File No. IA-J-11011/18/2020/IA-II (I), Category 'A'

EXECUTIVE SUMMARY
of
Environmental Impact Assessment Report
New 120 KLPD Molasses Based Distillery

M/s. SUGAR GRID LIMITED

Village: Pingali Bk., Tal. : Man, Dist. : Satara,
Maharashtra – 415 506

Prepared by

संशोधनेन संवृद्धिः

VASANTDADA SUGAR INSTITUTE, PUNE

Manjari (Bk.), Tal.:Haveli, Dist.:Pune - 412 307, Maharashtra, India
Ph. : (020) 2690 2100, 2690 2343/7, Fax : (020) 26902244
E-mail : admin@vsisugar.org.in Website : www.vsisugar.com

ISO 9001:2015 Certified

NABET Accreditated

Accredited by QCI/NABET for EIA consultancy services,
(Certificate No. NABET/EIA/1720/SA 106)
Recognized R & D Center by Department of Scientific and Industrial Research (DSIR),
Ministry of Science and Technology, Government of India
Recognized Post Graduate & Research Centre of 'Savitribai Phule Pune University'

JANUARY 2021

VSI/EIA/SGL/DR-01/20210105

CONTENTS

List of Tables

List of Figures

EXECUTIVE SUMMARY

1.0 INTRODUCTION

M/s. Sugar grid Ltd., (SGL), village Pingali Bk., in Man taluka of Satara district, Maharashtra. The unit is registered and having registration number is UI15424PN2011PLC138914, dated 18th March 2011. The proposed plant will be based on advanced technology of cascade continuous fermentation. For distillation, multi-pressure technology will be adopted for the production of ethanol from rectified spirit. Multi-effect evaporation (MEE) followed by incineration and Biomethanation followed by MEE followed by agitated thin film dryer (ATFD) of spentwash, Condensate polishing unit (CPU) for the treatment of spent lees and process condensate as a primary effluent treatment system.

The purpose of this environmental impact assessment (EIA) study is to obtain Environmental Clearance for proposed 120 KLPD molasses-based distillery unit M/s. Sugar grid Ltd. The notification no. S.O. 1533 promulgated on September 14, 2006 has covered distillery industry under activity 5(g). This report presents the executive summary of environmental impact analysis of the proposed distillery project. The adverse impacts can be minimized by using appropriate control or mitigation measures.

Because of new ethanol related policies of Government of India, the management of the factory has planned extensive cane development activities in its command area (i.e. area of operations). Hence, sugarcane area is anticipated to increase over a period of time. Considering the increased availability of sugarcane, the production of byproduct like molasses is also increase, so the management of SGL has decided to establish a new 120 KLPD molasses based distillery unit to improve its financial viability.

1.1 Selection of Site

The present site fulfills the industrial site selection criteria of MoEFCC. Molasses will be available from own sugar mill and supplementary from nearby sugar mills. Also, water, electricity, good infrastructure, support facilities and labour etc. is also available in the area. The project implementation will involve two routes for achieving zero liquid discharge. Spentwash generation will be 960 m^3/day of which, 360 m^3 spentwash will be concentrated to 90 m^3 and then incinerated with coal. The remaining 600 m^3 spentwash will first be subjected to biomethanation, then concentrated and dried to powder form in agitated thin film drier (ATFD). The highlights of the project are given in table 1.

Table 1: Highlights of the project

1	**Name of project Proponent**	**M/s. Sugar Grid Limited**		
2	**Location of the project**	Gat No. 1739, village Pingali Bk., Tal. - Man, Dist.- Satara, Maharashtra415506.		
3	**Project**	New Molasses based distillery unit of 120 KLPD		
4	**Product/byproduct**	Rectified Spirit, Extra Neutral Alcohol (ENA), Ethanol (Anhydrous alcohol) Byproduct: fusel oil		
5	**Land**	Distillery unit= ~40,600 sq.m Green belt (33% of distillery plot) = ~13,400 sq.m Allocated plot area = ~54,000 sq.m.(roughly 13.50 acres)		
6	**Operation days per annum**	Year around-330 days		
7.	**Main Raw Material**	Material	Quantity	
		B- Heavy Molasses OR C- Molasses OR Cane Juice OR Sugar syrup/sugar	387.09 TPD 444.45 TPD 1,600 TPD 1,600 TPD	
		Nutrient (N,P)	300 kg/d	
		Turkey Red Oil (TRO)	450 kg/d	
8.	**Water Requirement**	961 m^3/day (after considering recycling)		
9	**Steam**	**Maximum 40 TPH = 960 TPD** **Source:** Incineration boiler**: (15TPH) and** **Conventional boiler (28 TPH) using coal & biogas** **Steam utilization:** Distillery unit + MEE + Boiler- de-aerator & SCAPH + ATFD + losses		
10	**Fuel**	**Incineration**	**Conventional**	**Total**
	Conc. Spent wash **Indian coal or** Bagasse Biogas	111.6 TPD 37.20 TPD 670.3 TPD -	- 126.43 TPD 218.38 TPD 8400 m^3/day	111.6 TPD 163.63 TPD 285.41 TPD 8400 m^3/day

11	**Power**	3.6 MW (Maximum); Source: Captive
12.	**Effluent Treatment System**	Multi-effect evaporation (MEE) followed by incineration for 360 m^3/day spent wash and Biomethanation followed by MEE followed by agitated thin film dryer (ATFD) for 600 m^3/day of spentwash Condensate polishing unit (CPU) for the treatment of spent lees and process condensate
13.	**Manpower**	85-90 (permanent)
14.	**Project Cost**	Rs. 131.49 crores
15.	**Capital expenses for Environment management**	Rs. 53.18 crores

TPD = Tons Per Day

2.0 MATERIAL ANDINFRASTRUCTURE

2.1 Molasses/Sugarcane syrup

The estimated molasses requirement for 120 KLPD production capacity for year-round of operation (330 days per annum) will be 444.45 TPD (C heavy) and 387.09 TPD (B heavy). The sugar mill expected to be operated at an average crushing rate of 3500 TCD installed capacity. The molasses will be pumped through pipeline, from storage tanks to the distillery day molasses tank. Raw material and chemical requirements given in the following table.

Raw materials for the proposed project will be available from the local market. Bagasse used as a fuel and molasses as raw material will be available from in-house only. Product wise raw material consumption is given below.

Table 2: Availability of raw materials, finished good product and mode of transport

Particulars	Estimated quantity	Source market	Final product	Estimated quantity	Transport mode
Raw Material					
Molasses (C-Type)	444.45 TPD	Own sugar mill	Rectified spirit + Impure spirit (5%) or ENA + IS or Fuel Alcohol +	120 KLPD	By Road-through Tanker
Molasses (B-Type)	387.09 TPD				
Sugarcane juice	1600 m^3/day				

Particulars	Estimated quantity	Source market	Final product	Estimated quantity	Transport mode
			IS		
Chemicals					
Nutrients N, P	250-300 Kg/day	Satara, Sangli, Pune etc.	-	-	By Road-Truck
Turkey Red Oil (TRO)	450 Kg/day				
Utilities					
Fuel					
Spentwash Coal/ Bagasse Biogas	111.6 TPD + 163.63 TPD/ 285.41 TPD/ 8400 m^3/day	Distillery, market, Sugar mill	-	-	By Road/rail
Water (daily)	912 m^3/d	Pingali Small scale reservoir	-	-	Closed pipeline
Steam	960 TPD	Captive incineration boiler			
Power	3.6 MW	Captive incineration /conventional boilers	-	-	-

2.2 Water

Estimated water requirement is given in table 2.8. According to which water requirement for the proposed project will be 912 m^3/ day (after recycling). The project proponent has permission from irrigation department to lift water from Pingali Small Scale reservoir. This permission is available for lifting 56,400m3 of water per annum. Water will be required for domestic, process and utility purpose. Detailed water budget is as follows.

