outside plant boundary will leads to the ground water pollution. • Discharge of distillery effluent loss of soil fertility and deteriorate the soil quality. • High organic and inorganic load effluent (COD 1, 00,000 mg/l) discharge of in the surface water body alters the water characteristics and may leads to eutrophication of water bodies. Further, its dark color hinders photosynthesis by blocking	• Total spent wash will be around 380-400 CMD will be treated through Bio-methanation followed by MEE followed by bio-composting. • Spent wash storage lagoon shall be constructed as per CPCB guidelines. Details are given in Below Figure 4.1. • Guard pods shall be constructed around molasses and spent wash storage area. • Process condensate, spent lees, boiler, and cooling tower blow down will be the major effluent streams. Details of effluent generation and its characteristic are below given in section 4.4 Table • Effluent water generation quantification and its characteristics are described in section 4.4

Environment Aspects	Project Activities and pollutants	Anticipated Pollutant	Impacts prediction	Mitigation measures
			sunlight and is therefore deleterious to aquatic life. • Failure in effluent treatment and storage system leads to undesirable changes on living and nonliving things by means of alteration in environment, which causes health impact and deterioration of environment. • Nearest impact zone which may suffer this problem are village Amdapur 1.4 km South and Singnapur. However, chances of arising such situation are very rare. If occurs, plant will be shut down immediately.	
Soil/Land Environment	Disposal of spent wash, solid such as yeast sludge, boiler ash, CPU sludge and hazardous waste on land	Spent wash, yeast sludge, ETP sludge	Spent wash if discharged directly on land, damages the soil characteristics like porosity, soil fertility etc. These factors cause germination disorders in seeds that are plated. Infiltration of silt and sand with storm water collection.	• Proposed distillery unit will be zero liquid discharge distillery unit. No spent wash shall be disposed on land without treatment. All solid waste and hazardous waste from the proposed Distillery Unit will be properly collected, stored and disposed.

Environment Aspects	Project Activities and pollutants	Anticipated Pollutant	Impacts prediction	Mitigation measures
				• The hazardous waste i.e. spent oil generated will be sent to authorize recycler/burnt in boiler along with fuel. • Solid waste such as CPU sludge will be used as manure as it is non-hazardous. • Yeast sludge mixed in press mud and will be used as manure. • Boiler bagasse ash will be sold to as manure as it is rich in potash. • Storm water will be collected in proposed rain water harvesting pond. • Greenbelt has been planned for the proposed project which will result in the overall considerable beneficial impacts on land/ soil. It also prevent erosion of soil by holding the soil by its roots. • Quantification of Solid waste generation is described in section 4.4
Biological Environment	Burning of fuel and flue gas emission, Vehicular movement, effluent disposal	Effluent, flue gas emission and solid waste disposal	• Flue gas emissions in the air will lead to increase in concentration of particulate matter, minor sulfur dioxide and oxides of nitrogen. An increase in air	• Flue gas emission will be controlled by wet scrubber and electrostatic precipitator. • No effluent discharged • Sugar ETP treated water is

Environment Aspects	Project Activities and pollutants	Anticipated Pollutant	Impacts prediction	Mitigation measures
			pollutants may affect the vegetation growth in and around the area. • Dust emission is envisaged during material handling & transportation, which affects the growth of vegetation. • Disposal of solid/hazardous waste on land pollute the soil, which eventually affect the vegetation • Waste water disposal thorough runoff/leakages to land will effect negatively on terrestrial flora of the surrounding area and also affect crop productivity.	used for exiting green belt development/ irrigation purpose. • Zero liquid discharged will be implemented for proposed distillery Hence no adverse impacts on surrounding ecology. • Well-designed material storage area as well as handling facilities will be provided to prevent particulate emissions from the storage, handling, & transportation activities. • Solid waste storage area will be designed as per the guidelines to avoid the leachate percolation into the ground or water bodies. • Distillery process condensate effluent will be treated in condensate polishing unit and recycled in the process. • Greenbelt area will be developed in & around the plant premises and shall be maintained properly.

Environment Aspects	Project Activities and pollutants	Anticipated Pollutant	Impacts prediction	Mitigation measures
Social Environment	Establishment of distillery unit		• The impacts of the proposed project will lead to the positive impact on surrounding. The proposed project will generate the employment to local people. • The proposed activities shall generate indirect employment in the region due to the requirement of workers, supply of raw material, auxiliary and ancillary works, which would marginally improve the economic status of the people. • The proposed project will be an increase in local skill levels through exposure to activities. • Thus, the said project will not have any significant impact on socio-economic pattern of the surrounding region. The integrated project will provide stability to sugar factory in financial terms. This ultimately benefited to farmers and employees.	
Occupational health and safety	Workplace area involving Milling, Pan boiling, Centrifugation, production unit, distillation unit, Boiler section, turbine section, raw material handling area etc.	Risk and hazard	• It is envisaged that occupational health hazards shall be associated with operational activities such as spillage and exposure to the chemical, mechanical hazards like cuts and hits and electrical shocks. • Accident due to fall from height, burn injury and trap in the machine or motors during operation.	• All safety signs will be placed at proper location. • First aid kits will be made available at every department • Pre-employment Medical checkup and periodical medical checkup shall be undertaken to know the occupational health hazards at the early stage. • Work permit system will be introduced to avoid the entry or un-authorized working to avoid the incidences which can lead to the accident if proper care is not

Environment Aspects	Project Activities and pollutants	Anticipated Pollutant	Impacts prediction	Mitigation measures
				taken. • All arrangement required for fire hydrant system shall made at every vulnerable location to have the firefighting facility. • Apart from above, all required fire extinguishers shall be provided at appropriate locations • All staff and workers will be trained in firefighting operations and emergency preparedness plan or to tackle the accident • Apart from all engineering control measures, if required necessary PPEs shall be provided as last protection measures to the employees. Good housekeeping also plays important role in avoiding the undesirable incidences / accidents, hence good housekeeping practices will be employed throughout the Factory premises.

4.4 Qualitative and Quantitative Impact Assessment

4.4.1 Air emissions

Fuel composition

Details of Boiler fuel composition, stack details and incremental concentration air emissions are given in below tables.

Table 4.4: Proximate analysis of Bagasse and Biogas

S. No.	Constituent	Bagasse %	Biogas %
1.	Moisture Content	47.01	10 - 20
2.	Volatile Matter	35.69	16 - 30
3.	Ash Content	10.59-15.00	25 - 50
4.	Fixed Carbon	6.71	24- 40
5.	GCV (kcal/kg)	2000	2800-5000

(Source: Guidelines-Coprocessing-Distillery_Spentwash_in_Cement_Ind.pdf)& http://www.eecpowerindia.com

Table 4.5: Ultimate analysis of Bagasse

S. No.	Constituent	Spent wash Value %	Indian Coal %
1.	Carbon	19.92	30 - 55
2.	Hydrogen	2.59	2 - 4
3.	Nitrogen	1.35	0.7- 1.15
4.	Sulphur	0.96	0.3 - 0.8

(Source: Guidelines-Coprocessing-Distillery_Spentwash_in_Cement_Ind.pdf) & http://www.eecpowerindia.com

Table 4.6: Composition of Biogas

Content	%
CH_4	50 to 75
CO_2	25-50
H_2S	0-3
Nitrogen	0-10
H_20	1 %

(Source: IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) ISSN: 2278-1684, PP: 37-41 www.iosrjournals.org)

4.4.2 Waste water quantitative and quality assessment

Wastewater from sugar mill will not have significant BOD/ COD levels. All waste water will be collected in effluent treatment plant and treated water is used for green belt development/irrigation purpose. The treatment scheme incorporates Aerobic treatment for the wastewater with state of the art. Domestic wastewater will be treated in ETP and Septic tank via Soak pit. Composition of different effluent streams are given in below table. Existing ETP and CPU schematic is shown in Figure 4.4 and 4.5.

Cooling tower blow down

- The usage of cooling water will be low because the air cooled condenser system for the turbine and generator. In addition to the condenser, the auxiliaries of the turbine/ generator, like the oil cooler and generator air cooler use cooling water. The cooling water is circulated through the condenser, the other coolers and through the cooling water. The cooling water is cooled by evaporative cooling and the cooling water consequently gets concentrated with the chemicals in the water.
- The cooling tower blow down water would be used for dust suppression. The low level of pollutants will be achieved by operating at sufficient blow down levels to prevent the buildup of pollutants.
- Cooling blow down also can be used for green belt irrigating based on COC.

Boiler Blow Down

- The pH and temperature of water are main factors for boiler blow down, as quantity of suspended solids is negligible. The pH will be in the range of 9.8 to 10.3 and the temperature of 100^0C.
- The blow down is small and hence, it will be collected in a trench and connected to the effluent ponds. However, the main usage for blow-down water will be for ash quenching.

DM Plant Blow Down

- The effluent from the cation resin units in the water treatment plant (DM plant) is acidic in nature and from the anion resin units are alkaline in nature. The combined wastewater from the DM plant would be neutralized in a neutralizing pit, if required lime dosing for final pH adjustment will be followed. The neutralized effluent is expected to have suspended solids.
- This shall be pumped and mixed with other effluents& the entire treated waste water will be recycled and reused.

Condensate Polishing Unit (CPU)

Process Condensate from Multi Effect Evaporators and spent lees generated in the process offers an ideal opportunity for recycle after treatment in the distillery; where there are major water consuming activities, and which can effectively minimize the fresh water intake. The treatment approach is depicted in the Process Flow Diagram. Cooling tower blow down water shall be used for gardening which cannot treat in CPU as it is design for biological degradation.

CPU Capacity: 650 m^3 /day

Sludge: 25 m^3 /day can be used for composting.

Table 4.9: Effluent generation from existing sugar and proposed cogeneration unit

Effluent Source	Existing 2500 TCD
Spray pond overflow	100
Cooling tower, Boiler blow down	32
DM reject	10
Cleaning, leakages	100
Total	**242**
From domestic	12
Total	**254**

Table 4.10: Effluent generation from distillery unit

Effluent Source	45 KLPD molasses based CMD
Process condensate	320
Spent less	90
Spent wash	400
Cooling tower and boiler blow down	16.5
Total	**826.5**

Table 4.11: Composition of spent wash from continuous manufacturing process

Sr. No.	Parameter	Raw spent wash(mg/l)	Anaerobically digested spent wash (mg/l)
1.	Color	Dark brown	Dark brown
2.	pH	4.0 – 4.3	7.5–8
3.	COD	110000 – 130000	45,000 – 52,000
4.	BOD	55000 – 65000	8000 – 10,000
5.	Total Solids	130000 - 160000	70,000 – 75,000
6.	Chloride (Cl)	6000 – 7500	7000 – 9000
7.	Sulphate (SO4)	7500 – 9000	3000 – 5000
8.	Nitrogen (TKN)	5000 – 7000	4000 – 4200

(IL&FS Technical EIA Guideline manual for Distilleries)

Table 4.12: Characteristics of Spent Lees

S. No.	Parameter	Range
1.	pH	3.6 – 4.5
2.	COD	5000 - 6000 mg/l
3.	BOD	200 – 300 mg/l
4.	Dissolved Solids	5000 – 6000 mg/l
5.	Suspended Solids	500 – 1000 mg/l

6.	Chlorides	50 – 100 mg/l

(IL&FS Technical EIA Guideline manual for Distilleries)

Table 4.13: Characteristic of wastewater from cooling tower and boiler blow down

Sr. No	Parameter	Range
1.	pH	8.0-9.0
2.	COD	1500
3.	BOD	60-70 mg/l
4.	Suspended solids	800-1500 mg/l
5.	Total dissolved solids	1500-3000 mg/l

Table 4.14: Inlet and outlet characteristics of Process Condensate treatment unit

Sr. No	Parameter	Inlet	Outlet	Unit
1.	pH	3.5-4.0	6.5-7.5	-
2.	COD	4000-6000	<100	mg/l
3.	BOD	1000-3000	<10	mg/l
4.	Total dissolved solids	120	-	mg/l

Table 4.15: Characteristic of wastewater generated from sugar factory

S. No.	Parameter	Inlet	Outlet	MPCB Limits	Units
1.	pH	3.4	7.2	5.5-8.0	-
2.	COD	4780	160	<250	mg/l
3.	BOD	2225	45	<100	mg/l
4.	TDS	3025	1200	<2100	mg/l
5.	Chlorides	564	298	<600	mg/l
6.	Oil and grease	36	5.0	<10	mg/l

Spent wash storage lagoon details

- Storage lagoon capacity: Five days.
- Preparation of embankment in soil for all four sides 1:2 slopes to be maintained.
- Proper compaction.
- Laying of 250 micron thick HDPE sheet
- Flat brick lining over HDPE sheet for bottom and slopes in cement mortar 1:5 with pointing.
- Construction of the wall to avoid underscoring of the embankment during heavy rains.
- Lagoon top with bricks on edge in cement mortar 1:5.
- Two coats of coal tar epoxy paint (120 micron total)
- Provision of fencing around the lagoon to prevent entry of trespassers and stray animals
- Piezometers will be installed all around spent wash storage tank at strategic locations

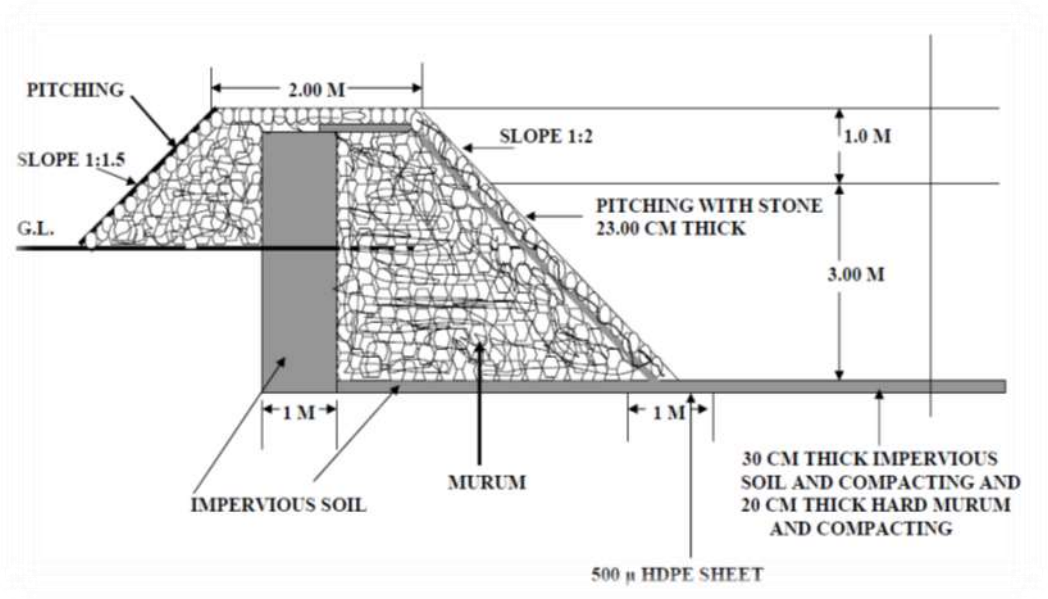


Figure 4.1: Spent wash lagoon details

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4.4.3 Solid waste generation

Solid waste generation from existing sugar and proposed distillery will be Sugarcane trash, bagasse, press mud, ash, & ETP and yeast sludge. Qualitative and quantitative assessment is given in below table.

Table 4.16: Solid waste generation and its characteristics

Sr. No.	Type of waste	Quantity	Quality		Final Disposal
1.	Existing from Sugar press mud	100 TPD	Moisture	76.3 %	Press mud will be sold to the farmer as manure.
			Volatile matter	76.6 %	
			Sugars	6.4%	
			Wax	7.2%	
			C/N ratio	14%	
			(Source: IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) ISSN: 2278-1684, PP: 37-41 www.iosrjournals.org)		
2.	Existing from Sugar Bagasse Ash	4.2 TPD	SiO_2	73%	Bagasse ash will be sold to farmer as manure
			Al_2O_3	6.7 %	
			Fe_2O_3	6.3 %	
			CaO	2.8 %	
			MgO	3.2 %	
			P_2O_5	4.0 %	
			Na_2O	1.1 %	
			K_2O	2.4 %	
3.	Proposed bagasse ash	20	Loss of Ignition	0.9 %	

<table>
<tr><td>4.</td><td>Yeast sludge</td><td>25-30 TPD</td><td><table>
<tr><td>Protein</td><td>2</td></tr>
<tr><td>Methionine</td><td>4</td></tr>
<tr><td>Tryptophan</td><td>2.4</td></tr>
<tr><td>Lysine</td><td>10</td></tr>
<tr><td>Calcium</td><td>3</td></tr>
<tr><td>Iron</td><td>0.35</td></tr>
<tr><td>Phosphorus</td><td>0.23</td></tr>
<tr><td>Phenol</td><td>0.23</td></tr>
<tr><td>Crude fiber</td><td>5.5</td></tr>
<tr><td>Moisture</td><td>5</td></tr>
<tr><td>Ash</td><td>56</td></tr>
<tr><td>Glucan</td><td>3.6</td></tr>
<tr><td>Mannan</td><td>2.5</td></tr>
<tr><td>Glycogen</td><td>1.2</td></tr>
<tr><td>Thiamine</td><td>0.06</td></tr>
<tr><td>Ascorbic acid</td><td>3.0</td></tr>
<tr><td colspan="2">Source:International Journal of Poultry Science 4 (10): 787-789, 2005, ISSN 1682-8356 Distillery Yeast Sludge (DYS) as an Alternative Feed Resource</td></tr>
</table></td><td></td></tr>
<tr><td>5.</td><td>ETP and CPU Sludge</td><td>25-30 TPD</td><td>-</td><td>Partly recirculate and remaining will be used in composting.</td></tr>
<tr><td>6.</td><td>Domestic</td><td>~50 kg Negligible</td><td>-</td><td>Local waste collection system</td></tr>
<tr><td>7.</td><td>Spent oil (5.1)</td><td>Negligible</td><td>Mainly mineral oil waste containing 10%-90% water, oil, oxidized lubricants, waste metal particles (source: Recycling and Analysis of Spent Engine Oil , International Journal of Scientific & Engineering Research, Volume 6, Issue 11, Nov 2015,711, ISSN 2229-5518)</td><td>Authorized recycler</td></tr>
</table>

4.4 IMPACT ASSESSMENT MATRIX

Impact matrix facilitates to identify components and phases of project activities for determination of likely impacts. Matrix identifies the interaction between project activities and environmental components using a grid like table. Entries are made in the cell which highlights impact severity in the form of symbols or numbers or descriptive comments. The impact of different project activities on various environmental components like biological environment, air environment, aesthetics and socio-economic have been summarized in a form of a matrix in Table 4.20.

