DRAFT
ENVIRONMENTAL IMPACT ASSESSMENT & ENVIRONMENTAL MANAGEMENT PLAN (EIA/EMP)

For

Proposed Project for 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant

At

M/s. The Gurdaspur Cooperative Sugar Mills Ltd. V.P.O Paniar, Dist. Gurdaspur, Punjab- 143531.

Land/Plot Area: 392545.0 m^2 (97 Acre)

[ToR Letter No: No.IA-J-11011/502/2021-IA-II (I) dated 08th December 2021]

[Study Period: December 2021 to February 2022]

[Schedule 5(g), 5g(a), 1(d) & 5(j) as Category-'A' as per EIA Notification 2006 and amended till date]

[NABL & MoEFCC Accredited Laboratory-Ecosystem Resource Management Pvt. Ltd., Certificate No.TC-6603]

APPLICANT

The Gurdaspur Cooperative Sugar Mills Ltd.

V.P.O Paniar Village, Dist. Gurdaspur, Punjab- 143531.

E-Mail: gsugarmills@yahoo.com

CONSULTANT

Eco Chem Sales & Services

Office Floor, Ashoka Pavilion - A New Civil Road, Surat, 395001

NABET/EIA/2023/SA 0156

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Doc. No.: 2021_ECSS_EIAI2_2100021

March 2022

DECLARATION OF CONSULTANT

Declaration by experts contributing to the EIA report for Proposed Project for 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant at V.P.O Paniar Village, Dist. Gurdaspur, Punjab- 143531., by The Gurdaspur Cooperative Sugar Mills Ltd.

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

EIA Coordinator : **Mr. Sunil Pandey**

Signature :

Date : **28/03/2022**

Period of involvement : **December 2021 to March 2022**

Contact Information : **eco@ecoshripad.com**

FUNCTIONAL AREA EXPERTS

S.No.	Functional Areas	Name of the Expert	Involvement (period & task**)	Signature & Date
1.	AP	Mrs. Rekha Shah	**December 2021 to March 2022** Site visits followed by selection of monitoring locations, Supervision of air quality monitoring, Identification of probable impacts of different air emission from the plants/ facilities proposed, suggesting most suitable control device and contribution to EIA documentation.	RSShah
2.	WP	Mrs. Rekha Shah	**December 2021 to March 2022** Site visit & supervision & checking of sampling locations for surface water & Ground water samples & their analysis results, Water use auditing, water balance, water budgeting, water conservation and developing scheme for reuse of water, identification of impacts, finalization of mitigation measures and contribution to EIA documentation.	RSShah
3.	SHW	Mrs. Rekha Shah	**December 2021 to March 2022** Identification of waste generated from the site, confirming adequacy of mitigation measures for management of hazardous waste and contribution to EIA documentation.	RSShah

S.No.	Functional Areas	Name of the Expert	Involvement (period & task**)	Signature & Date
4.	SE	Mr. Ghanshyam Patel	**December 2021 to March 2022** Conducting baseline socio-economic surveys through interviews/ questionnaire from the surrounding area/villages of the proposed project, impact identification and mitigation measures for incorporating to EIA documentation.	
5.	EB	Mrs. Dipti Patel	**December 2021 to March 2022** Site visit and conduct of ecological survey and preparation of status report for rare endangered and threatened species of animals and plants and also species protected under national laws, assessment of the impacts of proposed project activities on the biological environment and contribution to EIA documentation.	
6.	HG	Mr. Joshua Anand	**December 2021 to February 2022** Understanding and representing groundwater conditions, supervision of groundwater sampling locations, finalization of survey findings, identification of impacts, suggestion of mitigation measures and contribution to the EIA documentation.	
7.	GEO	Mr. Ravikant Sharma	Not involved, as Functional Area is rationalized as per QCI scheme for Accreditation Version 3	--
8.	SC	Mr. Dr. B. K. Patel	Not involved, as Functional Area is rationalized as per QCI scheme for Accreditation Version 3	--
9.	AQ	Mr. Ramdas Wani	**December 2021 to February 2022** Evaluation of meteorological data with collected secondary data, modeling and prediction, identification of impacts, finalization of mitigation measures and contribution to EIA documentation.	
10.	NV	Mrs. Dipti Patel	**December 2021 to March 2022** Checking of noise sampling results, analysis of data, identification of impacts and mitigation measures, and contribution to EIA documentation.	
11.	LU	Mr. Joshua Anand	**December 2021 to February 2022** Generation and analysis of data related to landuse pattern. Development of landuse maps of study area using ArcGIS / related tools, site visit for ground truth survey, finalization of landuse maps, and contribution to EIA documentation.	