Table 3: Water Balance: Distillery of 120KLPD (Quantities in cum/day)

A. WATER INPUT	M^3/day
For molasses dilution	1286
For cooling tower make up (fermentation, Distillation, F. A. & Evaporation etc)	800
Fermenter washing	15
For vacuum pump cooling	20
For air blower cooling	30
For fusel oil decanter & Alcohol scrubber	15
Steam generation 40TPH	960
Others (Domestic & Laboratory)	10
Total Water Input at start-up	**3136**
B. WATER OUTPUT	
Spent Lees (PR & Rect.)	240
Process condensate @ 15° brix from both evaporation	835
From vacuum pump cooling	20
From air blower cooling	20
Boiler steam condensate	912
Total Water Output	**2027**
C. WATER LOSS	
Cooling tower drift loss total circulation rate evaporation	800
Boiler blow down and other process loss	48
Fermenter washing and other	15
Domestic and other	10
For fusel oil decanter & Alcohol scrubber	15
Water loss in concentrated spent wash @ 40% in concentrated spent wash on 90 Cu.m /day is 36 + loss in dried SW power 4 = 40	40
Over all process loss	181
Total	**1109**
D. WATER AVAILABLE FOR RECIRCULATION IN PROCESS	

Process condensate recycle to process after CPU treatment	835
Minor polluted effluent streams : boiler blow down + CT blowdown water will be recycle back after treating in CPU with process condensate + WTP reject (70+48+70 = 188)	188
Boiler steam condensate recycle back to boiler as a feed water	912
Spent lees	240
Total water available for recirculation	**2175**

SUMMARY OF WATER BALANCE	
Fresh water requirement	= Water input – water recycle
	= 3136 – 2175
Net fresh requirement m^3/day	= 961
Water requirement per lit of alcohol	= 8.0 lit
Net fresh water required over the year	= 961 X 300 = 288300.0 m^3 per annum

Fresh water requirement for the proposed distillery unit will be of 961 m^3 per day.

2.3 Fuel

Raw spentwash 360 m^3/day will be concentrated to >55^o brix up to 60^o brix (Solids) and will be incinerated along with coal or bagasse. Spent wash available for incineration will be 90 m^3/day and its specific gravity usually observed 1.24. Thus, estimated spent wash availability per day will be 111.6 TPD. This quantity of spent wash will produce 8.14 TPH steam (GCV 1750K.cal). Along with spentwash, coal or bagasse will be used as supplementary fuel in 70:25 ratio

Biogas (8400 m^3/day) generated from 600 m^3/day spentwash will be used in 28 TPH boiler with 4 TPH coal

2.4 Steam

The distillery will require maximum 40 TPH steam. The breakup of steam consumption is as follows

a. Fermented Wash to Rectified spirit: 2.2 Kg /litre
b. Fermented Wash to ENA: 3.2 Kg /litre
c. for Anhydrous ethanol: 2.8 Kg /litre
d. Standalone evaporation: 0.3 Kg /litre

The steam requirement will be fulfilled by an independent incineration boiler of 15 TPH & 28 TPH incineration boiler along with 4.5 MW steam turbine generator (STG) set is proposed for the project. Exhaust steam from STG will be used for distillery.

2.5 Power

The mill has decided to install a separate 4.5 MW capacity steam turbine generator. It will fulfill an estimated power requirement of 3.6 MW of distillery including MEE, CPU and auxiliary units. In case of shut down, power will be purchased from state electricity grid.

2.6 Boiler

One new fluidized bed boiler of 15 TPH capacity, having 45 kg/cm² (g) pressure & 400 ± 5^0C temperature, proposed for the project. It will comply IBR specifications. The scheme for the incineration boiler and power generation are as per figure 2.5.

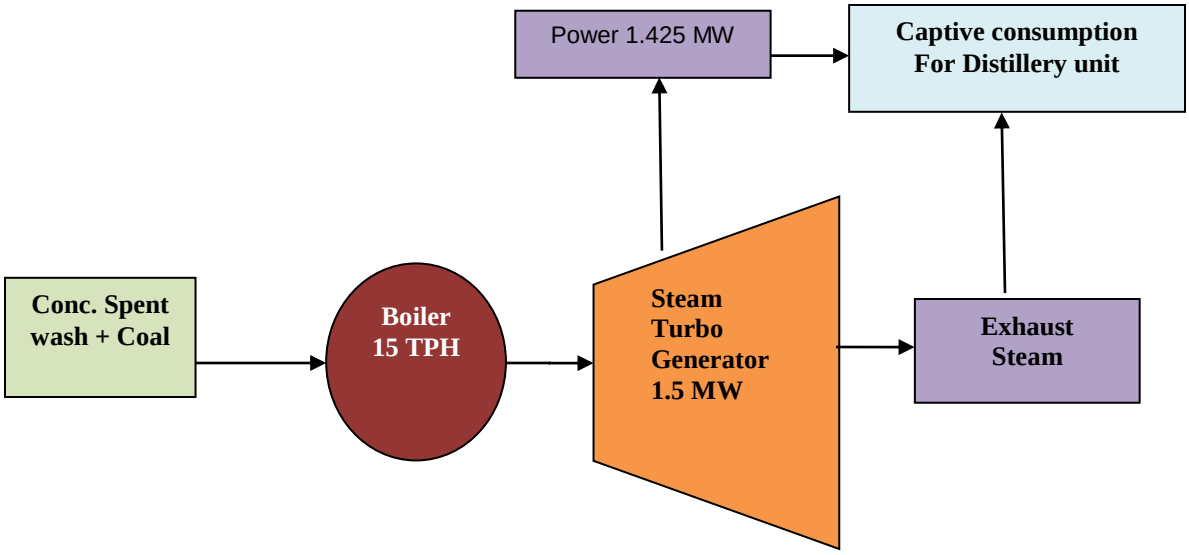

Figure 1: Schematic of steam and power generation

Important technical features of proposed boiler are as follows.

a. It will be multi-feed fuel i.e. coal/bagasse and spent wash
b. It will be constructed in such a way that the fouling potential minimized through multi-pass design. It will be easily maintainable.
c. Deep fluidized bed construction will improve combustion efficiency and ensure complete combustion
d. Special on-line cleaning devices will be provided