- Environmental Pollution

- Water: surface and ground water pollution
- Air: Ambient air quality
- Soil: Soil quality
- Land: Change in land use pattern and topography

- Biological Environment
- Existing Flora and fauna
- Aquatic Ecosystem

- Socioeconomic Environment

Health and safety, cultural, aesthetic and economic aspects

Table 4.17: Impact Matrix of Proposed Project

		Pre-construction		Construction Phase					Operation and maintenance							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Environment components	**Project activity / Parameters**	**Land acquisition**	**Site clearing**	**Site preparation**	**Excavation / Temporary structure**	**Transportation of material**	**Civil/construction work**	**Influx of construction workers**	**Transportation of material**	**Movement of energy reserves**	**Alcohol Manufacturing process**	**Sugar and Cogeneration power plant**	**Raw Material / Finished Products Storage & Handling**	**Storage of raw material and finished**	**Operation of cooling system**	**Pollution control equipment's nonfunctioning**
Resources utilization	Fuel	0	0	0	0	0	0	0	-1	-1	-1	-1	0	0	0	0
	Electricity	0	0	0	0	0	-1	-1	0	0	0	0	0	0	0	0
	Water	0	0	0	0	0	-1	-1	0	-1	-1	-1	0	0	-1	0
	Construction material ex. Stone	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0
	Land	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0
Air	Air Quality	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	-2
	Climate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water	Alteration of surface/ groundwater bodies	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2
	Alteration of surface run-off and interflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Alteration of Hydraulic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Regime															
	Contamination	0	0	0	0	0	0	-1	0	0	-1	0	-1	-1	-1	-2
Soil/Land	Soil erosion	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0
	Contamination	0	0	0	0	0	-1	-1	0	-1	-1	-1	-1	-1	-1	-3
	Alteration of Soil properties/ Soil Quality	0	0	-1	-1	0	-1	-1	0	-1	-1	-1	-1	0	-1	-3
	Land topography	0	-1	-1	-1	0	0	0	0	0	0	0	0	0	0	0
Noise	Noise pollution	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	-1	-2
Ecology	Effect on trees, grasses, herbs & shrubs	0	-1	-1	-1	-1	0	0	-1	0	0	0	0	0	0	-3
	Effect on farmland	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0
	Effect on aquatic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Effects on fauna	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2
	Habitat change and removal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1
	Introduce new exotic species	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Occupational Health & Hazards	Health	0	0	-1	-1	-1	-1	0	-1	0	-1	-1	-1	-1	0	-3
	Sanitation	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0
Socioeconomic	Creation of new economic activities	+1	0	0	0	0	+1	0	+1	0	+1	0	0	0	0	0
	Commercial value of properties	+1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Generation of temporary and permanent Jobs	0	0	0	0	0	+1	0	0	0	+1	+1	+1	+1	0	0
	Effect on crops	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1
	Reduction of farmland productivity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1
	Income for the state and private sector	+1	0	0	0	+1	0	0	+1	0	+2	0	0	0	0	0
	Savings in foreign currency for the state	0	0	0	0	0	0	0	0	0	+2	0	+1	0	0	0
	Training in new technologies and new skills	0	0	0	0	0	0	0	0	0	+1	+1	0	0	0	0

	to workers															
	Political/social Conflicts	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2
	Land use change	0	0	-1	-1	0	0	-1	0	0	0	0	0	0	0	0
	Aesthetics and human interest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1
	Cultural status	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Evaluation marking criteria

Description	*Value*
No / Zero Impact	: 0
Minor/ Negligible negative impacts	: -1
Minor / Negligible positive impacts	: +1
Significant negative impact	: -2
Significant positive impact	: +2
High negative impact	: -3
High positive impact	: +3

4.3.1 Conclusion of impact matrix assessment

Proposed project will not have any significant negative impacts on the environment. In absence of pollution control equipment, project will have high negative impact. Appropriate Environmental Management Plan (EMP) nullifies all high potential adverse

4.3.2 Summary of Impact

Based on the assessment made in the preceding sections the overall impacts due to the proposed power project are summarized in **Table 4.18.**

Table 4.18: Assessment of Impacts due to proposed activity on Environment

Sr. No	Environmental Component	Project Activity	Impacts Identified	Impact Assessment after Mitigation
1.	Topography	Site Clearance	Minor changes in landscape	Insignificant
		Construction Activities	Changes in landscape	Insignificant
		Operation activities	Changes in land use. The available free land is utilized.	Insignificant
2.	Air Quality	Site clearance	Excavation and levelling activities are limited hence, fugitive emissions would be restricted.	Insignificant

		Construction activities	Local increase in SPM	Insignificant
		Transportation	Vehicular and fugitive emissions	Insignificant
3.	Noise	Construction activities	Temporary local increase in noise	Insignificant
		Operation activities	Continuous noise but confined to within the Plant Area	Insignificant
		Transportation	Increase in noise levels due to vehicular traffic	Insignificant
4.	Water Resources	Construction activities	The water will be used during the construction activities.	Insignificant
		Operation activities	Surface water	Insignificant,
5.	Water Pollution	Construction activities	Small volume of wastewater from the construction and sanitation	Insignificant
		Operation activities	Effluent generated in the plant	Insignificant as there will be zero discharge of effluent.
6.	Ecology	Site Clearance	There will not be major disturbance to flora fauna	Insignificant
		Construction activities	There will not be major disturbance.	Insignificant
		Operation activities	There will not be major disturbance to flora fauna.	Insignificant
7.	Soil Characteristics	Construction activities	Since there is minimal levelling and excavation, the proposed project area is within the existing facilities.	Insignificant
		Operation activities	No changes are envisaged in this phase.	Insignificant
8.	Land Use	Construction activities	There will be change in land use for industrial purpose.	Significant
		Operation activities	The existing land use is change to industrial use.	Insignificant
9.	Socio-economics	Construction activities	Creation of additional jobs/ businesses.	Significant
		Operation activities	Rise in per capita income due to increased opportunities.	Significant
10.	Civic Amenities	Construction activities	Built up of temporary structures for workers and non-workers.	Moderately insignificant
		Operation	Availability of permanent	Moderately

		activities	structures for workers, non-workers	insignificant
11.	Occupational Health	Construction activities	Dusty conditions during summer with vehicular movement	Insignificant
		Operation activities	Process specific activities, heat and emission protective control measures followed	Insignificant
12.	Vibrations	Construction activities	Heavy equipment usage will be temporary	Insignificant
		Operation activities	Continuous usage of machinery	Insignificant
13.	Solid/ Hazardous waste	Construction activities	General construction waste will be disposed of in designated sites	Insignificant
		Operation activities	Ash from burning of bagasse in boilers	Insignificant

4.5 CONCLUSION

The anticipated/identified potential environmental impacts of proposed project will be mainly from solid waste disposal, effluent disposal, ground water exploitation, and flue gaseous emissions. However, an effective mitigation measure reduces level of significant impact on the environment. Hence, proposed project will be safe as there won't be disposal of effluent on the land or into the water body. Moreover, all required control measures and required equipment shall be provided to mitigate the impacts.

CHAPTER V: ANALYSIS OF ALTERNATIVES

5.1 Site Alternatives

Proposed project will be within existing factory premises at Amdapur, Post. Singnapur. Tal. & Dist. Parbhani. Location of the site has below advantages,

Availability of raw material/fuel

Proximity of molasses as a raw material and cost-effective transportation logistics

Availability of water supply

The availability of water from the source is adequate to meet the requirement of the proposed distillery. Source of water for proposed distillery is the factories own rainwater harvesting pond.G

Availability of infrastructural facility

Industrial infrastructural facilities such as roads, transport, security, water, power, administration etc. are available with existing factory. Community facilities such as quarters, medical services, education and training facility etc. are also available at site.

Environmental features of site

There are no any eco-sensitive areas such as biosphere, mangrove, protected forest, national parks etc. or environmental sensitive locations such as protected monuments, historical places within 10 km from the site.

5.2 Assessment of new & untested technology for the risk of technological failure

No new technology will be used for proposed distillery unit, as selected technology is a proven technology in the field of molasses based distillery.

5.3 Description of Alternative Technologies

The technology selection is done on the basis of following considerations

- Indigenous technology
- Least stress on resources
- Reduce, recycle and reuse of wastes
- Reduce the pollution from the industry
- No risk to human and property

Alcohol manufacturing is based on two main steps, Fermentation and Distillation.
Different technologies available in the field fermentation and distillation are given below,

5.3.1 Different fermentation technologies

1. High brix fermentation
2. Multistage continuous fermentation

3. Immobilized enzyme fermentation
4. Continuous fermentation without yeast separators

The continuous fermentation proposed is the latest and proven technology as compared to the old batch fermentation technology. It has many advantages like continuity of operation, higher efficiency and ease of operation. Continuous fermentation also results into consistent performance over a long period as compared to batch fermentation. To adopt continuous or fed-batch fermentation process is an appropriate step towards the updating technology of alcohol production for efficient performance. Volume of effluent discharged is less than that of total effluent discharged in
Conventional distillation process.

(Source: Information from client, DPR prepared by VSI, Pune)

Advantages of continuous fermentation

- **Fermentation**
  - Good ease of operation and easy way as no daily cleaning / filling required
  - Consistency in plant operation and performance is very high
  - Less operating manpower required
  - The process is automated with less cost and great ease
  - Easy to control & trouble shoot
- **Cultured Yeast Advantage**
  - No fresh yeast dosage required. Yeast is present in its culture form and hence saving in cost of the yeast
  - Elimination of other yeast related problems like wild yeast and contamination along with the fresh yeast
  - Yeast culturing and activation will also ensure optimum yeast concentration in the Fermenters, even when there is some bacterial growth
- **Higher Alcohol Concentration in Wash**
  - Less effluent volume and low cost of treatment
  - Reduced steam consumption in Distillation
  - Higher alcohol concentration ensures low bacterial activity in Fermenters
- **Rugged Process based on culture Yeast Technology**
  - Can handle varying quality raw material
  - Easy to start and stop, as and when required
  - Can take care of fluctuations like temperature and other conditions
  - Good control and handling of bacterial contamination
  - Higher alcohol yield per ton of molasses
- **Minimum and controlled air sparging is employed for Fermenter:**
  - Low electricity consumption

- Maximum CO2 recovery of up to 80 to 85 % of the total CO2 production is possible

5.3.2 Distillation

The distillation column system consist of number of bubble cap plates where wash is boiled and alcoholic vapors are separated according to their boiling point and concentrated on each plate stage by stage**.**

i. Atmospheric Distillation

Atmospheric distillation is a technique used to separate components in fermented wash that is performed under atmospheric pressure. This technique is used to separate components having a low boiling point (low boiling fractions).

In this process, pre-heated beer is passed into a distillation column in which the pressure at the top is maintained around 1.2-1.5 atm (nearly the atmospheric pressure).

ii. Multi-pressure Distillation

Multi Pressure system operates a number of columns at different pressure levels. The finely-balanced application of vacuum, atmospheric and overpressure allows to reuse the heat input multiple times.

This brings about a significant reduction in live steam consumption, thus generating equivalent (cost) savings in the energy required to produce it.

(https://www.vogelbusch-biocommodities.com/process-units/distillation-rectification/multipressure-distillation/)

Multi-pressure distillation system for production of Rectified Spirit consists of Distillation columns namely –

For –Rectified Spirit mode

1. Degasifying cum analyzer column
2. Rectification Column
3. Fusel Oil Concentration column

For –ENA mode

1. Degasifying cum analyzer column
2. Pre-rectifier column
3. Extractive Distillation column
4. Rectification Column
5. Refining /simmering column
6. Fusel Oil Concentration column
7. Head Concentration column

Choice of technology

Factory will adopt Multi pressure distillation system (For rectified spirit mode) and Molecular Sieve Dehydration Technology for fuel ethanol (anhydrous alcohol) production from molasses due to its eco-friendly nature and worldwide adoption of this technology.

5.4 Distillery Spent wash treatment

Alternative methods of spent wash treatment are given in Fig. 5.1.

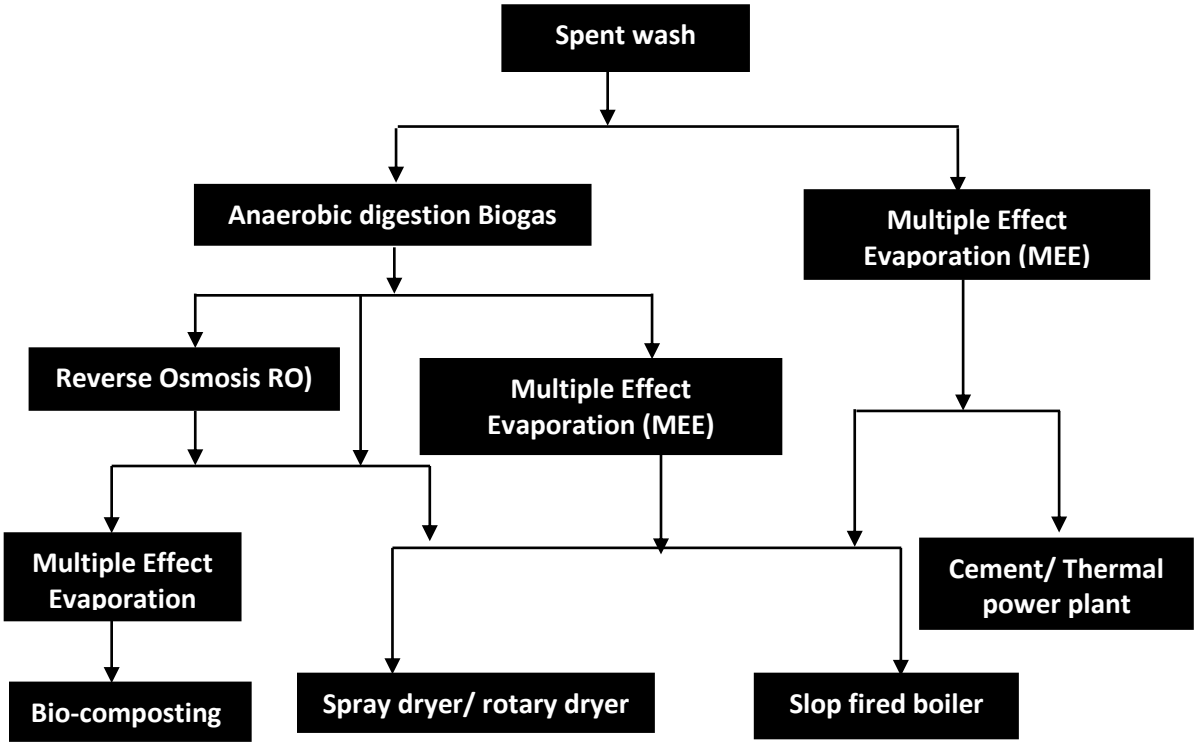


Figure 5.1: Alternative technologies for spent wash treatment

(Guidelines on Techno – Economic Feasibility of Implementation of Zero Liquid Discharge (ZLD) For Water Polluting Industries by Central Pollution Control Board January 2015)

Considering the aspect reuse of water recycling, cost of the technology and treatment efficiency, the industry has decided to adopt Multi effect evaporator followed slop fired boiler for the proposed expansion. Brief of both the system is given below,

Multi Effect Evaporator (MEE)

- Well established technology for concentration up to 40 % solids, which can result in substantial spent wash volume reduction.
- Integrated raw spent wash evaporation can result in reduction of final volume.

Slop fired boiler

- Solids concentrate (55 to 60 %) or spent wash powder is fired in a specially designed boiler with or without subsidiary fuel. Steam generated runs a TG set to generate electricity. Exhaust steam is used in distillery and evaporation plant operations
- Overall system is supposed to be self-sustaining in terms of steam and power balance after initial stabilization period.
- Potash rich ash as a by-product.

(Guidelines on Techno – Economic Feasibility of Implementation of Zero Liquid Discharge (ZLD) For Water Polluting Industries by Central Pollution Control Board January 2015)

Bio-composting

Spent wash will be composted with pressmud and microbial culture in windrows system. Separate aeration machine will be used for proper turning and aeration. Curing period will be 30 days.

Benefits of Composting

- Low production of waste biological solids
- Low nutrient requirements
- Production of methane as an energy
- Very high loading rates can be achieved
- Active-anaerobic sludge can be preserved unified for many months.

Choice of treatment technology

Spent wash generated during the process of distillation will be send to bio-methanation followed by multiple effective evaporators and bio-composting.

Summary of adverse impacts of each alternative

Other fermentation technologies and atmospheric distillation technologies are energy consuming and less effluent generating. Continuous fermentation and Multi-pressure distillation are the proven technology as compared to other old technologies.

5.5 Selection of alternative including justification.

Technology selection is done on the basis of efficient utilization of raw material, water, electricity, fuel and considering the recycle and reuse of wastes generated from industry. Considering the advantages and technology feasibility, distillery will be operated through Continuous Fermentation & Mutli Pressure Distillation. Spent wash generated during the process of distillation will be treated in Bio-methanation followed by multiple effective evaporators along with Bio-Composting. The proposed spent wash treatment option will be able to achieve the aim of **"zero discharge"** of effluent.

Chapter VI: Environment Monitoring Program

6.1 Objective of Monitoring Plan

The basic objective of implementing a monitoring plan on a regular basis is as follows:

- Monitoring the effectiveness of mitigation measures proposed
- To know the pollution status within the plant and its vicinity.
- Generate data for corrective action in respect of pollution.
- Correlate the production operations with emission and control mechanism.
- Examine the performance of pollution control system.
- Assess the environmental impacts.
- Remedial measures and environment management plan to reverse the impacts.

6.2 Environment Monitoring Plan

The post project monitoring plan will be as follows,

- Prior to the commencement of operation
- After 6 months of commencement of operation
- Once in a year from the commencement of operation

6.3.1 Environmental Monitoring Plan during Construction Phase

The construction activities require clearing of vegetation, mobilization of construction material and equipment. The proposed activity envisages setting up of boilers, turbines and cooling towers, establishment of storage facilities. The generic environmental measures that are to be undertaken during project construction stage are given in **Table 6.1.**

Table 6.1: Environmental monitoring plan during construction phase

Environmental Facets	Parameter	Frequency of Monitoring
Air Emissions	Random checks of equipment's logs/manuals	Weekly
	Vehicle logs	Weekly during site clearance & construction activities
	Gaseous emissions (SO_2,CO,NO_X)	Monthly emission monitoring
	The ambient air quality will conform to the standards for PM_{10},$PM_{2.5}$,SO_2,NO_X and CO	As per CPCB/ SPCB requirement or on monthly basis whichever is earlier
Noise	Equipment logs, noise reading	Weekly during construction
	Working hour records	Daily records
	Maintenance of record of vehicles	Daily records

Environmental Facets	Parameter	Frequency of Monitoring
	Spot Noise recording	As per CPCB/SPCB requirement or on monthly basis whichever is earlier
Wastewater Discharge	No discharge hoses shall be in vicinity of watercourse	Monthly during construction activities.
Soil Erosion	Effective cover in place	Period during construction activities
Drainage & effluent Management	Visual inspection of drainage and record thereof	Weekly during construction activities
Waste Management	Comprehensive Waste Management plan should be in place and available for inspection onsite.	Fortnightly check during construction activities
Non-routine events & accidental releases	Mock drills and records of the same	Monthly during construction activities
Health of workers	All relevant parameters including HIV	Monthly check ups
Loss of flora and fauna	No. of plants, species	During site clearance Phase.

6.3.2 Post Project Environmental Monitoring Plan

Environmental parameters to be monitored and its frequency after commissioning of proposed project is mentioned in **Table 6.2**

Table 6.2: Environmental monitoring schedule

Sr. No.	Particulate	Parameters	Number of location	Frequency
1.	Ambient air quality	PM_{10}, $PM_{2.5}$, SO_2, NOx, CO, etc.	Ambient air quality at minimum 3 locations. Two samples downwind direction at 500 m and 1000m respectively. One sample upwind direction at 500m.	Monthly
2.	Stack gas	PM, SO_2 and NOx	Number of stacks - 2	Monthly
			Online stack monitoring will be installed for both the stacks.	-
3.	Work place	$PM_{2.5}$, SO_2, NOx, CO, O_3	Process emission in workplace area/plants (for each area/plant minimum 2 locations and 1 location	Monthly

Sr. No.	Particulate	Parameters	Number of location	Frequency
			outside plant area near vent)	
4.	Waste water	pH, EC, SS, TDS, O&G, Ammonical Nitrogen, COD, BOD, Chloride, Sulphides etc.	Wastewater from all sources. Inlet & outlet of ETP, spent wash, Condensate treatment plant	Monthly
			Online Monitoring machine will be installed at existing ETP. Camera at spent wash tank will also be installed.	
5.	Surface water and ground water	pH, Salinity, Conductivity, TDS, Turbidity, DO, BOD, Phosphate, Nitrates, Sulphates, Chlorides, Total Coliforms (TC) & E.Coli	3-5 location Ground as well as Surface water. Within 1 km radius from spent wash tank and compost yard. 2 locations downward 1 location upward additional three locations within 10 km radius from the site. River sample One each at upstream and downstream	Half yearly
6.	Solid waste	Ash	Process dust, generated sludge and ash. Before used as manure if used manure	Monthly
7.	Soil Organic and Inorganic matter	N, P, K, moisture, EC, heavy metals etc.	At lands utilizing compost manure and treated effluent, 3 locations	Pre –monsoon and Post monsoon
8.	Noise	Equivalent noise level - dB (A) at min. Noise Levels measurement at high noise generating places as well as sensitive receptors in the vicinity	5 location At all source and outside the Plant area.	Monthly
9.	Green belt	Number of plantation (units), number of survived plants/ trees,	In and around the plant site	Monthly

Sr. No.	Particulate	Parameters	Number of location	Frequency
		number of poor plant/ trees.		
10.	Soil	Texture, pH, electrical conductivity, cation exchange capacity, alkali metals, Sodium Absorption Ratio (SAR), permeability, porosity.	2-3 near Solid waste storage. At least five locations from Greenbelt and area where manure of biological waste is applied. Near spent wash storage lagoon	Quarterly
11.	Compost Analysis	Moisture, Carbon: nitrogen ratio, Organic matter content, salinity, total nitrogen, total phosphorus, heavy metal etc.	At compost yard	Twice a year
12.	Occupational health	Health and fitness checkup of employees getting exposed to various hazards and all other staff	All worker	Yearly/ twice a year
13.	Emergency preparedness, such as fire fighting	Fire protection and safety measures to take care of fire and explosion hazards, to be assessed and steps taken for their prevention.	Mock drill records, on site emergency plan, evacuation plan	Monthly during operation phase

6.4 Monitoring methodologies

Environmental samples will be collected as per the guidelines provided by MoEFCC/ CPCB. The method followed for monitoring will be recommended/ standard method approved/ recommended by MoEFCC/ CPCB. Detail of the same is mentioned in Table 6.3.

Table 6.3: Methodology of Environmental Monitoring

Sr.	Description	Method

No		Sampling/ Preservation	Analysis
1.	Ambient air monitoring	Samplers (Designed as per USEPA) to collect PM $_{2.5}$, PM_{10} & the gaseous samples	Any standard methods such as IS 5182, CPCB guideline etc.
2.	Stack gas monitoring	Samplers (Designed as per USEPA) to collect particulate matter & the gaseous samples	-
3.	Water and waste water	Standard methods for examination of water and wastewater published by APHA 21st edition, 2005	Standard methods for examination of water and wastewater published by APHA 21st edition, 2012
4.	Noise monitoring	Instrument : Sound level meter	-
5.	Soil monitoring	Collected as per soil analysis reference book, M. I. Jackson and soil analysis reference book by C.A. Black	Analysis reference book, M. I. Jackson and soil analysis reference book by C.A. Black

6.5 Reporting and documentation

All the necessary reports and documents will be prepared to comply with statutory rules and regulations. The records of the monitoring program along with the results of all the parameters being monitored will be maintained on regular basis. The environmental monitoring activities will be recorded and the following documents are proposed to be maintained,

- Log sheets of operation and maintenance of pollution control facilities/ equipment such as ETP/slope fired boiler operation and test results of inlet and outlet.
- Instruction manuals for operation and maintenance of pollution control facilities/ equipment like ETP as well as for manual for monitoring of water, solid and gaseous parameter discharged from the project.
- Statutory records as per the environment related legislation.
- Monthly and annual progress report.
- Bi-annual compliance statement for Regional Office, MoEFCC.
- Annual environmental audit statements and compliance to NOC/ Consent conditions to State Pollution Control Board/ Regional Office, MoEFCC.

6.6 Formulation of Environment Management Cell (EMC)

The Environmental Management Cell shall be responsible for the environmental management, monitoring and implementation activities of the proposed unit. EMC will

carry out various activity of environment under the supervision of the Head of the plant. EMC cell shall be responsible for,

- Monitoring of efficiency of pollution control equipment's
- Preparation of maintenance schedule of pollution control equipment and treatment plants and see that it is followed strictly.
- Monitoring activities within core (within factory premises) and buffer zone(3 km from factory premises) of proposed project as per monitoring schedule.
- Inspection and regular cleaning of setting tanks, drainage system etc.
- Greenbelt development and maintenance
- Water and energy conservation measures
- Good housekeeping

Structure of EMC is mentioned in below

Table 6.4: Environment Monitoring Cell

Managing Director	**: One**
Environment Officer (Sugar + Distillery)	: One + One
Chemist (Sugar + Distillery)	: One + One
Laboratory Attendants (Sugar + Distillery)	: One + One
Safety Officer	: One

6.8 Effective Implementation on Environmental Monitoring Program

The mitigation measures suggested in **Chapter IV** Anticipated Environment & Mitigation measures will be implemented so as to reduce the impact on environment due to the operations of the proposed project. In order to facilitate easy implementation of mitigation measures, the phased priority of implementation is given in Table 6.5.

Table 6.5: Implementation Plan to Mitigate Environmental Impact

Sr. No.	**Recommendations**	**Time Requirement**	**Action**
1.	Air pollution control measures	Before commissioning of respective units	Immediate
2.	Water pollution control measures	Before commissioning of the plant	Immediate
3.	Noise control measures	Along with the commissioning of the Plant	Immediate
4.	Ecological preservation & up gradation	Stage wise implementation	Immediate & Progressive
5.	Green Belt development	Stage wise implementation	Immediate & Progressive

6.9 Budgetary provision for environment management

Environment management cost will be around Rs.8.3 cr. & recurring cost will be Rs. 0.29 cr. The details of EMP cost is mentioned in Table 6.6.

Table 6.6: Environment Management Cost

Sr. No	Description	Capital Cost (Rs. Cr.)	Recurring Cost (Rs. Cr.)
1.	Air Pollution Control (ESP and stack, Ash handling system)	6.3	0.01
2.	Water Pollution Control (CPU)	**1.5**	**0.05**
3.	Solid waste Management	0.05	0.05
4.	Environmental Monitoring and Management	0.05	0.03
5.	Rainwater Harvesting	0.15	0.05
6.	Occupational Health	0.05	0.05
7.	Green belt development	0.2	0.05
8.	**Total**	**8.3**	0.29

CHAPTER VII: ADDITIONAL STUDIES

7.1 Public consultation

The project falls under Category "B", Activity 5 (g) [All molasses based distilleries ≤100 KLPD], of schedule–I of the EIA notification-2006 (as amended timely). As per the ToR's issued by in SEAC 179th meeting dated 20.02.20. Hence, public consultation is applicable to the proposed project. The Public Hearing will be conducted after the submission of the draft EIA to the Maharashtra Pollution Control Board. The details of public hearing minutes will be unified in this report after completion of Public hearing.

7.2 Risk Assessment

An emergency occurring in the proposed project is one that may affect several sections within it and/or may cause serious injuries, loss of lives, extensive damage to environment or property or serious disruption outside the plant. It will require the best use of internal resources and the use of outside resources to handle it effectively. It may happen usually as the result of a malfunction of the normal operating procedures. It may also be precipitated by the intervention of an outside force such as a cyclone, flood, earthquake or deliberate acts of arson or sabotage.

A properly designed and operated plant will have a very low probability (to a level of acceptable risk) of accident occurrence. Subsequently, a properly designed and executed management plan can further reduce the probability of any accident turning into an on-site emergency and/or an off-site emergency.

The three main goals of risk assessment are

- Identify risks,
- Quantify the impact of the potential threats and
- Provide an economic balance between the impact of risk and the cost of the safeguard.

7.2.1 Risk mitigation

- Design, manufacture and construction of buildings, plant and machineries will be as per National and International Codes as applicable in specific cases and laid down by statutory authorities
- Provision of adequate access ways for movement of equipment and personnel will be made.
- Minimum of two numbers of gates for escape during disaster will be provided.
- In the vicinity of main plant entrance, there will be an emergency assembly point where plant personnel will assemble in the event of any disaster.

- Adequate numbers of Fire Fighting equipment's & Fire extinguishers will be installed in the work places for emergency purpose and the Supervisors / Workers will be trained to use the equipment's.
- An ambulance will be provided in the factory premises.
- A qualified Doctor and a compounder will be employed for attending to any emergency.

7.2.2 Identification of risks and hazards

For identification of risk due to proposed project, it requires in depth study of

- Raw material
- Process Risk
- Storages
- Operations
- Maintenance
- Safety
- Fire protection
- Effluent disposal

Details of major anticipated risks from the Hazards is given in Table 7.1,

Table 7.1: Hazards of the proposed plant

Sr. No.	Name	Description	Severity	Hazard
1.	Transportations of raw material	Molasses	Major	Exposure
		Coal	Minor	-
		Yeast, urea	Minor	Exposure & inhalation
		Sulphuric Acid, Di ammonium Phosphate, Anti-foam reagent, Caustic soda	Major	Exposure & inhalation
2.	Storage of Molasses products and by products	Molasses, RS/ ENA/ Technical Alcohol, Bagasse, fusel oil	Major	Explosion, Fire
3.	Manufacturing process	Fermentation	Major	Fire
		Distillation Unit	Major	Heat & fire
4.	Utilities	D.G set, Boiler, Turbine	Major	Heat, fire & electrocution
5.	Other accidents	Leakages from the vessels, Catastrophic rupture of pressure vessels and Storage Tanks	Major	Exposure & fire

7.2.1 Salient feature of risk mitigation

- Design, manufacture and construction of buildings, plant and machineries will be as per National and International Codes as applicable in specific cases and laid down by statutory authorities
- Provision of adequate access ways for movement of equipment and personnel will be made.
- Minimum of two numbers of gates for escape during disaster will be provided
- In the vicinity of main plant entrance, there will be an emergency assembly point where plant personnel will assemble in the event of any disaster.
- Adequate numbers of Fire Fighting equipment's & Fire extinguishers will be installed in the work places for emergency purpose and the Supervisors / Workers will be trained to use the equipment's.
- An ambulance will be provided in the factory premises.
- A qualified Doctor and a compounder will be employed for attending to any emergency.

7.2.2 Identification of risks

For identification of risk due to proposed project, it requires in depth study of

- Raw material
- Process Risk
- Storages
- Operations
- Maintenance
- Safety
- Fire protection
- Effluent disposal
- Inspection and regular monitoring of storage area
- Training to Workers for proper handling
- PPEs will be provided as Nose mask, Hand gloves.
- Provision of level indicators for storage Tanks
- If causes eye irritation wash area with soap, flood eye with water and water

E) Risk: Potential exposure to electricity

Particular: Entire power plant, specifically the generator area, distribution panel, and control rooms.

Follow up of standard operating procedures and regular training on electrical safety. Ensure suitability and adaptability of electrical equipment with respect to classified hazardous areas and protection against lightening protection and static charges. Adopting preventive maintenance practices as per testing and inspection schedules. Ensure all maintenance and repair jobs with prior work permit system. Use of personal protective equipment and ensuring compliance of the Indian Electricity Rules, 2003. Ensure all electrical circuits designed for automatic, remote shut down.

F) Risk: Fire incident

Particular: Bagasse Storage yard, entire power plant, specifically the Storage area, electrical wearing and fuel handling area.

Follow up of standard operating procedures and regular training on firefighting Mock drills of firefighting .Installation of fire alarm & proper fire extinguisher. Ensure suitability and adaptability of electrical equipment with respect to classified hazardous areas and protection against lightening protection and static charges. Adopting preventive maintenance practices as per testing and inspection.

G) Risk: Solid/ liquid waste disposal

Particular: Ash generated from boiler and effluent generated from distillery unit.

Standard operating procedures for disposal of ash need to be followed like isolated disposal of hot ash inside the silo, use ash will sold, brick & cement manufacturing industries. Effluent will be treated as per regulatory norms and treated water will be reused. Regular monitoring will be carried out as per schedule to avoid any kind of pollution

H) Risk: Health risk

Particular: Exposure to toxic and corrosive chemicals

Provision of secondary containment system for all liquid corrosive chemicals fuel and lubricating oil storages. Constructing storage tanks and pipes for toxic chemicals and fuel oil as per the applicable standards. Inspection and radiography will be followed to minimize risk of tank or pipeline failure. Provision of protective equipment's such as protective clothing, goggles, safety shoes and breathing masks for workers working in chemical storage. Provision of emergency eyewash and showers in the working area.

I) Risk: Safety risk

Particular: Ensure Worker Safety

Periodical SHE training of staff and contractor. Ensuring special training to develop competent persons to manage specific issues such as safety from the system, risk assessment, scaffolding, and fire protection, Training will include the proper use of all equipment operated, safe lifting practices, the location and handling of fire extinguishers, and the use of personal protective equipment. Ensure good housekeeping practices (e.g., keeping all walkways clear of debris, cleaning up oil spots and excess water as soon as

they are noticed, and regular inspection and maintenance of all machinery). Daily collection and separate storage of hazardous and non-hazardous waste.

J) Risk: Force Majeure and Insurance coverage to the Project

Particular: Natural calamities like flood, earthquake, fire, and other act of God and Act of Man etc.

Mitigation: Complete plant need to be insured and also care has been considered while designing and construction of the plant to minimize the impact. Third party Liability, Workers compensation, Employers Liability, Legal and contractual liabilities, Loss of profit due to interruption due to fire machine, break down, and related perils, Loss of profit due to loss of generation are some of the other risk against which the mitigation measures have been considered in the project by the way of insurance.

7.2.3 Fire and Explosion Index

Fire, Explosion and Toxicity Indexing (FETI) is a rapid ranking method for identifying the degree of hazard. In preliminary hazard analysis, chemical storages are considered to have Toxic and Fire hazards. The application of FETI would help to make a quick assessment of the nature and quantification of the hazards in these areas. However, this does not provide precise information.

- Respective Material Factor (MF),
- General Hazard Factors (GHF)
- Special Process Hazard Factors (SPH)

They are computed using standard procedure of awarding penalties based on storage handling and reaction parameters.

It can be used to classify separate elements of plant within an industrial complex. Before indexing is done, the plant is divided into plant elements. Depending upon the material in use, material factor, number of parameters such as exothermic reactions, handling hazards, pressure of system, flash point, operating temperature, inventory of flammable material, corrosive property, leakage points and toxicity are taken into consideration in determining a plant/ equipment /operation hazard. A standard method of awarding penalties and comparing the indices is used. However, this method does not give absolute status of the equipment or section. Dow's Fire and Explosion Index (F and E) is a product of Material Factor (MF) and hazard factor (F3) while MF represents the flammability and reactivity of the substances, the hazard factor (F3), is itself a product of General Process Hazards (GPH) and special process hazards (SPH). An accurate plot plan of the plant, a process flow sheet and Fire and Explosion Index and Hazard Classification Guide published by Dow Chemical Company are required to estimate the FE & TI of any process plant or a storage unit.

Computations and evaluation of fire and explosion index

The degree of hazard potential is identified based on the numerical value of F&EI as per the criteria given Table 7.1.

Table 7.2: Fire & Explosion Index

F&EI Range	Degree of Hazard
0-60	Light
61-96	Moderate
97-127	Intermediate
128-158	Heavy
159-up	Severe

Risk Index (RI)

The risk categories can be expressed in terms of the risk index as given below.

Table 7.3: Risk Index

Category	Risk Index
Acceptable Region	<0
Low Risk	0
Moderate Risk	0.67
Significant Risk	1.33
High Risk	2
Unacceptable Region	>2

Table 7.4: The Physiological effects of threshold Thermal Doses

Threshold Dose (kj/m2)	Effect
375	3rd degree burn
250	2nd degree burn
125	1st degree burn
65	Threshold of pain, no reddening or blistering of skin caused

Note:

1st degree burn- Involves only epidermis. Example sunburn. Blisters may occur.

2nd degree burn- Involves whole of epidermis over the area of burn plus some portion of dermis area.

3rd degree burn- Involves whole of epidermis and dermis. Sub cutaneous tissues may also be affected.

Table 7.5: Damage due to Incident Radiation Intensity

Incident Radiation Intensity (KW/m^2)	Type of Damage

Incident Radiation Intensity (KW/m^2)	Type of Damage
37.5	Minimum energy required igniting wood at infinite long exposure (non-piloted)
32.0	Maximum flux level for thermally protected tanks
12.5	Minimum energy required for piloted ignition of wood, melting plastic tubing etc.
8.0	Maximum heat flux for un-insulated tanks.
4.5	Sufficient to cause pain to personnel if unable to reach cover within 20 seconds. However blistering of skin (1^{st} degree burns) is likely.
1.6	Will cause no discomfort to long exposure.
0.7	Equivalent to solar radiation.