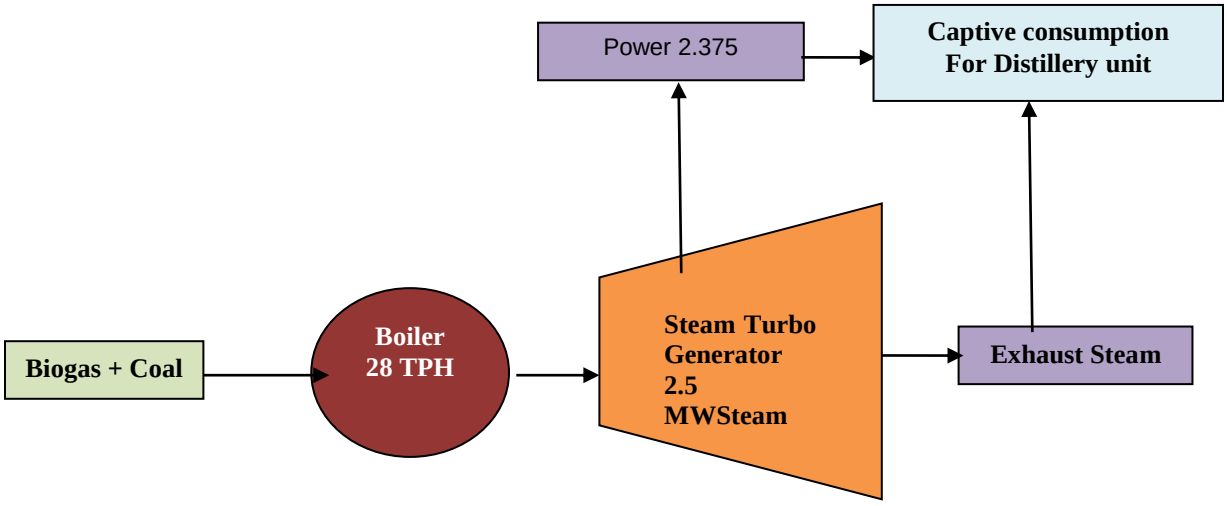

Figure 2: Schematic of steam and power generation from incineration boiler

2.7 Fuel Handling System

Entire coal storage area/ yard will be covered with permanent weather shed roofing and walls on three sides. Mechanized fuel handling system as well as dust suppression system will be installed for this area. Coal handling will have a capacity of max. 5 TPH. The conveyors will be suitably covered with hood or enclosures. Crushed coal will be used, mainly of 3 to 8 mm size. In case of bagasse, the in-house bagasse will be used and it will be transport from bagasse yard to boiler section through conveyer belt or in covered trucks.

2.8 Ash handling system

The ash handling system envisages wet extraction of bottom ash & dry extraction for fly ash. The fly ash will be extracted in dry form from the electrostatic precipitator hoppers, economizer, air heater hoppers, stack hopper, and transported to storage silo as a measure for promoting ash utilization. For collecting fly ash in dry form, the system will be designed such that, the fly ash and conveying air mixture will be conveyed to storage silo with bag filters. Once in eight hours shift, the fly ash will be sequentially extracted from these hoppers. The fly ash handling system will be designed to collect ash in dry form in fly ash silos through pneumatic pressure conveying system.

2.9 Land

The project requires around 13.5 ha of land. The detailed break-up of land for different units of the distillery are already given in table 1.

2.10 Manpower

The project will be generating direct employment for 85-90 persons. Apart from this, anticipated indirect employment opportunities will be from transportation, local service providers, shopkeeper and various facility providers such as schools, medical facilities, etc.

3.0 PROCESS DESCRIPTION

For the proposed project, the Management has planned to adopt the latest technology for process as well as for effluent disposal. Overall objective of this is to achieve high efficiency of operations, save energy and water and achieve Zero Liquid Discharge (ZLD). The characteristic of manufacturing process is given below and a schematic is shown in Fig. 2.

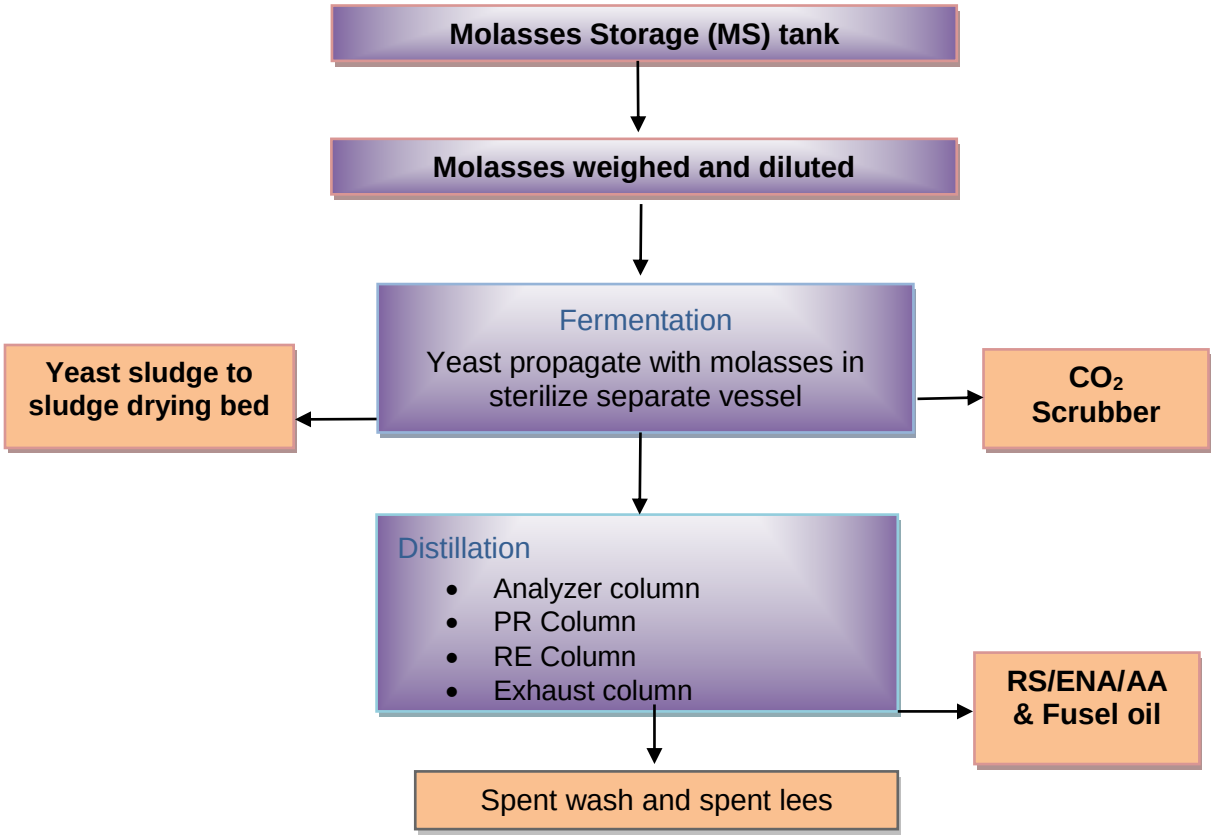

Figure 3: Schematic of Manufacturing Process

3.1 Manufacturing Process

The production process mainly involves fermentation and distillation process.

3.1.1 Fermentation

Molasses is the chief raw material used for production of alcohol. Molasses contains around 50% total sugars, of which 30 to 33 % are cane sugar and the rest are reducing sugar. During the fermentation, yeast strains of the species *Saccharomyces cerevisieae*, a living microorganism belonging to class fungi converts sugars such as sucrose or glucose present in the molasses in to alcohol. The continuous fermentation process involves addition of fresh nutrients medium either continuously or intermittent withdrawal of portion of nutrient for recovery of fermentation products. In continuous process, Fermenter is in constant usage with little shut down and after initial inoculation of yeast culture, further inoculation is not necessary.

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 with batch fermentation. Most modern ethanol production plants adopt this continuous fermentation technology. Hence, continuous fermentation process will be adopted in the proposed unit. The yield of alcohol is ~270 litres/ ton of C type molasses and 300 to 330 litres for B-heavy type.

3.1.2 Distillation

After fermentation, the next stage in the manufacturing process is to separate alcohol from fermented wash and to concentrate it to 95%. This is called Rectified Spirit (RS). For this purpose, method of multi- pressure distillation will be adopted. After separation of alcohol, the remaining part is the effluent of the process i.e. spent wash and spent lees.

3.1.2.1 Multi-pressure 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
4. Extractive Distillation columns

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

Advantages of MPR Distillation

Maximum heat integration is possible.

Few columns operate under vacuum, few under pressure, few under atmospheric pressure.

Low steam consumption with reboiler (2.2 Kg/lit. of Rectified Spirit)

Spent wash generation is less.

3.1.2.2 Re-Distillation to Manufacture Extra Neutral Alcohol (ENA)

ENA is prepared by re-distillation of the rectified spirit (RS) for the removal of impurities like higher alcohols, aldehydes and methyl alcohol. This is done by, remixing rectified spirit with soft water and distilling it in the ENA column.