7.2.4 Consequence Analysis

Hazardous substance on release can cause damage on a large scale in the environment. The extent of the damage is dependent upon the nature of the release and the physical state of the material. It is necessary to visualize the consequences and the damages caused by such releases.

The quantification of the physical effects can be done by means of various models, which can then be translated in terms of injuries and damage to exposed population and buildings.

Hazardous substances may be released as a result of a catastrophe causing possible damage to the surrounding areas. The extent of damage depends upon the nature of the release. The release of flammable materials and subsequent ignition results in heat radiation, pressure wave or vapour cloud depending upon the flammability. It is important to visualise the consequences of the release of such substances and the damage caused to the surrounding areas.

An insight into physical effects resulting from the release of hazardous substances can be had by means of various models. Vulnerability models are used to translate the physical effects occurring in terms of injuries and damage to exposed population and buildings

7.2.5 Risk mitigation measures

The materials handled at the proposed installation are inflammable and reactive substances and based on the consequence analysis; the following measures are suggested as risk mitigation measures.

- It should be ensured that combustible materials such as oiled rags, wooden supports, oil buckets etc. are not kept in the storage and process areas as well as road tankers

loading/unloading sites where there is maximum possibility of presence of flammable hydrocarbons in large quantities, to reduce the probability of secondary fires.

- Smoke and fire detectors should be suitably located and linked to firefighting system to reduce the response time and ensure safe dispersal of vapours before ignition can occur.
- Training in firefighting, escape action, operation of emergency switches etc. is vital.
- Pump loading line failures also have possibility of causing major damage. Strict inspection, maintenance and well laid down operation procedures are essential for preventing escalation of such incidents.
- Emergency procedures should be well rehearsed to achieve state of readiness.

Potential risk and mitigation measures during operation phase at every stages are given below

Boiler Operation

Sr. No.	Activity	Associated Hazards	Health impact	Risk rating	Proposed mitigation & control measures
1.	Working near Boiler	High noise	Noise induced hearing loss	M	Required PPEs need to be used
2.	Boiler maintenance	Mechanical hazard	Physical injury	M	• PPEs • Regular monitoring for checking leakages • Individual vigilance and proper training to worker for proper handling • Provision of First aid box
3.	High Pressure Steam	Explosion	Release of energy from pressure burst and flashing of liquid content to vapor	H	• Required PPEs • Only trained personals • Flammable chemicals stored away from the source of ignition • Firefighting facility • Provision of First aid Box
4.	Incomplete Combustion	Asphyxiation from carbon monoxide	Possible fatality	H	• Online CO monitors • Regular checking of workplace • Individual alertness and precaution

5.	Maintenance work	Slips, Trips and Falls	Physical injury	M	• PPEs • Individual alertness and precaution
6.	Electrical maintenance work	Electricity	Electric shock, Possible burns	H	• Regular checking and maintenance of electrical units • PPEs • Provision of First aid box
7.	Maintenance of burner	Burn injury	Severe Physical injury or burn	M	• PPES will be provided. • Work will be carried out under proper supervision. • Follow of SOPs. • Individual alertness and precaution is important • Provision of First aid box

Risk Impact and rating matrix for D.G. set operation

Sr. No.	Activity	Associated Hazards	Associated Risk /Health impact	Risk rating	Proposed mitigation measures
1.	Working near DG	High noise	Noise induced hearing loss	M	• Use of PPEs • Acoustic enclosure
2.	Maintenance	Fire	Burns, Serious injury	H	• Restricted Entry • Use of flame proof fittings • Use of PPEs
3.	HSD Storage	Leakage / Fire	Risk of severe physical injury and burn	H	• Storage will be away from ignition source • Regular monitoring to check the leakages and spillages • Firefighting facility will be provided • PPEs will be provided • First aid box
4.	DG set maintenance	Mechanical Hazard	Physical injury	M	• PPEs • Leakage and heat in the joint will be checked before maintenance • First aid box at approachable place

Impact matrix of Storage and handling of raw material

Sr. No.	Activity	Associated Hazards	Associated Risk / Health impact	Risk rating	Proposed mitigation measures
1.	Storage, handling, loading & Unloading of material	Exposure, leakage, Fire, Explosion	Physical Injury, burn, Eye irritation and respiratory problem	H	• Provision of Eye wash • Inspection and regular monitoring of storage area • Training to Workers for proper handling • PPEs will be provided as Nose mask, Hand gloves. • Proper system for loading operation to prevents spillage • Provision of level indicators for storage Tanks • Spill kit for Acid and other chemicals • Proper ventilation • First Aid boxes
2.	Storage of coal, bagasse, molasses, spent wash of existing sugar Unit	Fire, explosion	Burns, serious injury	H	• Firefighting facility in the factory premises is provided.
2.	Transportation	Fire, Accident, leakage	Burns, serious injury	H	• Firefighting facility • Training to Driver • MSDS • TREM Card • First Aid Box

Hazard & associated Risk of Molasses storage tank

Sr. No.	Activity	Associated Hazards	Associated Risk/ Health impact	Risk rating	Proposed mitigation measures
1.	Storage and	Explosion	• May cause slight	H	• Store in good quality ventilated and leak-proof tanks (mild steel,

	Handling		irritation • May cause irritation		stainless steel, polyethylene, PVC) at ambient temperatures, out of moisture. • Continuous mixing of molasses should be done. • If there is increase in temperature beyond 30 ^{o}C external cooling of tanks should be provided. A temperature recorder should be provided to the tanks. • Avoid microbiological contamination or dilution with water. • Regular monitoring and maintenance to avoid leakages. • Training to Workers for proper handling • PPEs will be provided as Nose mask, Hand gloves. • Provision of level indicators for storage Tanks • If causes eye irritation wash area with soap, flood eye with water and water

Impact matric of risk associated Alcohol storage

Sr. No.	Activity	Associated Hazards	Health impact	Risk rating	Proposed Control and mitigation measures
1.	Storage of Alcohol	Exposure, inhalation, ingestion & Fire	• Exposure to over 1000 ppm may cause headache, drowsiness and lassitude, loss of appetite, and inability to concentrate. Throat Irritation • Ingestion causes depression of central nervous system, nausea, vomiting, and diarrhea	H	**Storage** • Storage will be away from process area with well-ventilation. Avoid all possible sources of ignition like spark or flame. • Use spark/flame proof hand tools • Electrical wiring will be flame proof type • Based on the leakage quantity, wiped out with or dilute by spraying the water to suppress the

			• Liquid or vapor may cause eye and skin irritation • Burn injury		vapors **Control measures in case of over exposure** • If victim is conscious and able to swallow, then give water to dilute the contents in the stomach • Look out for medical help **Skin or Eye exposure** • Immediately flush affected area with plenty of water. Eyes should be flushed for at least 15 minutes with water • PPEs will be provided to avoid exposure

Impact matric of risk associated distillation area

Sr. No.	Activity	Associated Hazards	Health impact	Risk rating	Proposed Control and mitigation measures
1.	Working near Distillation column	Heat & Fire	Physical injury & burning	H	• PPEs • Firefighting facility • First aid box • Periodic checking of all parts

Warning Information for Ethyl Alcohol

Section I	
Product Name	Ethyl Alcohol,
Synonyms	Anhydrous Ethyl Alcohol, Dehydrated Alcohol
Chemical Family	Alcohol
Molecular Weight	46.07
Formula	C_2h_5oh

Health	Fire	Reactive	Other	Degree of Hazard	Colour Coding	Other Codes
0	3	0	-	0 = Minimum 1 = Slight 2 = Moderate 3 = Serious 4 = severe	Health = Blue Fire = Red Reactivity = Yellow Other = White	Ox = Oxidiser Acid = Acid Alk = Alkaline COR = Corrosive W = No use water

SECTION II – INGREDIENTS

COMPOSITION	CAS RN.	NOMINAL WT/WT%	PEL/TLV	HAZARD

Ethyl Alcohol	64-17-5	100.0	**1000 ppm**	Flammable/Nervous System Depressant

PEL = Personal Exposure Limit
TLV = Threshold Limit Value

SECTION III – HEALTH INFORMATION

INHALATION	Exposure to over 1000 ppm may cause headache, drowsiness and lassitude, loss of appetite, and inability to concentrate. Irritation of the throat.
INGESTION	Can cause depression of central nervous system, nausea, vomiting, and diarrhea.
EYE CONTACT	Liquid or vapor may cause irritation.
SKIN CONTACT	May cause irritation and defatting of skin on prolonged contact.
SECTION IV – OCCUPATIONAL EXPOSURE LIMITS	
PEL (OSHA Permissible Exposure Limit): Mixture	See Section II
TLV (ACGIH Threshold Limit Value): Mixture	See Section II
SECTION V – EMERGENCY FIRST AID PROCEDURE	
FOR OVEREXPOSURE BY SWALLOWING	If victim is conscious and able to swallow, have victim drink water or milk to dilute. Never give anything by mouth if victim is unconscious or having convulsions. CALL A PHYSICIAN OR CHEM-TREC (POISON CONTROL) IMMEDIATELY. Induce vomiting only if advised by physician (Poison Control)
INHALATION	Immediately remove victim to fresh air. If victim has stopped breathing, give artificial respiration, preferably mouth-to-mouth. GET MEDICAL ATTENTION IMMEDIATELY
CONTACT WITH EYES OR SKIN	Immediately flush affected area with plenty of cool water. Eyes should be flushed for at least 15 minutes. Remove and wash contaminated clothing before reuse. GET MEDICAL ATTENTION IMMEDIATELY
SECTION VI – PHYSICAL DATA	
BOILING POINT	173° F (78 ^{0}C)
MELTING POINT	-173° F (-114 ^{0}C)
VAPOR PRESSURE	44.6 mm Hg @ 68° F (20 ^{0}C)
SPECIFIC GRAVITY	0.7940 @ 60°/60° F
VAPOR DENSITY (AIR = 1)	1.59
SOLUBILITY IN WATER	Complete in water, chloroform, acetone, ether, benzene and methanol
APPEARANCE AND COLOR	Clear and colorless, volatile liquid with a weak, vinous, alcohol odour and bitter taste. Odour threshold = 84 ppm
SECTION VII – FIRE AND EXPLOSIVE HAZARDS	
FLASH POINT	56° F ASTM D-56 (Tag Closed Cup)
AUTO-IGNITION TEMPERATURE	685° F
FLAMMABLE LIMITS IN AIR, % BY VOLUME	LOWER: 3.3 UPPER: 19
NFPA (National Fire Protection Association) RATING	HEALTH (0) FIRE (3) REACTIVITY (0)
FIRE FIGHTING PROCEDURES	(Note: Individuals should perform only those fire-fighting procedures for which they have been trained.) Use dry chemical, "alcohol" foam, or

	carbon dioxide; water may be ineffective, but water should be used to keep fire-exposed containers cool. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect men attempting to stop a leak. Water spray may be used to flush spills away from exposures and to dilute spills to nonflammable mixtures.
	Firefighters should wear self-contained breathing apparatuses in the positive pressure mode with a full-face piece when there is a possibility of exposure to smoke, fumes, or hazardous decomposition products.
SECTION VIII – REACTIVITY	
STABILITY	Generally stable.
HAZARDOUS POLYMERIZATION	Not likely.
CONDITIONS & MATERIALS TO AVOID	Contact with acetyl chloride and a wide range of oxidizing agents may react violently.
SECTION IX – EMPLOYEE PROTECTION	
CONTROL MEASURES	Handle in the presence of adequate ventilation.
RESPIRATORY PROTECTION	Where exposure is likely to exceed acceptable criteria, use NIOSH/MSHA approved respiratory protection equipment. Respirators should be selected based on the form and concentration of contaminant in air and in accordance with OSHA (29 CFR 1910.134).
PROTECTIVE CLOTHING	Wear gloves and protective clothing, which are impervious to the product for the duration of the anticipated exposure if there is potential for prolonged or repeated skin contact.
EYE PROTECTION	Wear safety glasses meeting the specifications of ANSI Standard Z87.1 where no contact with the eye is anticipated. Chemical safety goggles meeting the specifications of ANSI Standard Z87.1 should be worn whenever there is the possibility of splashing or other contact with the eyes.
SECTION X – ENVIRONMENTAL PROTECTION	
ENVIRONMENTAL PRECAUTIONS	Avoid uncontrolled releases of this material. Where spills are possible, a comprehensive spill response plan should be developed and implemented.
SPILL OR LEAK PROCEDURES	Wear appropriate respiratory protection and protective clothing as described in Section IX. Contain spilled material. Transfer to secure containers. Where necessary, collect using absorbent media. In the event of an uncontrolled release of this material, the user should determine if the release is reportable under applicable laws and regulations.
WASTE DISPOSAL	All recovered material should be packaged, labeled, transported, and disposed of, or reclaimed in conformance with applicable laws and regulations and in conformance with good engineering practices.
SECTION XI HANDLING AND STORAGE	
Precautions Keep locked up. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, alkalis, and moisture.	
Storage Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Do not store above 23°C (73.4°F).	

7.2.6 Possibilities, nature and effects of emergency

Leaving aside earthquake, cyclone, flood, arson and sabotage, the possible emergencies that can arise in the power plant due to operations and storages and handling of the fuels and gases are:

- Explosion in boilers, turbo generators, transformers and hydrogen plant
- Subsequent fire in the fuel handling area
- Large fires involving the bagasse storage yard and bagasse handling areas
- Accidental release of ash slurry
- Accidental fire due to some other reasons such as electrical short circuit.

7.2.7 Methodology of MCA Analysis

The MCA analysis involves ordering and ranking of various sections in terms of potential vulnerability. The data requirements for MCA analysis are:

- Flow diagram and P&I diagrams
- Detailed design parameters
- Physical & chemical properties of all the chemicals
- Detailed plant layout
- Detailed area layout
- Past accident data

The following steps are involved in MCA analysis:

- Identification of potential hazardous process units, storage sections and representative failure cases from the vessels and pipe lines
- Visualization of chemical release scenarios
- Consequence Analysis for computation of damage distances from the release cases through mathematical modeling

7.2.8 Consequence analysis

Hazardous substance on release can cause damage on a large scale in the environment. The extent of the damage is dependent upon the nature of the release and the physical state of the material. It is necessary to visualize the consequences and the damages caused by such releases. The quantification of the physical effects can be done by means of various models, which can then be translated in terms of injuries and damage to exposed population and buildings. Hazardous substances may be released as a result of a catastrophe causing possible damage to the surrounding areas. The extent of damage depends upon the nature of the release. The release of flammable materials and subsequent ignition results in heat radiation, pressure wave or vapor cloud depending upon the flammability. It is important to visualize the consequences of the release of such substances and the damage caused to the surrounding areas.

An insight into physical effects resulting from the release of hazardous substances can be had by means of various models. Vulnerability models are used to translate the physical effects occurring in terms of injuries and damage to exposed population and buildings.

7.2.9 Factors influencing the use of physical effect models

In order to calculate the physical effects of the accidental releases of hazardous substances the following steps must be carried out in succession:

- Determine the form in which the hazardous substances occur- gas, gas condensed to liquid or as a liquid in equilibrium with vapor
- Determine the way in which the release takes place, above or below the liquid level in a process unit or storage facility, instantaneous or continuous
- Determine the outflow volume (as a function of time) of the gas, vapor or liquid in the event of liquid outflow, possible two phase outflow,
- Determine the evaporation from the pool of liquid formed
- Dispersion of the released gas or vapor which has formed into the atmosphere

A distinction has to be made between toxic and flammable substances. In the event of the incidental release of toxic substances it is necessary to compute the concentrations of gas cloud (as a function of time and place) spreading in the surrounding areas. In the case of flammable substances, the heat radiation is computed for the following situations:

- Torch, if vapors are ignited
- Pool fire, if pool of liquid is ignited
- Boiling Liquid Expanding Vapor Explosion (BLEVE) which is a physical explosion

In the event of an explosive gas cloud the peak overpressure resulting from the explosion is calculated and the damage contours are plotted. In the distribution model account is taken of the atmospheric stability, the so-called Pasquill classes (A to F) and a wind velocity. The model is based on a point source. In practice, however, a point source will never exist; for example, a surface sources in the case of pools. To enable the source dimensions to be included in the calculation in the dispersion models in spite of this, an imaginary (virtual) point source is assumed, which is put back in such a way that the cloud area calculated according to the model has the source dimensions at the site of the actual source. In calculations based on a continuous source, the duration of the source is also included in the calculation. Some conditions for this calculation model are as follows:

There must be some wind at the site

The model applies only to open terrain; allowance is made, however, for the roughness of the terrain. The influence of trees, houses, etc. on the dispersion can be determined by means of the roughness length.

Models for the calculation of heat load and shock waves

If a flammable gas or liquid is released, damage resulting from heat radiation or explosion may occur on ignition. Models for the effects in the event of immediate ignition (torch, pool fire and BLEVE) and the ignition of a gas cloud will be discussed in succession. These models calculate the heat radiation or peak overpressure as a function of the distance to the torch, BLEVE, the ignited pool or gas cloud.

Model for a BLEVE

BLEVE stands for Boiling Liquid Expanding Vapor Explosion. BLEVE is a follow-up effect that occurs if the vapor side of a tank is heated by a torch or a pool fire. Due to the heating, the vapor pressure will rise and the material of the tank wall will weaken. At a given moment the weakened tank wall will no longer be able to withstand the increased vapor pressure and it will burst open. As a result of the expansion and flash-off a pressure wave occurs. In the case of flammable gases a fireball will form. The effects of a BLEVE for a tank with a flammable liquid are:

- A fireball: model gives the radius of the fire ball and the thermal load
- Pressure wave effects resulting from the expansion of the vapor and the flash-off. This is however, not predominating in this case
- Rupture of the tank, resulting in the formation of numerous fragments of the tank. These fragments can be hurled over at fairly great distances by the energy released

Ignition of a Gas Cloud

If a flammable gas is not ignited directly, this cloud will spread in the surrounding area. The drifting gas cloud will mix with air. As long as the gas concentration is between the lower and upper explosion limit, the gas cloud may explode or give flash fire on availability of an ignition source. The flammable content of a gas cloud is calculated by a three-dimensional integration of the concentration profiles, which fall within the explosion limits. If the gas cloud ignites, two situations can occur, namely non-explosive combustion (flash fire) and explosive combustion (flash fire + explosion).

The heat radiation from a flash fire is not calculated since the burning time is very short. Models exist for the calculation of the peak overpressure in explosive combustion as a function of the distance from the center of the gas cloud.

Burning Torch

The out flowing gas on immediate ignition gives a burning torch. In this model, an ellipse is assumed for the shape of a torch. The volume of the torch (flare) in this model is proportional to the outflow. In order to calculate the thermal load the center of the flare is regarded as a point source.

Injuries resulting from Flammable Liquids and Gases

In the case of flammable liquids and gases on immediate ignition, a pool fire or BLEVE or a flare will occur. The injuries in this case are mainly caused by heat radiation. It is only in the case of a BLEVE that injury may occur as a result of flying fragments also. Serious injuries as the result of the shock wave generally do not occur outside the fire ball zone. Fragmentation of the storage system can cause damage up to distances of over 1 km.

If the gas is not ignited immediately, it will disperse into the atmosphere. If the gas cloud ignites, it is assumed that everyone present within the gas cloud will die as a result of burns or asphyxiation. The duration of the thermal load will be too brief in case of explosion to cause any injuries. In the event of very rapid combustion of the gas cloud the shock wave may cause damage outside the limits of the cloud. Explosive combustion will only occur if the cloud is enclosed to some extent between buildings and structures.

Damage Models for Heat Radiation

It is assumed that everyone inside the area covered by the fire ball, a BLEVE, a torch, a burning pool or gas cloud will be burnt to death or will asphyxiate. The following probit functions are examples of methods which can be used to calculate the percentage of lethality and first degree burns that will accurate a particular thermal load and period of exposure of an unprotected body.

Lethality

Pr = - 36.38 + 2.56 ln (t.q4/3)

First degree burn symptoms

Pr = -39.83 + 3.0186 ln (t.q4/3)

Where, t= Exposure time in seconds,

q= Thermal load in W/m2,

Pr= Probit value, which relates to the percentage of affected people

For the exposure time, two values are chosen:

- 10 seconds: In a residential area, it is reasonable to assume that affected people can find protection from the thermal load within 10 seconds.
- 30 seconds: This pessimistic assumption applies if people cannot directly flee or no protection is provided to them.

Damage Model for Pressure Waves

A pressure wave can be caused by a BLEVE or gas cloud explosion.

The peak overpressure of 0.3 bar will lead to heavy damage to buildings and structures. Secondary fire and explosion are likely to take place due to cascading effects. A peak overpressure of 0.1 bar is taken as the limit for fatal injury and 0.03 bar as limit for the occurrence of wounds as the result of flying fragments of the glass. Similarly a peak overpressure of 0.01 bar is taken as the limit for the smashing of windows pans.

7.7.10 Specific Emergencies Anticipated and Mitigation Measures

Consequence analysis for leakage from RS/ENA storage tank.

The following inputs were used to run ALOHA model for computation of damage distances from 2" & 4" leak from one RS/ENA tank:

ALOHA model developed by USEPA was used to quantify the damage distances for release scenario of 2 inch leak in one RS/ENA storage tank for heat loads of 37.5 kW/m^2, 12.5 kW/m^2, and 4 Kw/m^2 for pool fire scenario under weather condition of 3F. The damage distances for 37.5 kW/m^2, 12.5 kW/m^2, and 4 Kw/m^2 were computed as 6 m, 9 m and 17.3 m respectively.

Similarly the release scenario for 4 inch leak in one RS/ENA tank was visualized for heat loads of 37.5 kW/$m^{2,}$ 12..5 kW/$m^{2,}$, and 4 Kw/m^2 for pool fire scenario under weather condition of 3F. The damage distances for 37.5 kW/$m^{2,}$, 16.5 kW/$m^{2,}$, and 4 kW/m^2 were computed as 9.9 m, 19.2 m and 32.9 m respectively.

For avoiding any kind of fire incident leakages inside the factory premises, the following safety measures have to be undertaken:

Safety Equipment

Table 7.6: Fire & safety facilities

Sr. No.	Particulars
1.	DCP Type 5 Kg Fire Extinguisher
2.	DCP Type 10 Kg Fire Extinguisher
3.	CO_2,Water type ,Capacity 9 lit
4.	Mechanical Foam Type, Capacity 9 lit
5.	Carbon Di Oxide,(CO_2) Capacity 4.5 Kg

7.2.11 Risk Reduction Measures

The following opportunities will be considered as a potential means of reducing identified risks during the detailed design phase:

- Buildings and plant structures designed for cyclone and seismic events (where appropriate), to prevent structural collapse and integrity of weather (water) proofing for storage of dangerous goods;
- Provision for adequate water capacity to supply fire protection systems and critical process water;
- Isolate people from load carrying/mechanical handling systems, vehicle traffic and storage and stacking locations;
- Installation of fit-for-purpose access ways and fall protection systems to facilitate safe access to fixed and mobile plant;
- Provision and integrity of process tanks, waste holding tanks and bunded areas as per relevant standards;
- Containment of hazardous materials;
- Security of facility to prevent unauthorized access to plant, introduction of prohibited items, and control of onsite traffic; and
- Development of emergency response management systems commensurate with site specific hazards and risks (fire, explosion, rescue, and first aid).
- Surrounding population (includes all strata of society) should be made aware of the safety precautions to be taken in the event of any mishap within the plant. This can effectively be done by conducting the training programs.
- Critical switches and alarm should be always kept in line
- Fire extinguishers should be tested periodically and should be always kept in operational mode
- A wind direction pointer should also be installed at storage site so that in an emergency the wind direction can be directly seen and downwind population cautioned
- Shut off and isolation valves should be easily approachable in emergencies

A detailed HAZOP and Fault Tree Analysis should be carried out before commissioning of any new installation.

7.3 Disaster Management Plan

This DMP has been designed based on the range, scales and effects of "Major Generic Hazards" described in the Risk Assessment. The DMP addresses the range of thermal and mechanical impacts of these major hazards so that potential harm to people onsite and off-site, plant and environment can be reduced to a practicable minimum. The scenarios of loss of containment are credible worst cases to which this DMP is linked.

Disaster Management Plan is an elaborate scheme of planning events and organizing the chain of command which will enact swiftly to counter contingencies arising out of the accident whose cause can be catastrophic rupture of tank leading to pool fire –among many others. The general description of the emergency management plan is discussed below which is further bifurcated into the onsite emergency plan and off-site emergency plan.

The project is in its formative stage and detail engineering is yet to be done, so the elements of the DMP are based on concepts.

7.3.1 Capabilities of DMP

The emergency plan envisaged will be designed to intercept full range of hazards specific to power plant such as fire, explosion, major spill etc. In particular, the DMP will be designed and conducted to mitigate those losses of containment situations, which have potentials to escalate into major perils.

Another measure of the DMP's capability will be to combat small and large fires due to ignition, of flammable materials either from storage or from process streams and evacuate people from the affected areas speedily to safe locations to prevent irreversible injury.

Emergency medical aids to those who might be affected by incident heat radiation flux, shock wave overpressures, and toxic exposure will be inherent in the basic capabilities.

The most important capability of this DMP will be the required speed of response to intercept a developing emergency in good time so that disasters such as explosion, major fire etc. are never allowed to happen.

7.3.2 Declaration of Emergency

a) Communication with declarer of emergency

When an emergency situation arises in the plant, it will be first noticed by some workers on the shop floor. He will immediately get in touch with shift –in-charge of that particular section. The shift –in-charge will initiate action to overcome the emergency, and will use his discretion to shut – down the factory if he feels that emergency situation is very serious. He will simultaneously get in touch with the Declarer of Emergency. The possible Declarers of Emergency in the order of priority are given below

i) **Chairman General Manager**

ii) **Distillery Managers**

b) Communication with Declarer

The shift in charge has to try to get in touch with number one of the declarer of emergency on phone. The phone number of the Declarers of Emergency should be known to every worker. In case the phones are out of order due to some reason or the other, a messenger has to be immediately sent by the shift by the shift –in-charge to

contact the Declarer of Emergency As the vehicles are coming under the jurisdiction of the Transport Department, which is open all the 24 hours, the shift –in –charge will get in touch with the in charge of the Transport Department, who will in turn make arrangements to send a messenger to the Declarer of Emergency. In case the first Declarer is not available or is out of station, as the case may be, due to some reason or the other, the Shift –in –charge or the messenger, will get in touch with the second or the subsequent Declarer of Emergency in order of priority given in the above section.

c) Announcing of Emergency

The Declarer of Emergency has to immediately come to the place of work, assess the situation, and act in an appropriate way. He may decide that emergency may be declared in one or two sections. On the other hand, he may feel that the emergency is more serious and the whole plant is to be whole plant. To indicate to the workers and other living in the vicinity that an emergency will continue as "Regular declarer of the emergency". The Deputy Superintendent of Police will have to get in touch with the superintendent of Police and when he comes, he will have to look after the Emergency in the capacity as declarer.

7.3.3 Control of Emergency

The emergency has to be controlled from one particular spot. This spot should be away from the likely points of accident, should be easily accessible to workers / officers / police / Ambulance and also there should be easy asphalted access from the factory to the Control Room.

Facilities at the Control Room

- Factory Layout Plan
- Emergency telephone numbers;
- General telephone numbers;
- Emergency lighting;
- Hooters
- Daily number of people working in hazardous area;
- Population around the factory;
- Hot lines to the District Magistrate, Police Control Room, Fire brigade, antidotes and telephone numbers of hospitals etc.,
- Information regarding dispersion and
- Safety equipment.

Apart from the above information, the control rooms shall have a list of possible accidents and the number of people to be affected in each of possible accident displayed on daily basis depending on the predominant wind direction and weather conditions.

The Control room shall not be on the main road as it is likely that there will be traffic congestion at these points. This should make the task of controlling the Emergency as well as controlling the traffic easier.
After the assembly of plant workers at the control room suitable evacuation and plant shut down methodology is to be adopted.

7.3.4 Emergency Fire Fighting Equipment

The industry will provide firefighting facilities in the industry in order to tackle the emergency firefighting:

- Adequate number of fire extinguishers as per the factory rules shall be provided.
- A storage sump exclusively for storing water for meeting emergency fire conditions will be provided with necessary piping and pumping facilities;
- Adequate number of safety showers and eye wash fountains in the plant as per the factory rules shall be provided.
- Regular firefighting and safety training shall be imparted to the employees.

7.3.5 Evacuation of Workers and Plant Shut Down

When the emergency is declared, all workers should leave their places of work and reach the safe place has been recognized as the Main Gate of the Plant. However in confusion and excitement, the workers may not exactly know which path may not be visible.

Further when the emergency is in the same section in which a particular worker is working; there will be so much smoke or toxic fumes that it may be difficult for him to find the path or exit and he will require some special guidance. Thus it is very necessary that there are guide paths for the workers to follow in case of emergency so that they can reach the main gate in safe condition. The especial guide paths with an emergency lighting shall be drawn and workers will be made familiar with them. It may so happen that these paths fall in the way of toxic fumes. Thus alternate paths have also been decided upon.

There may be some workers who could be hurt and/ or unable to come out. To help them, a special team has to be selected on voluntary basis. This team is quite a large one

because not all its voluntary members will be available in one shift. The appropriate members who should send this team with hooters to the factory area along with necessary safety equipment which will always be kept ready for use in the main control room. This team shall pick up those workers who have been hurt and make arrangements to bring them to safe place near the main gate.

At the gate it there shall be arrangement for counting of the workmen reporting there. In some cases, it may so happen that in the excitement of the emergency some workmen may go away without reporting at the main gate, in spite of the fact the training being given to them to report at the main gate. All the workers who have arrived at the main gate. All the workers who have arrived at the main gate should be counted against the number which had entered. The total number consists of not only the workers but also the visitors and contract laborers (not only associated with the factory but also associated with the contractors).

When the injured workers are brought to the main gate, they have to be shifted to the hospitals with or without the help of police. For this, arrangements will be made for a number of vehicles, ambulances etc.

If outside public in the nearby villages are affected, their evacuation shall be done by police. The local controller of emergency shall also arrange for guarding the property and law and order control. The police shall also arrange for temporary shelter and food and will also make arrangements to take the public back to their residences, after the emergency situation has been controlled.

It is absolutely necessary that the plant is shut down immediately. For the shutting down of the plant, the procedure to be followed is described below.

7.4 Disaster Control Philosophy

The principal strategy of DMP is "Prevention" of identified major hazards. The "Identification" of the hazards will employ one or more of the techniques [e.g. Hazard and Operability Study (HAZOP), accident consequence analysis etc.]. Since these hazards can occur only in the event of loss of containment, one of the key objectives of technology selection, project engineering, construction, commissioning, and operation is "Total and Consistent Quality Assurance". The Project Authority will be committed to this strategy right from the conceptual stage of the plant so that the objective of prevention can have ample opportunities to mature and be realized in practice.

The DMP or Emergency Preparedness Plan (EPP) will consist of:

- On-site Emergency Plan

- Off-site Emergency Plan

Disaster Management Plan preparation under the headlines of On-site Emergency Plan and Off-site Emergency Plan is in consonance with the guidelines laid by the Ministry of Environment and Forests & Climate Change (MoEF&CC) which states that the "Occupier" of the facility is responsible for the development of the On-site Emergency Plan. The Off-site Emergency Plan should be developed by the Government (District Authorities).

7.4.1 On-Site Emergency Management

The following section describes methodology to deal with On-site emergency. The responsibilities of the various plant personnel are also indicated.

7.4.1.1 Duties of personnel if fire occurs

A) Chief Co-coordinator

Functions

He will declare the state of emergency to everyone concerned, especially to people above him and to the senior officials of the organizations whose help will be required

He will be in constant contact with the Deputy Chief Co-coordinator

1. He will receive all information regarding the emergency from the disaster site
2. He will receive information regarding additional resources requirement from site
3. He will convey necessary instructions to the site - Dy. Chief Co-ordinator
4. He will authorize evacuation of personnel through Dy. Chief Co-ordinator
5. He will authorize additional resources mobilization through his advisors
6. He will approve release of information regarding disasters to outside agencies through Administration Advisor

B) Special Advisor (Location: Main Control Center)

Functions

If the chief Coordinator is not in the spot then he is in charge of the crisis control room

1. He is communicator between the chief Co-coordinator higher up like Director, C. & M. D., Ministry, etc.
2. He is Coordinating with Air force, Navy and air freighting special equipment / material will be done by the special advisor on behalf of the chief advisor

C) Technical Advisor

Functions

1. Collection of data and analysis all the available data regarding the disaster
2. He is the communicator between Dy. Chief Co-ordinator through Chief Co-ordinator
3. He is responsible for maintenance of logbook record charts etc. will be in his custody
4. Any queries that regarding chemical, or any oils will be answered through him

D) Material coordinator

Functions

1) He is responsible and regularize for procurements being made on an emergency basis.
2) He will inform about all purchases to finance advisor

E) Finance Advisor

Functions:

1. He is responsible for all finance-related work such as excise and customs, insurance formalities and FR cashier and relating emergency cash if required

F) Administration Advisor

Functions

1. He takes approval from the chief co-ordinator and will inform the press and outside agencies regarding disaster.
2. He will arrange catering and inform through welfare officer regarding communication to relative of the injured employees
3. When approved by the chief co-ordinator he will supervise to as of the emergency location with the press/Govt. agencies along with the Technical advisor.
4. He arranges CISF for transport and additional manpower.

G) Fire and Safety Coordinator

Function

1. On arrival at the scene, he will evaluate the strategy chalked out by Manager-Fire & Safety / Manager-Shift and coordinate with Civil Fire Brigade for effective control
2. Co-ordinate with Dy. Chief Co-ordinator for actions as deemed necessary, which will assist the operations department to carry out their activities safety
3. Assess the need of rescue operation and make arrangements for the same
4. Co-ordinate with Medical Adviser for ambulance and other medical assistance as may be necessary
5. Ensure that all the assigned personnel as mentioned above are carrying out their duties and whenever any extra assistance is required makes arrangements for the same
6. Co-ordinate with Manager-PR, for meeting the Press and members of public, if called
7. Ensure adequacy of men and equipment at the scene and proposed plant premises. If required, make arrangements for getting necessary assistance
8. Make arrangements for replacements of unwanted equipment/damaged equipment from the scene Ensure that all approaches are clear and safe and deploy men and equipment in a coordinated fashion
9. Provide necessary expert guidance for firefighting operation and carry out further operations safety
10. If any maintenance assistance is required, liaises with Maintenance Co-ordinator for the same

Functions of medical centre

1. Co-ordinate Ambulance Activities

2. Get blood donors
3. Give First Aid
4. Get more ambulance
5. Hospital Co-ordination
6. Keep Statistics of injured employees

1. Take out History Cards of injured employees
2. Procure additional medicines/bandages Etc.

Functions of medical advisor

1. He will be stationed at the dispensary
2. He will be coordinating with first aid & ambulance teams
3. He will direct ambulances to the designated hospitals
4. He will be talking to different Hospitals in the city regarding admission to injured
5. He will call more Doctors to the factory if found necessary
6. He will consult with other specialists whenever necessary
7. He will arrange for outside ambulances and first aider if the situation calls for

Actions to be taken by Shift security chief

A: Function of Security Center

1. Receive and co-ordinate with police
2. To give direction to incoming external help
3. Cordon off area and provide road blocks as per instruction
4. Review evacuation procedure with police
5. Control incoming traffic, traffic near main gate & outgoing movements
6. Mobilize available vehicles
7. Get additional help from barricks

Actions to be taken by External Centre

A: Function of Mechanical center

1. Arrange available transport at different locations.
2. Arrange the additional vehicles.
3. Mobile Canteen.
4. Emergency maintenance jobs.