3.1.2.3 Anhydrous Alcohol (AA)

Anhydrous alcohol is an important product required by industry. As per IS specification it is nearly 100% pure or water free alcohol. Alcohol as manufactured by Indian distilleries is rectified spirit, which is 94.68% alcohol. It is not possible to remove remaining water from rectified spirit by straight distillation as ethyl alcohol forms a constant boiling mixture with water at this concentration and is known as azeotrope. Therefore, special process for removal of water is required for manufacture of anhydrous alcohol.

The various processes used for dehydration of alcohol are as follows-

i. Azeotropic Distillation
ii. Molecular Sieves
iii. Evaporation / Vapour permeation system

Details of molasses and product storage tanks are given in Table 4.

Table 4: Details of Storage Tanks

Specifications For Receivers & Storage Tanks – Thickness As Per IS-803-1976:			
#	**Particulars**	**Quantity**	**Capacity (in m^3)**
1.	Rectified spirit (Product)	02	1200
2.	Extra Neutral Alcohol (Product)	02	1200
3.	Fuel Alcohol (Product)	02	1200

4.	Impure Spirit storage tank	01	250
5.	Technical Alcohol storage tank	01	250
6.	Rectified Spirit day storage tanks	01	500
7.	Fuel Alcohol Receiver	03	03
8.	Rectified Spirit Receiver	03	03
9.	Extra Neutral Alcohol Receiver	03	03
10.	Molasses Storage at distillery (Tons)	01	6500

* These will be provided with flame arrester & cooling vent condenser.

The level indicators provided on all tanks. Receivers are also provided with flame arrester (SS-304).

Vent Condenser for storage tank and necessary piping will be provide as per requirement. Turbine type Flow meter with totalizer will be provide as per requirement.

4.0 BASELINE ENVIRONMENTAL CONDITIONS

The guiding factors for the present baseline study are the requirements prescribed by the Ministry of Environment, Forestry and Climate Change (MoEFCC) for conducting Environmental Impact Assessment study published in the EIA notification 2006 and its subsequent amendments. Apart from this, the terms of reference for the EIA were also considered while planning and executing the monitoring. For baseline data collection sampling of air, water and soil was carried out from October 2019 to Jan 2020.

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.

Table 5: Summary of Environmental features of study area

#	Facet	In brief
1	General characteristics	cool in the western hilly areas but as you move towards the eastern part of the district the weather becomes hotter and dry.
2	Rainfall	An average annual rainfall of 463 mm Rains are received mainly during June-September months
3	Temperature	The mean minimum temperature is 14.4 ^{o}C and mean maximum temperature is 36.8 ^{o}C for the district.
4	Humidity	The relative maximum humidity ranges between 70-89% and minimum humidity ranges from 25-35%.

5	Wind	Predominantly wind direction NE, E and NW during study period
6	Land use	Crop Land area 42.77 %, Settlement area 0.50 %, Water body 0.51 %, Scrub land 50.80 %, River 0.41 %, Forest 5.01 %
7	Air Quality	Complies NAAQ standards of Nov. 2009 at all monitored locations
8	Noise	Complies the standard
9	Ground water	As per Central Ground Water Board report 2013- Slightly alkaline, Suitable for both drinking and irrigation purposes
10	Soil	The soils of the district are the weathering products of Basalt and have various shades from brownish to reddish to black.
11	Nearest sanctuary	Mayani 25 km S

4.1 Land use

Satellite remote sensing, in conjunction with geographic information systems, has been widely applied and recognized as an effective tool in analyzing land cover/use categories. This study evaluates qualitative and quantitative outcome of land cover/use distribution using remote sensing data and GIS technologies.

The existing site is located at village Pingali, Tal-Man, Dist- Satara is covered in survey of India Toposheet no. E43O10 and lies within latitudes and longitudes are as follows:

1. 17^{0}39’59.32” N, 74^{0}30’33.85” E; **2.** 17^{0}39’57.52” N, 74^{0}30’37.41” E;

3. 17^{0}39’52.31” N, 74^{0}30’37.20” E; **4.** 17^{0}39’53.93” N, 74^{0}30’32.80” E.

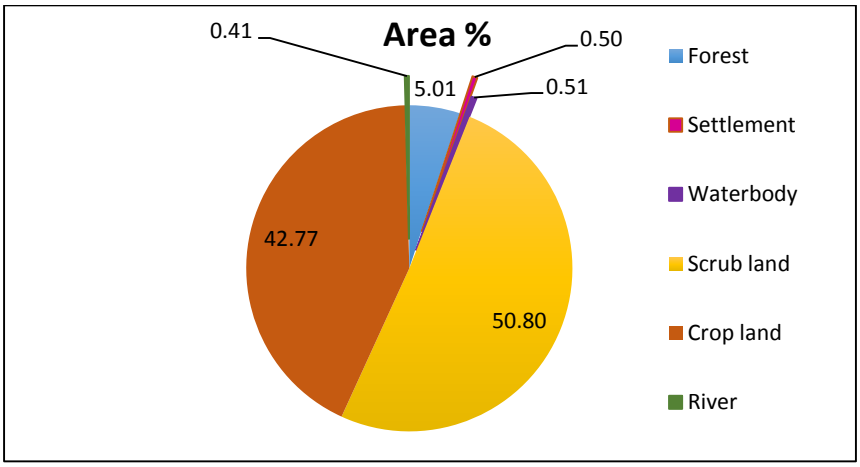

Figure 4: Landuse/ Landcover statistics for the 10 square km area

5.0 IMPACT ASSESSMENT

5.1 Air Environment

Impacts on ambient air quality during the operation phase of the project are likely due to vehicular and process emissions, Vehicular emissions will be generated from transportation of raw materials, finished product etc. Process related emissions can further be divided into two categories i) from burning of fuel to generate steam and ii) from fermentation process.

Activities of operation phase are already described in Chapter 2, along with project specific pollution sources, quantities and characteristics. All this data and baseline environmental conditions (of the site described in chapter 3), were considered for assessing impact.

5.1.1 Impact causing factors

Emissions from process: It will be due to incineration of spent wash along with coal.

Transportation: Vehicular pollution due to transportation activity, dust from roads, loading unloading of material and transportation of material will involve mainly transportation of coal, molasses to some extent and ethanol/spirit. In India, permanent carrier tankers are available popularly in capacities 12 KL, 16 KL, 20 KL and 24 KL capacity. Considering the specific gravity of cane molasses (B or C) of 1.4, a carrier of 20 KL will carry a molasses of 28 tons. Thus, in order to transport 47,565 tons B-heavy of molasses approx. 1699 tankers will be required. Whereas, in case of C-type molasses, 2265 tankers will be required to import estimated molasses. Required molasses needs to be transported in bulk at periodical intervals.

Fugitive Emissions and Other sources of air pollution: Fugitive emissions from handling and storage of coal and ash; transportation activities and odour are also anticipated to cause significant negative impact. System for suppression of dust from handling of coal and ash will be installed. It includes mainly, use of pulse jet bag filters for coal loading-unloading on conveyors, foggers/dust suppressors in coal and ash storage yard, wind breakers for ash storage area.

5.1.2 Impact Assessment: Estimated incremental concentrations of PM and SO_x in the downwind direction of the site are minor, considering the baseline value. The baseline concentrations of these pollutants are well within the NAAQS. Therefore, after adding the incremental concentration to the baseline value at nearest downwind site will not exceed the NAAQS. So, it is anticipated that, the increase in the concentration of these air pollutants due to the burning of fuel, likely to cause minor negative impact on air environment.

5.1.3 Preventive, control and mitigation measures

- Provision of asphalted or RCC roads inside the premises
- Approach road is already available up to highway

- Provision of separate parking for goods vehicles
- Engage authorized transport agency for goods transport on the term to use well maintained vehicles for all transportation activities
- While bulk transportation of raw material/finished product, manage the vehicles in such a way that waiting period for vehicles will be minimum. This will help in reducing the risks of traffic congestion and minor accidents, and over all air pollution.
- Provision of separate entrance and exit lanes/gates for vehicles
- Strict prohibition on washing and maintenance of vehicles on site or in parking area
- All roads with street light and proper signage at strategic locations
- Main gate/s with 24x7 security arrangements

5.1.3.1 Air Pollutant Dispersion Modeling

Prediction of impacts on air environment has been carried out employing mathematical model - AERMOD view dispersion model 9.2 software developed by Lakes Environment Software, Canada.

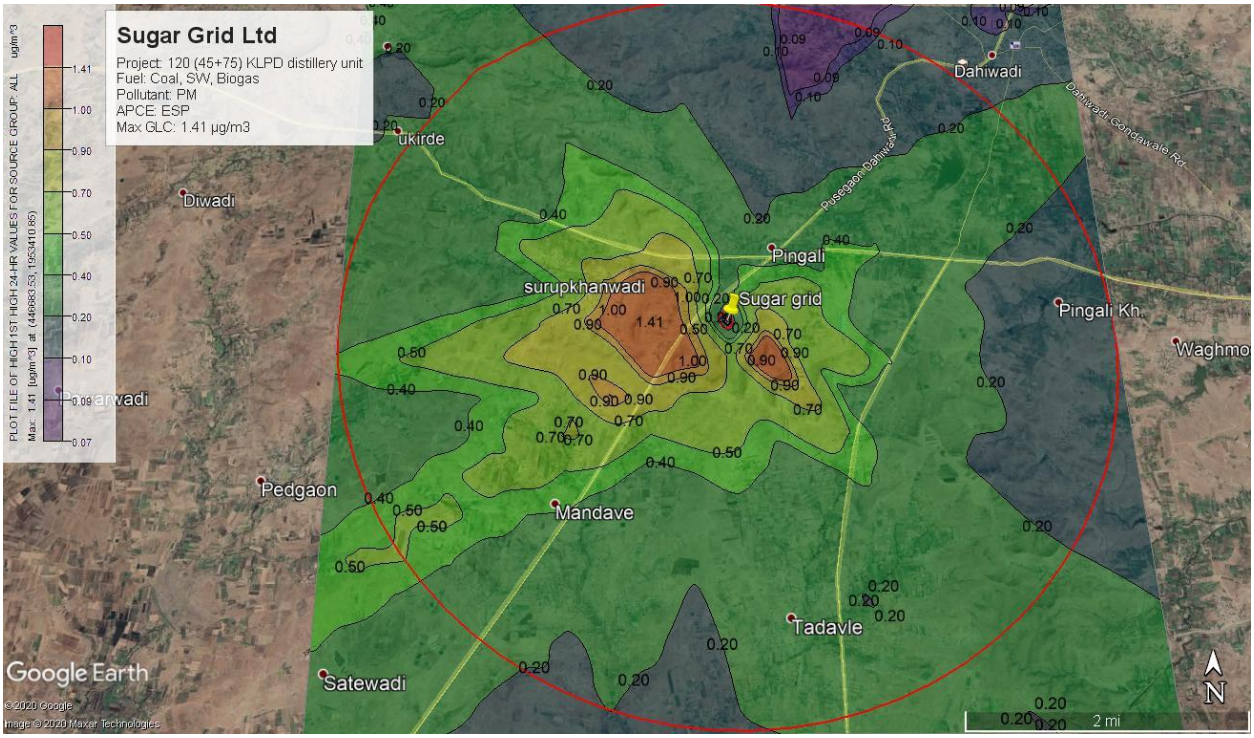

Figure 4: Short term 24 hourly GLCs of PM

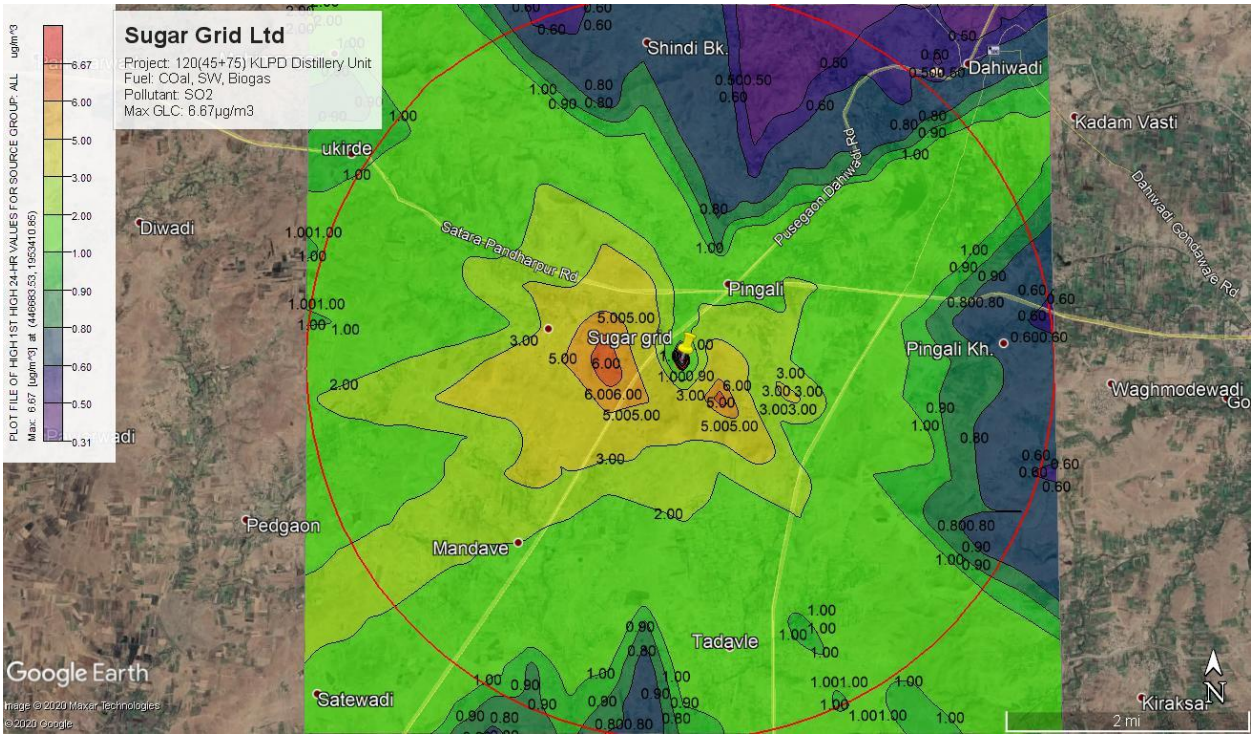

Figure 5: Short term 24 hourly GLCs of SO2

Observation

From the mathematical modeling of air pollutant dispersion study, it is observed that -There will be an increase in the concentration of PM and SOx mainly towards west. The maximum incremental load of 1.41 µg/m3 for PM and 6.67 µg/m3 for Sox anticipated at a distance of ~1 km towards west. This area is predominantly open grassland. Nearest residential area towards west is village Surpakhanawadi (approx. 1.7 Km). From the results derived from the mathematical modeling study, it is observed that resultant concentration of these air pollutant in downwind direction will be well within the national ambient air quality standards prescribed by CPCB in Nov. 2009.