B: Function of Transport Officer

1. Will mobile all the available vehicles and drivers
2. He will rent vehicles as needed
3. Will arrange for vehicles requirement of plant coordinator, chief coordinator

A typical organogram for the on–site emergency plan is shown in **Figure -7.2**

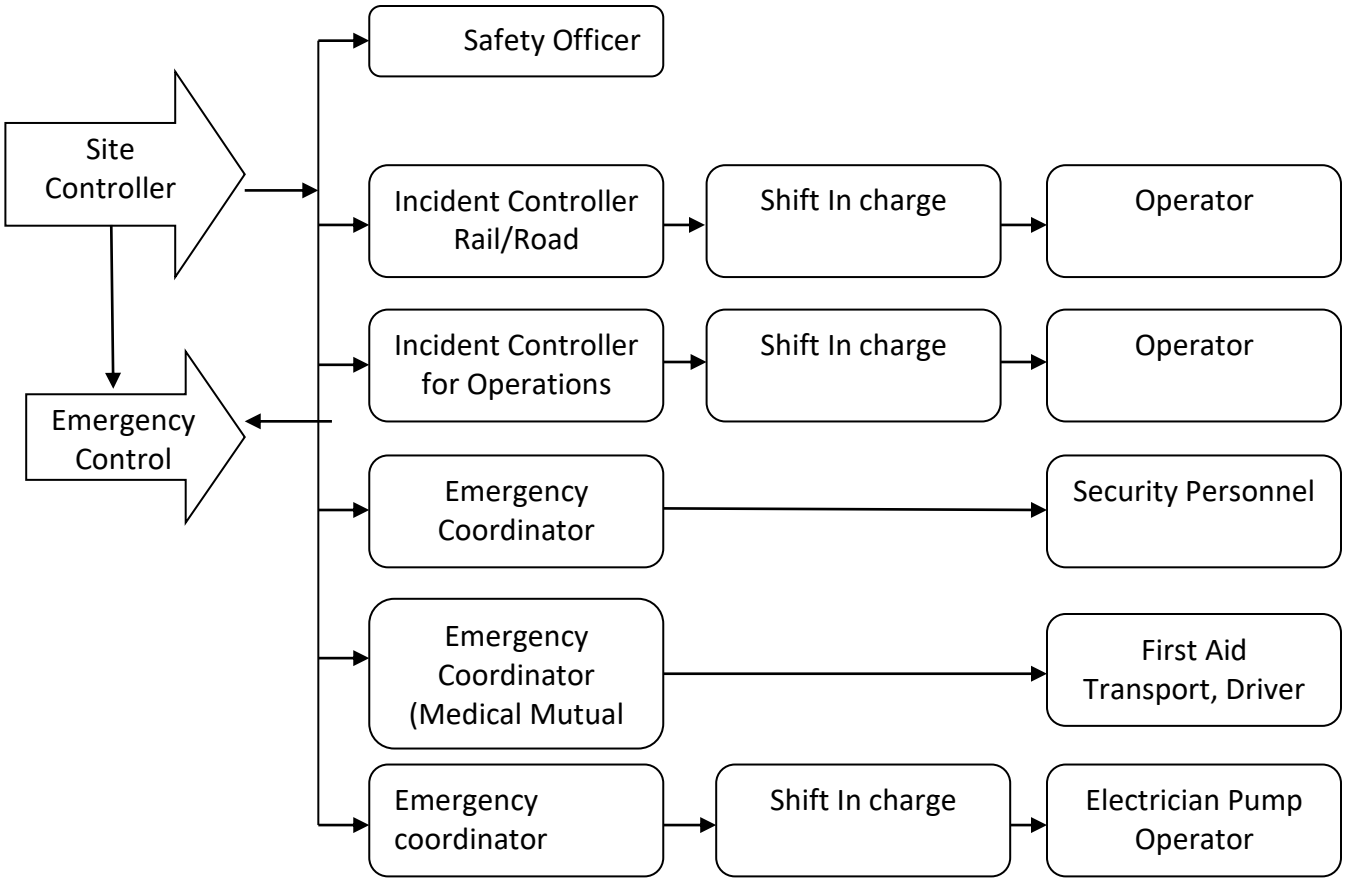


Figure 7.2: Typical organogram for onsite emergency management plan

7.4.2 Offsite Emergency Plan

The off-site emergency plan begins beyond the premises of the plant. The possible impact on the immediate vicinity of the plant when emergency condition arises from the proposed plant. The responsibilities of various personnel and departments are as given below:-

7.4.2.1 Responsibilities of the Police

- Communicate the information about the mishap to the other agencies.
- Provide support to the other agencies as required.
- Traffic management by cordoning of the area.
- Arrange the evacuation of people.

7.4.2.2 Responsibilities of the fire brigade

- Fighting fire and preventing the spread.
- Plugging the leaks of the chemicals, reducing the effects of gases and fumes.
- Rescue and salvage operation.

7.4.2.3 Medical /Ambulance

- First aid to persons affected.
- Medical treatment.

7.4.2.4 Technical (Factory Inspectorate, Pollution Board, Technical experts from industry, research and training institution)

- Furnish all the technical information to emergency services as required.
- Investigate the causes of disaster.
- Suggest the preventive measures for future action.

7.4.2.5 Rehabilitation (Local authorities and district administration)

- Provide emergency control center in the area with facilities for directing, co-ordinating emergency control activities.
- Arrange for rehabilitation of persons evacuated and arrange for food, medical, hygienic requirements.
- Arrange for transportation for evacuation from residential location when required.
- Maintain communication facilities and conditions with the help of the telephone department.

7.4.2.6 Measures to Be Taken During the Emergency

- The plant authorities shall immediately send messages to the administration in case the hazard is likely to spread beyond the plant.
- The concerned Police officers along with civic officials shall make arrangements for evacuation of the people from the villages to the safer areas.
- The plant authorities shall extend the technical support in containing the damage.
- Most importantly, it is the responsibility of the officials of the plant that the people don’t get panicky.
- After, all the hazard is totally curbed, people may be brought back to their respective villages.

A typical organogram for the off –site emergency plan is shown in **Figure 7.3**

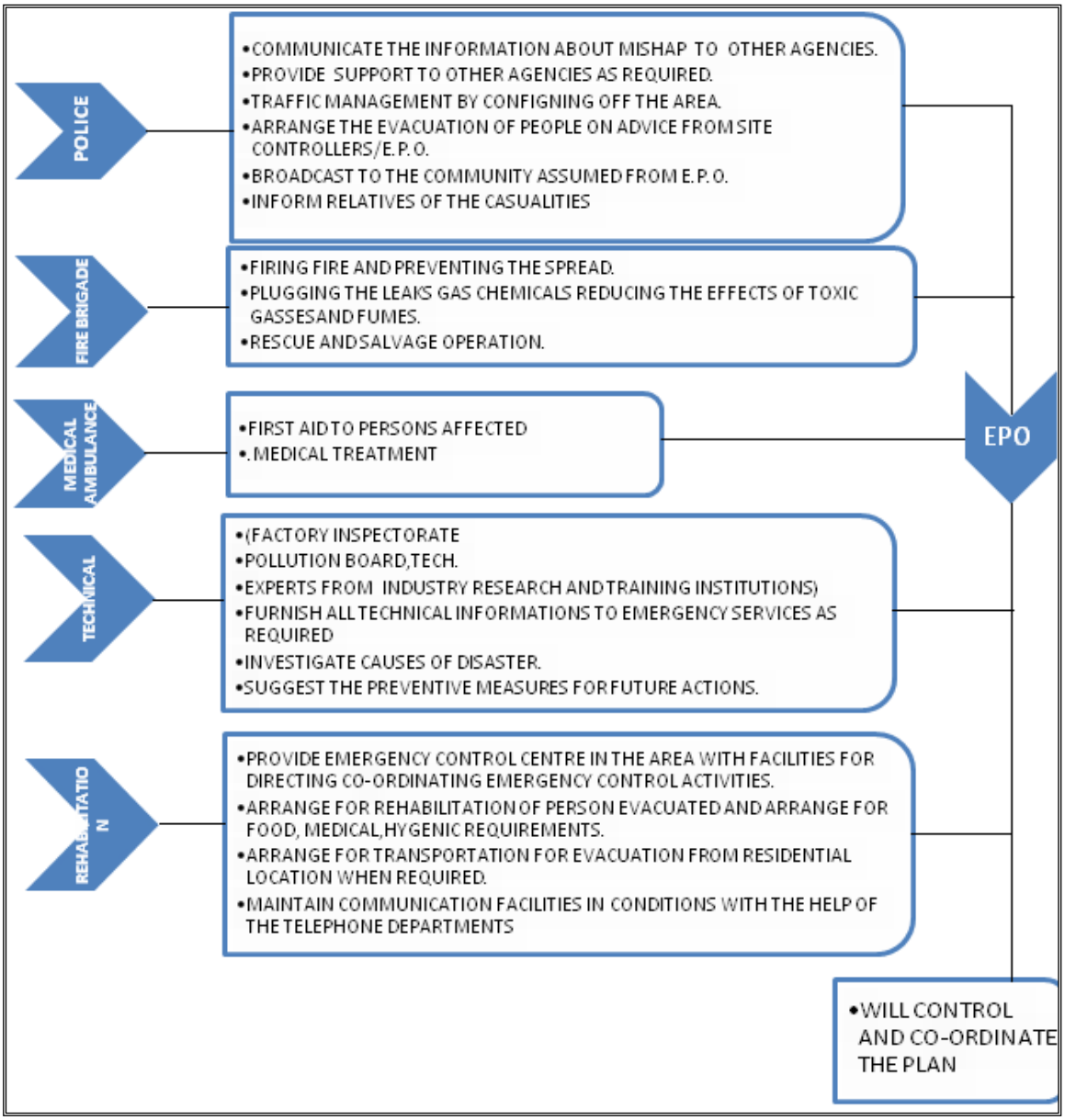


Figure 7.3: Typical Organogram for off-site emergency management plan

Chapter VIII: Project Benefits

8.1 Proponent approach towards the Project

The present crushing capacity of Shree Laxmi Narshinha Sugar LLP is 2500 TCD. The Factory has proposed cogeneration plant of capacity 20.5 MW and 45 KLPD distillery.

8.2 Project Benefits

8.2.1 Improvements in the physical infrastructure

The industry is established in the rural region of the state. The establishment of industry will provide direct and indirect employment to more than 100 local rural persons. Major part of these labors will be mainly from local villagers who are expected to engage themselves both in agriculture and project activities. This will enhance their income and lead to overall economic growth of the area.

It helps to sustain the development of this area including further development of physical infrastructural facilities.

The following physical infrastructure facilities will improve due to proposed project.

- **Road transport facilities**
  The road connectivity will get improved due to the industry. This improved physical infrastructure will be an added facility to the community for surface transport.
- **Water supply**
  Efforts will be more focused on recycling of wastewater after adequate treatment. Thus water extraction for process will be minimized.

8.2.2 Improvements in the social infrastructure

- The industry is in the rural region. Creation of job opportunity and other business activity will improve the economy and attitude of the public towards education and health. This may result in the creation of additional education and health care facilities in this rural area.
- The proposed project will change the pattern of demand of various items of food and non-food products. It will help to generate sufficient income to local people.
- Living in harmony is an important aspect of the society. This can happen only if, all the components are comfortably placed. Persons engaged in their respective vocation and accruing job satisfaction leads to this. This will become possible by this venture.
- Rural sector economy is generally growing slow because of lack of amenities and facilities. Proposed project helps to provide steady support of money-flow, such utilities can come to that area and sustain.

- This improved physical infrastructure will increase purchasing power of the farmers. They will be able to invest in modern agricultural practices.

The sugar factory has already initiated several activities for the development of the region. Some of the prime activities are as follows.

- It is providing good quality seed (Cane) material and fertilizers to member farmers.
- It is providing training to the farmers
- It has established an educational facility through which academic as well as technical education has been made available to the nearby students.

In short, many developmental activities took place due to the establishment of sugar factory. The sugar factory is also determined and dedicated for the economic and social development of the region and initiate and continues many social developmental activities in the region. Some prime benefits of the project are highlighted below

- It will develop economy brings with literacy and healthy living. Ultimately educational and health level will increases, if there is confirm income source.

8.2.3 Employment Potential

- The industry will be established in the rural region of the state.

8.2.4 Advantages of distillery and cogeneration

- Readily available infrastructure, fuel, & water for renewable energy power generation project.
- Provides an initiative to sugar mill to concentrate more on conservation of energy & reduction of operating cost, thereby improving their profitability of operation.
- Saves the expenditure on safe storage and disposal of bagasse.
- Benefits of quick return on biomass power capital investment and generation of additional revenue.
- Entire integrated project is proposed to be set up based on the stand-alone commercial viability of each component of the project.
- Distillery is aimed to improve the technical efficiency of the unit in terms of steam utilization and power consumption.

CHAPTER IX: ENVIRONMENT COST BENEFITS ANALYSIS

9.1 Environmental Benefits

- A large demand is anticipated for alcohol as a fuel. Alcohol is an eco-friendly product and is a substitute to the imported petroleum.
- Indeed fuel ethanol production has been promoted for a variety of reasons as mentioned below,

– It has less severe impact on the environment than conventional gasoline and less dangerous to health. Oxygenates are compounds such as alcohols or ethers which contain oxygen in their molecular structure. Oxygenated fuels tend to give a more complete combustion of its carbon to carbon dioxide (rather than monoxide) which leads to reduced air pollution from exhaust emissions.

– It reduces the dependence on oil imports.

– It helps to maintain rural economy.

- Factory proposes zero liquid discharge method for waste water treatment. Maximum waste water will be recycled back into the system.
- Proposed sugar factory will not require fresh water for its operation; instead that it is providing water to the distillery.
- Factory proposes to install Multiple Effect evaporator followed by Incineration boiler. Advantages are as follows

– Production of steam and power generation.

– Reduction in air pollution as compared to coal based boiler.

– Reduction in water pollution and achieve zero discharge in inland surface water.

CHAPTER X: ENVIRONMENT MANAGEMENT PLAN

10.1 Introduction

The objective of Environment Management Plan (EMP) is to conserve resources, minimize waste generation, treatment of wastes and protect natural properties.

Commitment and Policy: of proposed project will strive to provide and implement the Environmental Management Plan that incorporates all issues related to air, land and water.

Planning: This includes identification of environmental impacts, legal requirements and setting environmental objectives.

Implementation: This comprises of resources available to the developers, accountability of contractors, training of operational staff associated with environmental control facilities and documentation of measures to be taken

Measurement and Evaluation: This includes monitoring, corrective actions, and record keeping.

During study of the environmental attributes it was seen that all the aspects would be considered to promote the better development in case of future aspects of project as well as environmental aspects.

The Factory management will take all the necessary steps to control and mitigate the environmental pollution in the designing stage of the project. While implementing the project factory will follow guidelines specified by CPCB under the Corporate Environment responsibility (CER) for project. The EMP task will likely be administered by the Health, Safety and Environment (HSE) Department/ Environment department, who will have the authority where necessary to “stop the job” if an environmentally detrimental activity is being conducted. The EMP operation/implementation will be the responsibility of the “HSE Officer (health, safety, and environment officers)”, who will be coordinating, arranging the collection and reporting of the results of all emissions, ambient air quality, noise and water quality monitoring.

10.2 Environmental management during construction phase

The construction activities of the proposed unit will increase in dust concentrations and fugitive emission due to vehicles movement. The following control measures are recommended to mitigate the probable adverse impacts.

Table 10.1 Environment management Plan implantation during construction phase

Aspect	Description	Responsibility	Record
Site preparation	• Regular sprinkling of water around vulnerable areas of the construction sites to control the dust spread or emission into the atmosphere. Excavated soil will be covered with tarpaulin sheet or shall be kept in such way that dust emission will be avoided. • Top excavated soil be used in greenbelt development, rest hard rock will be used in leveling work. First Aid facilities shall be made available during construction	• Construction supervisor/ Contractor • Safety officer/ Site Engineer	• Water consumption • Excavated soil quantity and utilization
Noise	• No idling of machine shall be allowed during construction activities Night time construction activities and vehicular movement shall not be allowed. • Personal protective equipment like ear muffs or ear plugs, masks etc. will be provided to workers who will be exposed to high noise.	• Construction supervisor/ Contractor • Safety officer/ Site Engineer	Vehicular and construction equipment check record
Construction equipment and waste	• Transport vehicles as well as transport routes should be properly maintained during whole construction phase to minimize smoke / dust emission from vehicle exhausts and unpaved roads. • Composite solid wastes including metal scrape, earthwork, other wastes, getting generated in construction process should be disposed as per construction waste disposal guidelines.	• Construction supervisor/ Contractor • Safety officer/ Site Engineer	Record of transport vehicles Generation of solid waste, its storage and its disposal
Site security and	• Construction site has a potential hazardous environment. To	• Construction supervisor/	• Record and Supervision of Personal

Aspect	Description	Responsibility	Record
Occupational Health	ensure that the local inhabitants are not exposed to these hazards, the site shall be secured by fencing and manned entry points. It will be fully illuminated during nighttime • Necessary care will be taken as per the safety norms for the storage of the chemical products • Contractor will supervise the safe working of their employees. • Barricades and fences are provided around the construction area personnel protective equipment's e.g. safety helmet, goggles, gumshoes, etc. will be provided to the workers. • Accidental spill of oils from construction equipment and storage sites will be prevented. • Tree plantation will be undertaken during the construction phase for to prevent air pollution will be nullify in operation phase of the project. • Personal Protective Equipment like ear muffs or ear plugs, masks etc. will be provided to workers who will be exposed to high noise. • First Aid facilities shall be made available during construction. • All necessary infrastructural services like water, drainage facilities and electrification will be provided as per requirement • Drainage network will be properly channelized. Storm water drainage will be developed properly. This network will be checked & maintained regularly.	Contractor • Safety officer/ Site Engineer	protective equipment's provided • Record of all safety signs • Record of First aid kits • Record of medical check up • Supervision and record of good house keeping

Aspect	Description	Responsibility	Record
Greenbelt development	• Green belt shall be develop well before starting construction. • Green cover shall be increase all around factory in in tiers and along the road with native and thick canopy forming plants. • Green belt development will help to reduce Air and Noise pollution during construction works	• Construction supervisor/ Contractor • Safety officer/ Site Engineer	Record of planting, mainly around the factory supervision on irrigation facility and survival rate.

10.3 Environment Management Plan for Operation Phase

Table 10.2: Detailed EMP is described below for various environmental parameters.

S.N.	Activity	Responsibility	Implementation	Record
1.	Water Pollution Control devices	Process manager/ Distillery manger/ Environment Officer / Biogas & composting in-charge	Commissioning of Compost yard, CPU, CSTR (biogas unit), Spent wash lagoon (as per CREP guidelines as mentioned in 10.3.1) during Construction Spent wash (Max 380-400 m^3/d) treatment though Bio-methanation followed by MEE and bio-composting. Spent lees, cooling tower and boiler blow down will be treated in Condensate polishing unit. Sewage will be disposed through existing sugar ETP and septic tank via soak pit.	**Monitoring of wastewater Treatment** All the treated effluents will be monitored regularly for flow rate and its characteristics in order to assess the performance of the CPU. Appropriate measures will be taken if the treated effluent quality does not conform to the permissible limits. Record of ETP & CPU performance. Spent wash, spent lees, condensate analysis. Record of third party laboratory analysis report analysis. Regular inspection record, control & necessary maintenance for reduction of evaporation loss and blow down from cooling system, Optimization of COC in cooling system.