Table 6: Summary of Maximum 24-hour GLC due to proposed project

Description	**Concentration µg/m^3**	
	PM	**SO_2**
Maximum rise in GLC	1.41	6.67
Direction of Occurrence and distance	W	W
Coordinates of maximum GLC	17^{0}40'01.05" N 74^{0}29'50.29" E	17^{0}40'01.05" N 74^{0}29'50.29" E

Baseline Concentration(average) reported nearby GLC (at Village Surpakhanwadi)	62.45	21.24
Max. GLC at village Surpakhanwadi	0.90	5.00
Total Concentration (Post project scenario) at village Surpakhanwadi	63.35	26.24
NAAQS	100	80
*The distance is measured from stack to the receptor of maximum GLC		

5.2 Water Environment

5.2.1 Impact causing factors: The impact of a distillery project on water environment is crucial from two aspects viz. the consumption of water in process and wastewater handling, storage, treatment and disposal

5.2.2 Impact Assessment: Water scarcity or shortage anticipated for other users from the region during a season when rainfall will be less than average. Though, reuse and recycle of water will save significant amount of freshwater intake but in abnormal conditions, there is a possibility of water shortage for other users. Considering the option/s planned for ZLD in the proposed expansion, no negative impact envisaged on water environment as well as aquatic ecosystems of the surrounding area. However, negative impact in the form of change in the qualitative characteristics of receiving waters, envisaged in case of accidental leakages and spillage of spent wash. In such circumstances, severe impact anticipated if the accidental release of spent wash reaches to nay of the nearest natural waterbodies. In such circumstances, the water quality will deplete drastically due to acidic nature of spent wash; its dark brown colour and odour will make the water unfit for all sorts of usage, depletion of DO will make the water unfit for most aquatic life.

5.2.3 Environment management plan: In order to reduce the fresh water intake, the management has planned to reuse of waste water after proper treatment. Wastewater from various sources will be collected and properly treated so as to reutilize it and thus conserve the fresh water resource. The treated water shall be mainly reused in the sugar unit for auxiliary requirements and/or for gardening activity. The sanitary wastewater will be disposed by using septic tank and soak pit system. Thus, zero liquid discharge will be achieved. Boiler blow down and water from cooling tower will be stored in ponds and recycled thereafter. The management also proposed to install rainwater harvesting system to recharge the aquifer and partly fulfill the requirement during startup.

5.3 Land Environment

The distillery industry is an agro-based industry and hence its impact on soil considered equally important

- **Impact of effluent discharge**

Spent wash, a highly polluting waste has the potential to affect the soil properties however, spent wash storage will be in impervious lagoon and disposal will be through incineration and dry powder hence any impact of effluent discharge on land assumed negligible in normal case.

- **Solid waste**

Table 7: Solid Waste and its Management

#	Waste	Quantity (TPA)	Disposal	Remark
1.	Yeast sludge (Dry)	30-35	Used as soil conditioner	Organic
2.	Ash	16024 max from incineration	Sold to brick manufacturers	Inorganic
		14602 max from conventional boiler		
3.	CPU sludge (dry)	45-48	Used as soil conditioner	Organic/Inorganic
4.	Spent oil from DG set	3.4 KL	Spent oil is burnt in boiler	-

Indian coal will be used for the project. It is usually free of mercury and has low sulfur content.

5.3.1 Impact causing factors: Disposal of solid and hazardous waste, disposal of effluent, change in topography

5.3.2 Impact Assessment: The only hazardous waste likely from the project is the scrap oil mainly from DG set and machines. However, the DG set will be used only in case of total power failure i.e. captive as well as failure of power supply from electricity board. Thus, the quantity of used or scrap oil is assumed very minor. This waste oil can be disposed-off safely by giving it to authorized hazardous waste oil dealer. Alternatively, it can be burnt in boiler along with fuel at periodical interval.

5.3.3 Environmental management plan: Sludge which usually rich in organic matter, will enhance the organic content of the soil. Hence, positive impact envisaged on soil due to sludge. Ash is likely to cause long term change in the soil characteristics of ash storage area and surrounding soils. Ash storage and transportation likely to increase particulate matter in the ambient air - at and along the transportation route.

5.4 Ecology

5.4.1 Impact causing factors: Discharge of air and water pollutants into environment, solid waste, change in land use, removal of vegetation cover, reclamation of wetland/water bodies, etc.

5.4.2 Impact assessment: Minor negative impact anticipated on avi-fauna due to stack gas temperature (approx. 150^{o}C). Fly ash emitted will settle mainly up to 1 km distance from stack (as per isopleath – figure 4.1). Thus, agricultural vegetation and flora/plants in this area are likely to get affected (reduction in photosynthesis and its subsequent impact) due to dust/fly ash (particulate matter).

In normal operational conditions, no change in the aquatic or terrestrial flora/fauna anticipated due to the wastewater from the proposed project.

Considering the presence of ecologically sensitive carnivore in the study area, accidental pollution of waterbodies anticipated to have moderate to severe negative impact on wild life.

Odour of spent wash likely to attract insects and fungus, particularly in sludge drying beds. It usually attracts avi fauna due to availability of food. Thus, food chain likely to be stronger in the surrounding area (particular for birds). Ash from the project anticipated to cause negative impact on vegetation in the surrounding area of the site. Enhancement in soil micro-flora due to sludge application is anticipated as positive impact.

Negative impact anticipated due to canteen waste. It may attract wolf, hyena or fox – if not disposed properly.

5.4.3 Environmental management plan: ESP as an air pollution control device; stack of 70 m height; mechanized handling of bagasse and ash, etc. for air pollution prevention and control; Greenbelt development - for mitigation of air and noise pollution. Solid waste is organic and safely gets disposed-off by applying into soil.

5.5 Socio- economic environment

5.5.1 Impact Causing Factors: issues of rehabilitation; restoration; population flux; pressure on available resources and infrastructure.

5.5.2 Impact Assessment: Considering the long term benefits to the locals, the project will have positive impact on socio-economic environment.

5.5.3 Environment Management Plan: Project is agro-based – therefore, indirectly beneficial to

local farmers; no issues of rehabilitation or restoration; local candidates will be employed – thus, migration of population to the site surrounding area and pressure on infrastructure and resources is anticipated to be negligible.

5.6 Other impact: Traffic

During operation phase, the transportation activity will get increased considerably. However, availability of adequate and proper road infrastructure in the area and provision of adequate parking in the project premises, probability of traffic congestion envisaged very low.

It was observed that, during peak hour, the vehicle number on main road is around 188 vehicles. The project involves transportation of finished products and to some extent molasses, which is likely to increase vehicle density by 20-25% on the existing load. Road infrastructure in the surrounding region, is good. It comprises of state as well as national highway. Thus, additional load of vehicles will get distributed and accommodated within existing infrastructure. However, negative impact anticipated on the vehicle density and traffic of the study area due to the project.

6.0 FIRE PROTECTION SYSTEM

Fire protection system shall be provided in accordance to PESO, OISD-117 and LPA regulations. The fire- fighting system will consist of a hydrant network, piping etc. Fire protection system will also include one electric driven pump, one diesel engine driven pump, one jockey pump, piping, basin etc. Water hydrants will be provided at all strategic points. A suitable Fire ring system as per the guidelines of TAC will be incorporated. Non-flame proof and flame proof area will be separated by minimum distance of 15 meters. Portable fire extinguishers will also be provided in strategic locations viz., power house, control rooms, storage yard.

Fire Protective System – Fixed supply of Carbon dioxide from the Tank, normally connected to fixed piping system with nozzles arranged to discharge CO_2 directly on the burning material, equipped with Fire Alarm, Fire hydrant fm 200 and extinguishing system H.V.W / M.V.W Spray system (LOCAL APPLICATION ONLY). System consists of Alarm Bell, Control panel, remote station, electric control needed for operating system, Pressure switch Heat detector, Heat collector, and conveyor rail, Drain Board with dip tank and discharge nozzles.

Automatic fire Sprinkler System (Water Hydrant) – Electro-magnetic dehydration system uses an electric fire detection system installed in the area as open sprinklers /spray nozzles. Upon sensing a hazard, the Electromagnetic valve opens.

6.1 Safety Aspects through Design and Engineering

All design will be as per ISI standard specification and drawings are to be approved by factory/electrical inspectorate /safety inspectorate weights & measurement inspectorate etc.

The plinth level of distillery building will be at min 0.75 m height from developed ground level and it is to be built by brick masonry. For ground floor flooring of M10 grade (CC1:3:6) as a base concrete is to be made and its IPS shall be 50 mm of M15 grade (CC1:2:4). Plinth foundation should carry the load of 4 m height wall safely. All distillation columns accessed from flooring (grating) The roof of the structures (fermentation, distillation, receivers) must be covered totally by pre- coated sheets (Pre-painted galvano loom sheet i.e. PPGL sheets) of 0.5 mm thickness.

For anhydrous ethanol receivers & storage tanks PESO (Petroleum and Explosive Safety Organizations) guidelines. Distance between flameproof and non-flame proof area min. 15 m

The layout will take into account the working space & safety requirement of Factory Inspectorate, Govt. of Maharashtra State.

6.2 Plant Lighting

The normal process area lighting will generally compromise of Fluorescent fittings & Mercury vapor fittings. Flameproof light fittings conforming to IS 2148 shall be provided for hazardous areas, particularly in distillation & storage section, while non-flame proof fittings in other areas.

Plant building lighting will be as per norms & as per Electrical inspectorate / factory inspectorate norms.

6.3 Energy and Water Saving Measures

High alcohol % in fermented wash can result in substantial reduction in steam consumption (integrated evaporation system). It is possible to recycle of low strength waste generated i.e. process condensate, spent lees and other streams in distillery after treating through condensate polishing unit. It will help to reduce the consumption of fresh water for process and non-process applications.

7.0 ENVIRONMENT MANAGEMENT PLAN

Table 8: Environment management plan: operation phase

Environmental Aspect	Impact causing factor	Control/Mitigation Measures
Air Environment	Generation of Particulate Matter (PM), SO_2, NO_x during incineration Generation of Carbon dioxide from fermentation, Odour from spent wash storage Handling of coal and ash	• ESP to control ash emission through stack with height 70 m • CO2 scrubber followed by bottling • Mechanized system for handling of coal and ash handling • Fugitive dust control/suppression for coal yard will be done properly • Wind breaks for ash storage area • Development of greenbelt
Water Environment	Effluent generation from processes, cleaning, blow down water & condensate. Storage of spentwash, its treatment and disposal	'Zero liquid discharge' will be achieved by implementing - • Multi-effect evaporation (MEE) followed by incineration for 360 m^3/day spent wash and Biomethanation followed by MEE followed by agitated thin film dryer (ATFD) for 600 m^3/day of spentwash • Spentlees, condensate of MEE and other effluents will be treated in condensate polishing unit (CPU) and treated water will be reused in distillery. • All the effluent will be properly treated/ utilized/disposed within the premises • Separate tanks for storage of raw and concentrated spentwash. • Lagoons will be made impervious as per CREP guidelines • Fresh water requirement will be reduced by recycling of water (treated water), using rain

Environmental Aspect	Impact causing factor	Control/Mitigation Measures
		water during startup period • Piezometric well, in downstream area of spentwash storage to monitor ground water quality • STP for domestic wastewater
Soil Environment	Boiler Ash	• Sold to nearby brick manufacturing unit
	Sludge from Fermentation unit, digester and CPU	• Sludge is degradable, organic in nature hence, used for soil application
Noise	Increase in noise level due to operation of machines, motors, vehicular movement, DG set etc.	• Regular maintenance of machines and factory vehicles • provisions of separate parking for goods and other vehicles • Internal roads will be either asphalted or RCC, leveled, illuminated and will be maintained • Safety sign boards will be placed at strategic locations within premises • Provision of adequate personal protective equipment for workers • Job rotation for high noise level work places, if required • Regular health checkup for workers • Acoustic enclosure will be provided to DG set
Ecology and Biodiversity	Air, water, soil and noise pollution Tree cutting failing, disturbance to wildlife due to project	• Adequate preventive, control and mitigation measures for air, water and soil pollutants • No tree cutting/ felling involved • Development of greenbelt will help to enhance the biodiversity and will provide habitat to many species • Proper fencing to the proposed industrial unit to

Environmental Aspect	Impact causing factor	Control/Mitigation Measures
	Habitat alteration	prevent entry of carnivores • Areas should be strictly and effectively protected from fire. Mass level awareness at local level is required for this. Project proponent need to take help of Forest Department (local range office), local NGOs working in the field of wildlife to create awareness about behavioral characteristics of wolf, hyena etc. It will help in reducing probable man-animal conflict • Domestic solid waste to be disposed in such a way that it will not attract wolf or hyena • Nigh time light arrangements in the unit, to be made non-intense, non-glary; it should not disturb the wild animals
Socio-economic Environment	Rehabilitation and Restoration (RR), pressure on available manmade infrastructure/resource due to population flux	• No rehabilitation and restoration issue involved since site is already under the possession of project proponent • Local candidates will be preferred for employment. Skilled work force is available at nearby towns and cities
Safety and Occupational health	Accidents, improper work practices	• Safety officer and safety committee will be formulated • Provision of adequate safety gears • Insurance policy for workers • Implementation of all statutory and regulatory norms, guidelines • Regular health check-up

Environmental Aspect	Impact causing factor	Control/Mitigation Measures
Risk and disaster management	Fire, accidents, earthquake, etc.	• The entire premises will be declared as 'no smoking zone' • Lightening arresting system will be installed • Ethanol vapor condensing system will be installed at storage area • Proper storage of molasses, ethanol and coal • Ethanol storage as per PESO guidelines • Firefighting system as per OISD and local authority guidelines • Earthquake resistant construction

8.0 SAFETY, OCCUPATIONAL HEALTH MANAGEMENT

In case of proposed distillery project, aspects of Safety and Occupational Health are given with due consideration, over and above applicable legislations such as Factories Act, 1948. Extra attention is paid to provide measures for ensuring safety and health of workers as well as integrity of the unit.

Following applicable national or international standards shall be followed

- Use of flameproof and standard electrics
- Standard operating procedures (SOP)will be developed as per the manual of respective equipment and machines. These SOP will be strictly implemented to ensure safety, health and environment throughout the premises
- Provision of safety gears such as safety shoes, gloves, goggles, helmets, masks, ear plugs, etc. is made for workers
- Noise proof cabins will be provided to controlling operators
- Workers working in high noise/ high risk areas will be rotated to other areas
- Smoking and other igniting activities shall be strictly prohibited in the distillery/ parking areas
- The plant and buildings will be designed to meet the corresponding provisions of statutes regarding inter-distances, exits, ventilation, illumination, etc.
- Firefighting arrangements shall be provided as per the required statutes as well as corresponding standards

- Proper earthling arrangements will be made
- Work entry permit system will be implemented
- Necessary data and transport emergency (TREM) card must be available with the all vehicles used for transportation of finished products as well as raw material.
- Only well-maintained vehicles to be used for raw material and finished product transport

Facilities proposed by the Management

- Separate parking facility for private vehicles (non-goods), fuel station i.e. petrol pumps
- Drinking water facility
- Canteen
- Toilet and bathrooms
- First aid facility
- Safety gears

The above mentioned facilities will be made available to construction workers, harvesting labours as well as to the visitors and transporters. This will insure healthy and hygienic working conditions in the factory premises.