S.N.	Activity	Responsibility	Implementation	Record
2.	Air Pollution Control devices	Process manager/ Distillery manger/ Environment Officer	Commissioning of boiler, ESP, wet scrubber before starting operation.	• Ambient Monitoring record. Maintains record for storage of raw material and products. The emissions from the stack will be monitored continuously for exit concentration of the suspended particulate matter, SO_2 µg/m^3 and NOx µg/m^3. • Sampling ports will be provided in the stacks as per CPCB guidelines. If the concentration of these pollutants exceeds the limits, necessary control measures will be taken.
3.	Noise pollution	Process manager/ Distillery manger/ Environment Officer	Immediate during Operation	Record of noise monitoring. The workers working in the high noise areas like Boiler house, Distillation, MEE, feed pumps, steam generation plant and turbo generator area will be provided with ear muffs/ear plugs. The silencers and mufflers of the individual machines will be regularly checked Supervision record for Acoustic enclosure to DG, Boiler, insulation.
4.	Solid waste Managem ent	Process manager/ Distillery manger/ Environment Officer	Immediate during operation	Records of generation of solid waste. Supervision record of storage and disposal solid waste.
5.	Greenbelt developm	Process manager/	Gradually during Operation	Record of planting/number of plants planted and to be

S.N.	Activity	Responsibility	Implementation	Record
	ent	Distillery manger/ Environment Officer		plant, supervision on irrigation facility and survival rate ensuring healthy and dense greenbelt. Greenbelt development plan is described in section 10.5.
6.	Rainwater harvesting and storm water drainage	Process manager/ Distillery manger/ Environment Officer	• Gradually during construction and operation. Storm water drainage system will consist of well-designed network of open surface drains with rainwater harvesting pits. RWH structures will be provided to harvest the rain water from roof TOP and plant area. • The collected rain water will be utilized for plant uses to optimize the raw water requirement. The surface water run-off from the main plant area would be led to a sump for settling and the over flow would be collected in the common water basin for Industrial uses. • Tentative Rainwater Harvesting System (RWHS) designs and construction details are given in section 10.3.2.	Record of rainwater harvesting plan in the factory, collection lines provided and location of the same. Record of supervision and maintenance. Monitoring of rainwater system to avoid mixing of effluent into storm water,
7.	Occupational Health and Safety	Process manager/ Distillery manger/ Environment	During Operation	Record and Supervision of Personal protective equipment's provided. Record of all safety signs. Record of First aid kits

S.N.	Activity	Responsibility	Implementation	Record
		Officer		Record of medical check up Supervision and record of good housekeeping. Record ad supervision of firefighting equipment's provided and its regular check/
8.	CER	Chairman/Managing Director /Process manager/ Distillery manger/ Environment Officer	During Operation	Maintain separate record of CER activity carried out year wise and amount spent on that.
9.	Resource saving, Recycle/ Recovery	Process manager/ Distillery manger/ Environment Officer	During Operation	Reuse of process water, recycling of ETP treated water, recycling of used oil, use of power saving equipment's, natural ventilation designs in construction phase, use of thermal insulations wherever heat transfer is anticipated, CFL lighting, photosensitive switches, rainwater harvesting

10.4 Rain water harvesting and storm water management

Rain water harvesting is the collection rainwater from the surfaces on which it falls. Proponent has already implemented of rainwater harvesting program. The collected rain water is the source of water for whole industry.

Storm water Drainage Line: Based on the rainfall intensity of the proposed area, storm water drainage system will be designed at the construction stage of the project. Storm water drainage system will consist of well-designed network of open surface drains with rainwater

harvesting pond. A separate drainage system will be provided in which plant effluent will not be mixed.

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

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

Industry has been practicing roof top rain water harvesting in industrial shed, go downs, through nine Collection pipes. The out let pipes are to be directly connected to separate drainage and rainwater pond. The first storm water is to be let out of the system. After considerable flushing of rain water with dust and waste material during first storm, the roof top water is to be let out into the recharge structure. Existing 1 rainwater pond of capacity 180000 CMD. Rainwater collection pipes and storage tank and storm water drainage network is shown in Plant layout which is given in Chapter II.

Storm water management

Storm water drainage system will be designed at the construction stage of the project. Storm water drainage system will consist of well-designed network of open surface drains with rainwater harvesting pits. A separate drainage system will be provided in which plant effluent will not be mixed.

Rainwater harvesting quantification

Rainwater harvesting potential can be calculated using below given formula

Harvesting potential = Catchment Area (m^2) * Runoff Coefficient *Annual Rainfall (mm)

Average annual rainfall of Parbhani District is 888.5 mm. Catchment area and rainwater harvesting potential calculations is given in below table.

Table 10.3: Total run off and rain water harvesting potential in whole factory premises

Particulates	Area	Quantity
Catchment area (m^2)	Rooftop area of Sugar and Distillery area	12000
	Landscape area(soft cape)	131684
	Open area	163614
	Road area	32172
Run off co-efficient	Rooftop area	0.95
	Landscape area(soft cape)	0.6
	Road (Paved area)	0.7
	Open area	0.8
Harvesting potential (m^3)	Rooftop area	10128900
	Landscape area(soft cape)	70200740.4

Particulates	Area	Quantity
	Road area	20009375.4
	Open area	116296831.2

10.5 Greenbelt development Plan

Greenbelt will be developed along the periphery of the project area, along roads, around each separate unit, around cane yard, compost yard and around ETP. Factory has developed greenbelt on 27.92 acres. Additional green belt will be develop on 4.62 acres. The following characteristics have been taken into consideration while selecting plant species.

- Fast growing
- Thick canopy cover
- Perennial and ever green
- Large leaf area
- Preferably Indigenous
- Resistant to pollutants and should maintain ecological balance for soil and geo-hydrological conditions of the region.
- Abundance of surfaces on bark and foliage through roughness of bark, epidermal outgrowth on petioles, abundance of auxiliary hairs, hairs or scales on laminar surfaces and protected stomata (by wax, arches, rings, hairs, etc.)

Total number of trees in the factory premises will be 27220. There are around 15000 trees/shrubs/herbs present in the existing premises. Additional ~10000-12000 trees will be planted in the premises.

Greenbelt will be as developed as follows,

- Trees growing up to 5 m or more will be planted along the plant premises and along the road sides
- 8-10 m width green belt all along the border
- Tree plantation on both sides of interior roads in the premise.
- The spacing between the trees will be maintained slightly less than the normal spaces, so that the trees will grow vertically and slightly increase the effective height of the green belt.
- Since the trunks of the tall trees are generally devoid of foliage, it will be useful to have shrubs in front of the trees so as to give coverage to this portion.
- Shrubs and trees will be planted in encircling rows around the project site.
- The small trees (<10 m height) will be planted in the first two rows (towards plant side) of the green belt. The tall trees (>10 m height) will be planted in the outer three rows (away from plant side).
- Trees should be planted along road sides, to arrest auto-exhaust and noise pollution.

Table 10.4: Planned Schedule for greenbelt development

Trees interspacing	Planned scheduled	Tree density/ 100 m^2	Size/type	Location	Providing
3 x 3 m	2020-21	25	Shrubs, small and medium trees	Periphery of the industrial area. Along the road Near storage tanks, process area	• Plan to develop well designed greenbelt as per CPCB guidelines • Irrigation facility for greenbelt • Monitoring survival rate • Providing fertilizers

Table 10.5: List of Plant Species for Plantations

Sr. No.	Species Name	Local Name	Habit
1.	*Azadirachta indica Linn.*	Neem	Tree
2.	*Butea monosperma L.*	Palas	Tree
3.	*Cassia fistula*	Bahava	Tree
4.	*Ficus benghalensis L.*	Wad	Tree
5.	*Ficus racemosa L.*	Umbar	Tree
6.	*Ficus religiosa L.*	Pimpal	Tree
7.	*Millingtonia hortensis*	Indian Cork	Tree
8.	*Michelia champaca*	Son chafa	Tree
9.	***Gardenia jasminoides***	Anant	Tree
10.	*Mimusops elengi*	Bakul	Tree
11.	*Murraya paniculata*	Kunti/Kamini	Tree
12.	*Plumeria Rubra*	Red chafa	Tree
13.	*Pongamia pinnata (L.) Pierre*	Karanj	Tree
14.	*Ravenala madagascariensis*	Travellers palm	Tree
15.	*Syzygium cumini (L.) Skeels*	Jambhul	Tree
16.	*Terminalia catappa L.*	Deshi Badam	Tree
17.	*Terminalia arjuna*	Arjun	
	List of Some Hedge Plants		
18.	Arabian Jasmine	Butt mogara	Shrub
19.	*Hibiscus rosa-sinensis*	Jaswand	Shrub
20.	*Jasminum sambac*	Mogara	Shrub
21.	*Justicia adhatoda L.*	Adulsa	Shrub
22.	*Nerium indicum Mill.*	Kanher	Shrub
23.	*Tecoma stans (L.)*	Tabobia/Phutani	Shrub
24.	Ocimum americanum L.	Ran Tulas	Herb
25.	*Vitex negundo*	Nirgundi	Shrub

10.6 Fire Fighting & Protection System

The firefighting system will be designed in conformity with the recommendations of the Tariff Advisory Committee (TAC) of Insurance Association of India. While designing the fire protection systems for this power station its extreme ambient conditions need special attention. Codes and Standards of National Fire Protection Association (NFPA) will be followed, as applicable. The different types of fire protection / detection system envisaged for the entire project are given below.

- Hydrant System for entire area of power plant.
- High Velocity Water Spray System (HVWS) for Generator Transformer (GT), Unit Auxiliary transformer (UAT), Station Transformer (ST), and turbine lube oil canal pipe lines in main plant, Boiler burner front, diesel oil tank of DG set, main lube oil tank, clean and dirty lube oil tanks.
- Medium Velocity Water spray system – Cable gallery / Cable spreader room, bagasse conveyors, Transfer points and F.O. pumping station and F.O. tanks.
- Foam system for Fuel oil tanks.
- Portable and mobile fire extinguishers for entire plant.
- Fire tenders (minimum 2 nos.).
- Inert Gas System for Central Control Room, Control Equipment Room, Computer Room and UPS Room in the TG building.
- **Fixed Foam System:** This system is provided for LDO and HFO storage tanks. The water for the foam system will be tapped from the Hydrant system.
- **Inert gas system:** Inert gas system will automatically detect and suppress fire within a protected area. The system will be a total flooding fire suppression system with automatic detection and/or manual release capability. Complete system design will be in accordance with NFPA. The inert gas system will be generally provided above false and below false ceiling of Central Control room, UPS Room, Control equipment room and Computer room.

Fire Detection and alarm system

Fire Detection and alarm system will be provided for all Central Control room, Control Equipment Room, battery rooms, all switchgear rooms / MCC rooms, Cable spreader room and Computer rooms located in Power block area and in other auxiliary buildings. A microprocessor-based Fire Detection and Alarm system shall be provided for the entire plant area consisting of Intelligent Analog Addressable type detectors. The system will consist of a central monitoring station and the main Fire Alarm Panel (FAP) located in unit control room and one fire alarm and control panel and repeater panel provided in the fire station office

An industrial siren will be installed in the turbine generator building. The siren shall have an audible range of 3 km and produce a minimum sound level of 80 dB (A) above any other noise likely to persist for a period longer than 30 seconds. Additionally all exit routes and hallways in each occupied building shall be provided with sounders and flash light to facilitate safe evacuation in case of fire in the area. All necessary instruction and warning plates will be displayed.

10.7 CER activities Plan

In accordance with the circular issued by Ministry of Environment, Forest and Climate Change (MoEF&CC) dated May 01, 2018 and subsequent circular of June 19, 2018 on Corporate Environment Responsibility. CER cost will be 2% of the total project cost. Estimated cost of the project is 115.84 Cr and accordingly CER activities cost will be 2.3 Cr.

Proposed activities and yearwise action plan is given below

- Lighting by LED bulb / solar street lamps.
- Drinking water supply
- Water shed management in the area
- Tree plantation
- Construction of Road

Table 10.5: CER activity action plan

CER activity	1921-22 (Lacs)	2022-23 (Lacs)	2023-24 (Lacs)	Total (Lacs)
Lighting by LED bulb/ solar panels	30	25	25	80
Watershed programs	40	25	10	75
Providing water filters	15	10	5	30
Tree plantation	10	10	5	25
Drinking water facilities/storage tanks	10	5	5	20
Total	**105**	**75**	**50**	**230**

10. 8 Environment Management Cell (EMC)

Environmental Management Cell will be established, which will be supervised and controlled by an independent Plant Manager supported by a team of technically qualified personnel apart from other operating staff.

It will be the responsibility of this cell to supervise the monitoring of environmental attributes viz. ambient air quality, water and effluent quality, noise level etc. either departmentally or by appointing external agencies wherever necessary. In case the monitored results of environmental contaminants are found to exceed the standard

limits, the Environmental Management Cell will suggest remedial measures and get them implemented.

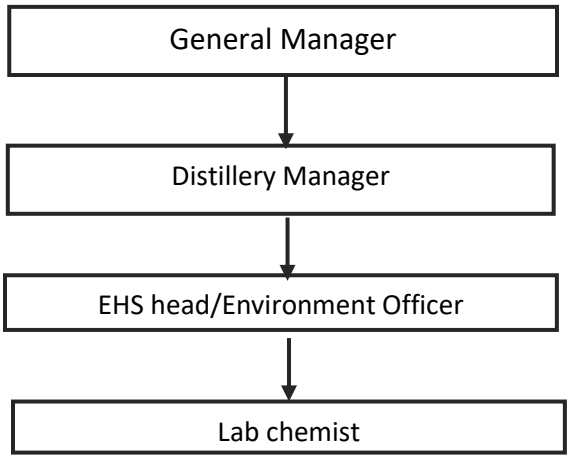


Figure 10.3: Environment Monitoring Cell

Table 10.6: Environment Monitoring Cell and its responsibilities

Sr. No.	Members	Number	Responsibility
1.	General Manger	One	Supervision of overall implementation of environment management in the factory.
2.	Distillery Manager	One	Implementation of mitigation measures considering all environment components.
3.	Environment Officer	One	Implementation of mitigation measures considering all environment components, Health and safety of the workers. Technical advisory for all legal issues of environment as well as implementation of Environment Management in the Factory. Arranging the training programs for staff. Monitoring of efficiency of pollution control equipment's, Water and energy conservation measures, Maintenance, supervision on housekeeping, ETP, Supervision and record keeping of compliance of all regulatory authorities.
4.	Lab chemist	One	Monitor the work environment, health and safety of the workers. Implementation of occupational health and safety policies, program, procedures. Undertaking the Awareness activities.

10.8.1 Responsibilities of Environmental Management Cell

The EMC has the responsibility to supervise all the activities in the plant to ensure that those are being carried out as per the standard operating procedure to avoid any type harm to the environment. The EMC also undertake periodical monitoring or survey of various environmental parameters including monitoring and analysis of effluent, air, water and noise to ensure that these parameters are maintained within the prescribed limits. If any deviation observed, they will inform to initiate corrective action by the concern department or they will do themselves if required.

They also undertake the physical survey of the green belt to ensure required growth and survival rate of the plant. They will also inform the concern department for corrective action if any to have proper growth of the plants.

Environmental monitoring: EMC will ensure that pollution is well below the prescribed limits or there is no much difference between the present concentrations and baseline data. If wide difference is observed then they will need to initiate required corrective action either by optimizing the treatment process or by providing equipment or improving the performance of existing pollution controls equipment. In case the results indicate parameters exceeding the prescribed limits, remedial actions will be taken through the concerned plant people. The actual operation and maintenance of pollution control equipment will be the responsibility of respective department head or a plant in charge.

Legal and statutory compliance: EMC will also supervise the work of other department pertaining to the activities of preparation of environment statement report, environment audit, Water Cess return and consent application as per the requirement under various Rules and regulations. They will also guide the HODs of individual department to fulfill the statutory requirements under various acts and applicable rules. Following Rules shall be applicable to the facility:

- The Water (Prevention and Control of Pollution) Act, 1974
- The Air (Prevention and Control of Pollution) Act, 1981
- Hazardous and Other Waste (Handling and Trans-boundary Movement) Rules, 2016
- The Environment Protection Act, 1986
- Explosive Act 1884 & the Explosive Rules, 2008
- E-Waste (Management) Rules, 2016

Documentation: The cell will also be responsible for maintaining the records of data, documents and information in line with the legislative requirement and will regularly furnish the same to the concern statutory authorities.

10.9 Post Clearance Monitoring Protocol

After grant of environmental clearance by the MoEFCC, half yearly compliance reports will be submitted in hard and soft copies to the concerned regional MoEFCC office on 1st Oct and 1st April of each calendar year with respect to EC conditions. All such compliance reports submitted will be the public documents. Copies of the same will be made available to the stakeholder upon the request. Existing factory has submitted all compliance to the regional MoEFCC office.

10.10 Environment Management Cost

Environment Management cost is depicted as under,

Table 10.7: Environment Management Cost

Sr. No	Description	Capital Cost (Rs. Cr.)	Recurring Cost (Rs. Cr.)
9.	Air Pollution Control (ESP and stack, Ash handling system)	6.3	0.01
10.	Water Pollution Control (CPU)	**1.5**	**0.05**
11.	Solid waste Management	0.05	0.05
12.	Environmental Monitoring and Management	0.05	0.03
13.	Rainwater Harvesting	0.15	0.05
14.	Occupational Health	0.05	0.05
15.	Green belt development	0.2	0.05
16.	**Total**	**8.3**	0.29

CHAPTER XI: SUMMERY AND CONCLUSION

11.1 Project in brief

Proposed project is of new 45 KLPD Molasses/sugarcane juice based Distillery and 20.5 MW cogeneration power plant. As per EIA notification 2006 and its amendment thereof, project requires environmental clearance and it is fall under Cat 'B', Cogeneration activity-1(d) Category "B" and Distillery activity-5(g) (All molasses ≤100 KLPD based on distillery).

Shree Laxmi Narshinha Sugars LLP (SLNSLLP) is located at Amdapur, Post. Singnapur. Tal. & Dist. Parbhani, 431402 and recently operating 2500 TCD sugar.

11.2 Project information in brief

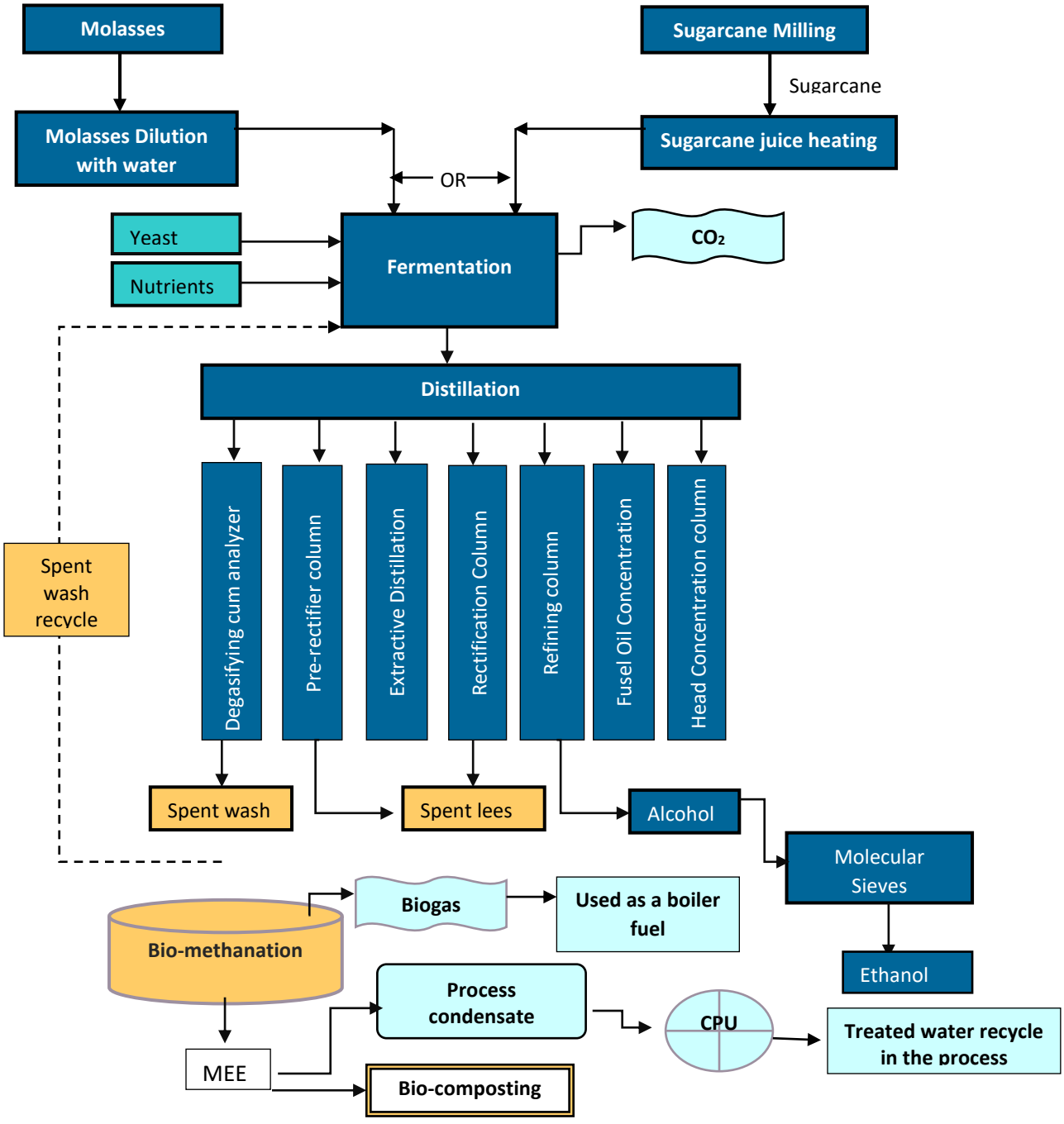
Table 11.1: Salient features of integrated project

#	Particulate	Description
1.	Project	Proposed 45 KLPD Molasses/Sugarcane Juice based Distillery/ Ethanol plant & 20.5 MW Cogeneration Plant of Shree Laxmi Narsinha Sugars LLP
2.	Product	Distillery: ENA/RS/AA/Ethanol of 45 KLPD (One at a time) Cogeneration: Proposed 20.5 MW
3.	Existing 2500 TCD Sugar (TPD) (13% on cane)	325
	Bagasse (TPD) (30%)	750
	Press mud (TPD) (4.0%)	100
	Molasses (TPD) (4.5%)	112.5
	B heavy molasses (6.5%) (TPD)	162.5
4.	Operation days	Sugar factory season: 160 days Cogeneration : 160 days, Distillery: Total 270 days
5.	Molasses requirement	Molasses generation(B-heavy) 162.5 TPD Molasses requirement for distillery Sugarcane juice 800-1000 MTD **OR**
6.	Sugarcane juice (MTD) from Sugar cane 1000 TCD to Ethanol production in season	800-1000
7.	Water requirement	Total fresh water for 45 KLPD Distillery 390 CMD
8.	Source of water	Own rainwater harvesting Tank of capacity 180000 CMD
9.	Boiler	**Existing Sugar** Existing boiler 2X32 TPH with T.G 2.5 MW power generation

		Proposed 45 KLPD Distillery Boiler 15 TPH **Proposed Cogeneration** Boiler 90 TPH with 18.0 MW TG Hence total Power generation at a time during season will be 20.5 MW
10.	TG	TG : 2.5 MW and 18.0 MW
11.	DG	Proposed 250 KVAX1
12.	Fuel	Bagasse : 950 TPD Biogas:15000 CMD
13.	Steam	Total steam requirement for project 13.19 TPH
14.	Total effluent generation	Sugar: 242 m^3/d Domestic: 13 Molasses based distillery: 880 m^3/d (spent wash, spent lees, condensate).
15.	Ash	• Existing Sugar Unit : Bagasse ash generation: 4.2 TPD • Proposed Bagasse ash generation: 20 TPD
16.	ETP sludge	The sludge from primary clarifies, settling tank and secondary clarifier will be sent to sludge drying beds. Sludge will be dried in natural heat of sunlight. The dried cakes will be can be utilized for as manure or in composting.
17.	Air pollution control measures	Proposed: Electrostatic precipitator for Cogeneration boiler and Wet scrubber for Distillery boiler
18.	Man-power	Existing manpower Permanent staff (skilled) 150 and Contract(unskilled) 170 For proposed project Skilled 40 and unskilled 77
19.	Total project cost	Sugar expansion: Rs 115.84 Cr
20.	EMP capital cost	Total Rs.~ 8.3 Cr
21.	CER Cost	Rs.2.3 Cr.
Environment Sensitivity		
22.	Nearest Village	Amdapur 1.4 km South
23.	Nearest Town / City	Parbhani 10 km in North
24.	Nearest National Highway	Parbhani-Gangakhed state highway 4.36 km in W and Singnapur- Amadapur road 1.21 in in SW
25.	Nearest Railway station	Singnapur : 3.0 km in West Parbhani : 9.0 km in North
26.	Nearest Airport	Shri. Guru Gobind Singhji Airport 60.0 km in East
27.	National Parks, Wildlife Sanctuaries, Biosphere Reserves, Tiger/ Elephant Reserves, Wildlife Corridors etc. within 10 km radius	No any in within 10 km of project area

28.	River / Water Body (within 10 km radius)	Water Canal 0.53 km in SE direction

11.1 Process Description



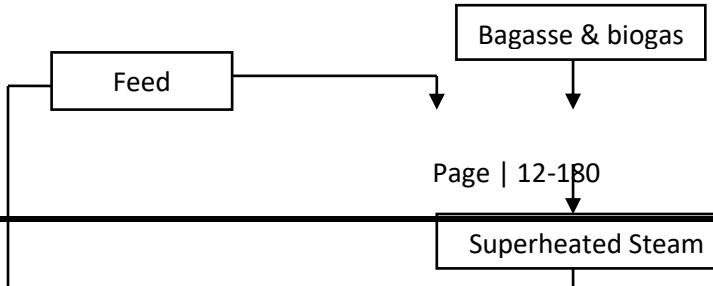


Figure 11.2: Cogeneration process

11.4 Description of the environment

The study area as per approved ToR in 179th SEAC meeting dated 20.01.2020. The study period conducted was from Oct 2019 to Dec 2019. The guiding factors for the present baseline study are the requirements prescribed by the guidelines given in the EIA Manual of the MoEFCC and methodologies mentioned in Technical EIA Guidelines Manual for Distilleries by IL&FS Ecosmart Ltd., approved by MoEFCC.

11.5 Anticipated Environmental Impacts

Anticipated environmental impacts due to operation of the proposed project are given in below Table 11.2

Table 11.2: Anticipated Impacts

Environmental Facets	Anticipated Impacts
Air Environment	Probable increase in concentration of air pollutants due to process, fugitive, and utility emissions.
Water Environment	Generation of industrial & domestic wastewater.
Land Environment	Impacts on land due to improper disposal of hazardous/ solid waste.
Ecological Environment	Positive as greenbelt of appropriate width will be developed and maintained by the factory in the area. No impacts are envisaged on aquatic flora & fauna as there will be zero effluent discharge outside the plant premises.
Social Environment	Overall development of the area in respect of the infrastructure development, educational growth, health facilities etc.

Economic Environment	Positive impacts on economy of the region and the country as the Alcohol will be exported and revenue generation.
Noise Environment	Minor increase in noise level within the project area.
Occupational Health & Safety	Major health hazards are identified in worst case scenario.

11.6 Environmental Monitoring Program

Table 11.3: Environmental monitoring schedule

Sr. No.	Particulate	Parameters	Number of location	Frequency
1.	Ambient air quality	PM_{10}, $PM_{2.5}$, SO_2, NOx, CO, etc.	Ambient air quality at minimum 3 locations. Two samples downwind direction at 500m and 1000m respectively. One sample upwind direction at 500m.	Monthly
2.	Stack gas	PM, SO_2 and NOx	Number of stacks	Monthly
			Online stack monitoring is installed for existing system.	-
3.	Work place	$PM_{2.5}$, SO_2, NOx, CO, O_3	Process emission in workplace area/plants (for each area/plant minimum 2 locations and 1 location outside plant area near vent)	Monthly
4.	Waste water	pH, EC, SS, TDS, O&G, Ammonical Nitrogen, COD, BOD, Chloride, Sulphides etc.	Wastewater from all sources. Inlet & outlet of ETP, spent wash, Condensate treatment plant	Monthly
			Online Monitoring machine is already installed at existing ETP. Camera at spent wash tank is also installed.	
5.	Surface water and ground water	pH, Salinity, Conductivity, TDS, Turbidity, DO, BOD, Phosphate, Nitrates, Sulphates, Chlorides, Total Coliforms (TC) & *E.Coli*	3-5 location Ground as well as Surface water. Within 1 km radius from spent wash tank and compost yard. 2 locations downward 1 location upward additional three locations within 10 km radius from the site.	Half yearly

			River sample One each at upstream and downstream	
6.	Solid waste	Ash	• Process dust generated sludge and ash. • Before used as manure if used manure	Monthly
7.	Soil Organic and Inorganic matter	N, P, K, moisture, EC, heavy metals etc.	At lands utilizing compost manure and treated effluent, 3 locations	Pre –monsoon and Post monsoon
8.	Noise	Equivalent noise level - dB (A) at min. Noise Levels measurement at high noise generating places as well as sensitive receptors in the vicinity	5 location At all source and outside the Plant area.	Monthly
9.	Green belt	Number of plantation (units), number of survived plants/ trees, number of poor plant/ trees.	In and around the plant site	Monthly
10.	Soil	Texture, pH, electrical conductivity, cation exchange capacity, alkali metals, Sodium Absorption Ratio (SAR), permeability, porosity.	2-3 near Solid/ hazardous waste storage. At least five locations from Greenbelt and area where manure of biological waste is applied. Near spent wash storage lagoon	Quarterly
11.	Occupational health	Health and fitness checkup of employees getting exposed to various hazards and all other staff	All worker	Yearly/ twice a year
12.	Emergency preparedness, such as fire fighting	Fire protection and safety measures to take care of fire and explosion hazards,	Mock drill records, on site emergency plan, evacuation plan	Monthly during operation phase

		to be assessed and steps taken for their prevention.		

11.7 Additional Studies

The following Additional Studies are to be done in reference to the awarded Terms of References issued by MoEFCC, New Delhi.

- Public Consultation
- HAZOP and Risk Assessment
- Carbon and water foot printing

11.8 Project Benefits

- Readily available infrastructure, fuel, & water for renewable energy power generation project.
- Provides an initiative to sugar mill to concentrate more on conservation of energy & reduction of operating cost, thereby improving their profitability of operation.
- Saves the expenditure on safe storage and disposal of bagasse.
- Benefits of quick return on biomass power capital investment and generation of additional revenue.
- The economic benefits available to the sugar factories from sale of exportable surplus and improvement in the operations
- Entire integrated project is proposed to be set up based on the stand-alone commercial viability of each component of the project.

11.9 Environmental Management Plan

Following mitigation measures shall be adopted by factory to minimize the impact of project on the surrounding environment.

Table 11.4: EMP for various Environmental Attributes

Environmental Attributes	Mitigation Measures
Air Quality Management	**Process Emission** • ESPs and Wet scrubber shall be provided for PM emissions. • The whole process will be carried out in closed condition so as to avoid any chances of VOC emissions. **Utility Emission** • All the D.G. sets shall be standby arrangement and will only be used during power failure.

	• Adequate stack height shall be provided to Boiler and D.G. sets. • Electrostatic Precipitator shall be provided as an air pollution control device to the boiler with approximately 99% efficiency to capture maximum boiler fly ash. **Fugitive Emission** • The main raw material and product shall be brought in and dispatched by road in covered enclosures. • Dust suppression on haul roads shall be done at regular intervals.
Water & Wastewater Management	• The proposed Sugar and distillery would be based on "Zero Liquid Discharge "technology. • Total Spent wash generation will be~ 380-450 840 CMD. Spent wash will be treated trough Biogas unit followed by Multi effect evaporator (MEE) followed by Bio composting. The Process condensate, spent lees will be treated in Condensate Polishing Unit, after treatment of which it will be recycled back to the process again. • Domestic wastewater will be treated in proposed STP. The treated water will be used for gardening. • Proper storm water drainage will be provided during rainy season to avoid mixing of storm water with effluent. • Rain water harvesting from the catchment area will be done for the proposed distillery project.
Noise Management	• Closed room shall be provided for all the utilities so as to attenuate the noise pollution. • Acoustic enclosure shall be provided to D.G sets. • Free flow of traffic movement shall be maintained. Earmuffs shall be used while running equipment's of the plant. • Proper maintenance, oiling and greasing of machines at regular intervals shall be done to reduce generation of noise. • Greenbelt shall be developed around the periphery of the plant to reduce noise levels.
Odor Management	• Odor shall be primarily controlled at source by good operational practices, including physical and management control measures. • Better housekeeping will maintain good hygiene condition by regular steaming of all fermentation equipment. • Use of efficient biocides to control bacterial contamination. • Control of temperature during fermentation to avoid in-activation/ killing of yeast. • Avoid staling of fermented wash.
Solid & Hazardous Waste Management	• The hazardous waste i.e. spent oil generated shall be very minor and shall be burnt in boiler along with fuel.

	• Bagasse will be used as manure • ETP & yeast sludge can be used in greenbelt development
Traffic Management	• Culverts shall be maintained. • The trucks carrying raw material & fuel shall be covered to reduce any fugitive dust generation. • Good traffic management system shall be developed and implemented for the incoming and outgoing vehicles so as to avoid congestion on the public road.
Green Belt Development / Plantation	• Plantation shall been done as per Central Pollution Control Board (CPCB) Norms. • The plantation in and around the plant site helps/will help to attenuate the pollution level. • Native species shall be given priority for Avenue plantation.
Corporate Social Responsibility	• An amount of INR 1.4 Cr. (As CER OM dated 1.05.2018 Brownfield project. 1.5 % of total project cost) will be allocated for CSR activities in the coming 3 years which will be utilized on the basis of requirement for weaker sections of the society for next 3 years.
Occupational Health & Safety	• Factory shall monitor the health of its worker before placement and periodically examine during the employment • Health effects of various activities and health hazard if any observed shall be recorded and discussed with the health experts for corrective and preventive actions need to be taken by the industry • All safety gear shall be provided to workers and care shall be taken by EMC that these are used properly by them. All safety norms shall be followed

CHAPTER XII: DISCLOSURE OF CONSULTANT

12.1 Background of the organization

MITCON Consultancy and Engineering Services Ltd., (MITCON) is a rapidly growing, an ISO 9001-2008 certified Consultancy Company, promoted by ICICI, IDBI, IFCI, and State Corporations of Maharashtra and Public Commercial Banks. It was founded in 1982; with Head Office at Pune and with supporting offices spread over entire country including Mumbai, Delhi, Bangalore, Hyderabad, Chennai, Chandigarh, and Ahmadabad etc. With experience, expertise, and track record developed over last almost three decades, MITCON provides diverse range of macro and micro consultancy services in the areas of

- Environment Management and Engineering (EME).
- Energy Efficiency.
- Biomass and Co-gen power.
- Agricultural Business and Bio-technology.
- Infrastructure.
- Market Research.
- Banking Finance and Securitisation.
- Micro Enterprise Development.
- IT Training and Education

12.2 Environmental Management and Engineering Division (EME)

Environmental Management and Engineering Division (EME) is one of the key divisions of MITCON and provide expert consultancy and laboratory services for various matrixes of services in the field of environmental management. Thus, EME division partners with an organization in their efforts of achieving sustainable business model.

Some of our credentials of EME division is,

- State-of-the-art Environment Laboratory with experienced and trained manpower.
- Recognition by Ministry of Environment and Forest (MoEFCC), Government of India and OHSAS 18001/2007.
- We are recommended as Technical Consultant by Directorate of Municipal Administration, Govt. of Maharashtra, Mumbai, for preparation of Detailed Project Reports (DPR) on Municipal Solid Waste Management for the Municipal Councils in Maharashtra.
- Accredited by QCI-NABET as an EIA consultant.
- Environmental Impact Assessment
- Environmental Audit / Status Report
- Consent from SPCB

- Municipal Solid Waste Management (MSW)/ Hazardous Waste (HZ) Management & Technical Services
- Water Supply and Sanitation
- Small Turnkey Projects
- Technical Appraisal
- GIS and Remote Sensing
- Laboratory Services
- Water Quality
- Soil Quality
- Wastes (Solid & Semisolid)
- Specialized Services
- Monitoring Services
- Operation&Maintenance Services

EME division of MITCON serves to various sectors like – GIS & RS, solid waste, infrastructure, power, sugar, engineering, chemical, real estate etc.

12.3 NABET Accreditation

MITCON Consultancy and Engineering Services Ltd. is accredited from National Accreditation Board for Education and Training (NABET), Quality Council of India for the EIA consultancy services in 16 sectors.

12.4 Key personnel's engaged in preparation of EIA report

Dr. Hemangi Nalavade is an EIA coordinator for this project. Other Functional Area Expertise (FAE) and Team Members (TM) undertaking this project with their specific roles and responsibilities are given in below,

Table 12.1: Experts engaged in the EIA report

S. No.	Name of the expert/s	Functional Area
1.	Dr. Sandeep Jadhav	EB, SC & LU
2.	Mr. Shrikant Kakade	EB, WP
3.	Dr. Hemangi N. Nalavade	AP, AQ, SHW, WP
4.	Mr. Ganesh Khamgal	SE
5.	Mr. Pratik Deshpande	HG, AQ
6.	Mr. Aniket Taware	RH
7.	Mr. Nikhil Chavhan	Noise