Plan of evaluation of health of workers

- SGL will monitor the health of its workers before placement and periodically examine during employment
- Proper schedule is in place which will be modified suitably if required and followed with help of occupational health experts and doctor
- Health effects of various activities and health hazard, if any observed will be recorded and discussed with the health experts for corrective and preventive actions need to be taken by the industry

Schedule of medical check-up during operational phase

- Comprehensive pre-employment medical checkup for all employees
- General checkup of all employees (including contractual employees and casual labour) once every year (the industry is doing it for existing unit)
- Local hospitals and Govt. health monitoring system will be engaged
- Dispensary and ESI facility will be provided to all workers as applicable

9. MANAGEMENT PLAN FOR SOCIAL ENVIRONMENT/ ENVIRONMENT RESPONSIBILITY OF THE INDUSTRY

The management will undertake activities to maintain as well as improve socio-economic conditions of the region. These activities and budgetary allocation are highlighted in table 9.

Table 9: Financial provision for CER activities planned for next five years

CSR activity head	Year					TOTAL
	1st	2nd	3rd	4th	5th	
	Budgetary provision (Rs. in lakhs)					
Improvement in social infrastructure:						
Provision of rooftop solar panels to local schools	15	15	15	15	15	**75**
Provision of sanitary fixture and drinking water supply to local schools	10	10	10	10	10	**50**
Health facilities: Health check-up of workers, their family members, organizing medical camps, medical aid to villagers, etc.	2	2	2	2	2	**10**
Education						
Education/training to local youths, farmers, family members of employee's	5	5	5	5	5	**25**
Infrastructure Development/Maintenance (Eg. Road, canal maintenance, etc)	5	5	5	5	5	**25**
Other activities for maintaining social and cultural harmony	2	2	2	2	1	**9**
TOTAL BUDGETARY ALLOCATION FOR NEXT FIVE YEARS (1.5% of the capital budget)						**194**

These activities will also include

- Conservation of fresh water resources
- Providing health / health checkup facilities to even family members of the employees, labours, contract labours, etc.
- Prefer local candidates for employment
- Provide employment to backward classes/communities as per the regulatory norms
- Proper implementation of schemes for employee's health, insurance, welfare, etc.

- Pay special attention on schemes for women and child welfare
- Policy under Public Liability Insurance Act, 1991 is mandatory
- Maintain the road infrastructure
- Help to strengthen the other infrastructures such as school, medical facilities, drinking water, sanitation, etc
- Help to maintain and improve social harmony in the region

Table 10: Estimated Capital & Recurring Expenses for Environment Management

#	Particulars	Amount (Rs. in Lakhs)
	Capital Expenses	
1.	MEE	900.00
2.	Incineration boiler	1200.00
3.	ATFD/spray drier	350.00
4.	Biomethanation plant	350.00
5.	Fuel handling system	900.00
6.	Ash handling system	180.00
7.	Stack with ESP	880.00
8.	Spentwash storage lagoon	140.00
9.	Condensate polishing unit	228.00
10.	Sewage treatment plant	40.00
11.	Environmental monitoring and management	50.00
12.	Greenbelt development	50.00
13.	Rainwater harvesting	50.00
	TOTAL	5318.00
	Additional provision towards CSR/CER (1.5% of capital cost)	**194.00**
	Recurring Expenses/Annum	
1.	Salaries and wages	25.00
2.	Maintenance (on capital investment of Rs. 5318 lakhs) of pollution control devices e.g. ESP, etc.	264.40
3.	Fuel (incineration activity)	1963.56
4.	Miscellaneous	15.00
	TOTAL	**2267.96**

10.0 CONCLUSION

Sugar Grid Ltd. (SGL) located at Pingali village in Man taluka of Satara district in Maharashtra has proposed a new molasses- based distillery unit of 120 KLPD. Baseline environmental quality data was collected for post monsoon season during October 2019 to January 2020. Identification and prediction of significant environmental impacts due to proposed activity has been given in detail in Chapter 4. The salient features of the proposed project are given in table 11.

Table 11: Salient Features of the Proposed Project

1.	Project	New 120 KLPD molasses-based distillery unit
2.	Land	5.4 ha for distillery unit Green belt 1.34 ha
3.	Operation Days	330
4.	Total Water Requirement	961 m^3/day considering recycle and reuse
5.	Water Source	Pingali reservoir. Additional permission applied for.
6.	Effluent Treatment System	Multi-effect evaporation (MEE) followed by incineration for 360 m^3/day spent wash and Biomethanation followed by MEE followed by agitated thin film dryer (ATFD) for 600 m^3/day of spentwash Condensate polishing unit (CPU) for the treatment of spent lees and process condensate
7.	Air Pollution Control Device for Flue Gases	Electrostatic Precipitator Stack height 70 m
8.	Power and its Source	**Requirement:**3.6 MW/hr **Source:** Captive Alternate source: state electricity board.
9.	Fuel	**Conc. Spent wash:** 111.6TPD; **Coal:** Max. 163.3TPD; **Bagasse:** 285.41TPD, **Biogas: 350 m^3/day** **Spent wash, bagasse & Biogas Source:** In-house (from own production) **Coal Source:** Will be purchased from market

10.	Steam	**Total: Maximum 960 TPD** **Source:** Through proposed 15 TPH incineration boiler & 28 TPH conventional boiler **Steam utilization:** Distillery, Standalone MEE and incineration boiler, ATFD units
11.	Manpower	Direct employment to 77 persons 40 permanent + 37 seasonal
12.	Total Project Cost	Rs. 131.49 crores
13.	Capital Expenses for Environment Management	Rs. 53.18 crores

Geographical coordinates of the site are $17^0$39'59.32" N, $74^0$30'33.85" E. The site is well connected by road, railway as well as air network. State highway 69 is 0.33 km towards west. NH 548C is approx.1.1 km and NH 160 is approx. 2.1 km towards south of the site. Rahimatpur railway station approx. 41 km and Airport of Kolhapur approx. 127 km is the nearest air ports to the site.

Waste Management: Raw spent wash generation 960 cum per day. Of which 360 m^3/day will be concentrated in standalone Multi effect evaporation; Conc. spent wash of >55-60% solids will be burnt in incineration boiler. Remaining 600 m^3/day of spentwash will be subjected to biomethanation after which it will be converted into powder using ATFD. Estimated domestic effluent will be 10 m^3/day, which will be treated in STP. The proposed industrial activity could generate solid waste in the form of yeast (30-35 TPA) and ETP/CPU sludge (45-48 TPA). These are biodegradable material. Daily ash generation from incineration boiler is approx. 33 tons and from conventional boiler of distillery will be approx. 44.3 tons. Thus approx. 8 dumpers will be required to transport the ash to its disposal site. This ash will be sold to brick manufacturing unit. Hazardous waste is will be the spent oil from DG set – quantity anticipated to be minor due to captive power source. It will be burnt in boiler. The stack height will be 70m. ESP system will be installed as air pollution control equipment. The plant and equipment's will be specified and designed with a view to minimize noise pollution. SGL is committed to the Health and Safety of all its employees. It strives to provide hygienic & safe work place and continually improve the effectiveness of Health & Safety system.

The basic infrastructure such as roads, electricity, transportation, drinking water supply, health

centers and hospitals, school, colleges, sanitation facilities are available in the vicinity. The proposed project is not going to exert any unbearable load on any of these resources. In fact, it will generate employment for the local people there by raising their standard of living. The proposed project will be generating 85-90 direct employment opportunities. Apart from this, the project anticipated to give indirect opportunities to transporters, shopkeepers and various facility providers such as schools, medical facilities, etc. Full precautions will be taken for pollution control, resource conservation and environmental protection. The unit is agro-based and hence it will promote sustainable development.