S.No.	Functional Areas	Name of the Expert	Involvement (period & task**)	Signature & Date
12.	RH	Mr. Vinay Patil	**December 2021 to February 2022** Identification of hazards and hazardous substances Preparation of impacts diagrams & mitigation measures, preparation of disaster management plan, contribution to EIA documentation.	
		Mr. Jenish Barot (FAE-Cat-B)	Assisted approved FAE for above mentioned task	

Declaration by the Head of the Accredited Consultant Organization/ authorized person

I, **Rekha S. Shah**, confirm that the above mentioned experts prepared the EIA report for **Proposed Project for 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant** by The Gurdaspur Cooperative Sugar Mills Ltd. at V.P.O Paniar Village, Dist. Gurdaspur, Punjab- 143531.

I also confirm that EC has gone through the report, and the consultant organization shall be fully accountable for any misleading information mentioned in this statement. It is certified that *No* unethical practices including plagiarism have been carried out and external data /text has not been used without proper acknowledgement, while preparing this EIA report.

Signature	:	
Name	:	**Rekha Shah**
Designation	:	**CEO**
Name of the EIA Consultant Organization	:	**Eco Chem Sales & Services, Surat** Office Floor, Ashoka Pavillion – A, Opp. Kapadia Health Club, Surat 395001 (GJ)
NABET Certificate No. & Issue Date	:	**NABET/EIA/2023/SA 0156 valid till 15th March, 2023**

CERTIFICATE OF PLAGIARISM CHECK

Title of EIA Report:	**M/s The Gurdaspur Cooperative Sugar Mills Ltd.** Proposed Project for 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant
Name of Accredited Organization:	Eco Chem Sales & Services
Unique Identification Number:	Company registration number: GUJ/BRT/(10)/15590
Name of EIA Co-ordinator (EC):	Mr. Sunil Pandey
Name of the Software:	Plagiarism Checker X
Date of Check:	26.03.2022
Time of Check:	05:15 p.m.

Declaration by the Head of the accredited consultant organization / authorized person

I hereby certify that this EIA Report has been evaluated using in-house software viz., Plagiarism Checker X version. The report produced has been analyzed by the system and based on it, I certify that the EIA report produced in accordance with good scientific practice.

Date and Sign of EIA Coordinator:

Name: Mr. Sunil Pandey

Designation: EIA Coordinator

Date and Sign of Head of Accredited Organization:

Name of the EIA Consultant Organization: Eco Chem Sales & Services

NABET Certificate No. & issue Date: NABET/EIA/2023/SA 0156 valid till 15th March, 2023

UNDERTAKING BY PROJECT PROPONENT

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The Gurdaspur Co-operative Sugar Mills Ltd.

PANIAR, P.BOX NO. 27, GURDASPUR

Ref No. GCSM/G/720 Dated 26/03/2022

Undertaking letter for Owing of EIA/EMP Report

The Member Secretary- IA Division (Industry: II)
Government of India
Ministry of Environment, Forests and Climate Change
Indira Paryavaran Bhavan, Aliganj
Jor Bag Road, New Delhi – 110003.

Sub.: Undertaking forownership of Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) and other documents of our proposed project of 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant by The Gurdaspur Cooperative Sugar Mills Ltd.at V.P.O Paniar Village, Dist. Gurdaspur, Punjab- 143531.

Ref.: MoEF&CC OM vide letter No: J-11013/41/2006-IA.II (I), dated: 05/10/2011.

Dear Sir,

We hereby give you an undertaking for owing the contents and information provided in EIA/ EMP report submitted to MoEFCC, New Delhi for Environmental Clearance of proposed project of 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant at V.P.O Paniar Village, Dist. Gurdaspur, Punjab- 143531

Yours Sincerely,

General Manager

UNDERTAKING BY CONSULTANT

ECOCHEM
SALES & SERVICES
POLLUTION CONTROL CONSULTANT, ENGINEERS & CONTRACTORS

Dated: 25/03/2022

To,

The Member Secretary- IA Division (Industry: II)
Government of India,
Ministry of Environment, Forests and Climate Change,
Indira Paryavaran Bhavan, Aliganj,
Jor Bag Road, New Delhi – 110003.

Subject: Undertaking on the compliance of Terms of Reference issued by the MoEFCC, New Delhi for Proposed development of 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant by The Gurdaspur Cooperative Sugar Mills Ltd. at V.P.O Paniar Village, Dist. Gurdaspur, Punjab- 143531.

Reference: OM vide letter No:J-11013/41/2006-IA.II (I), dated: 04/08/2009.

Respected Sir,

We hereby give you an undertaking that we have prepared the complete EIA Report based on the Terms of Reference (ToR) issued by the MoEFCC, New Delhi. We ensure that all the ToR points have been addressed in the EIA/EMP Report for the Proposed 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant by The Gurdaspur Cooperative Sugar Mills Ltd. at V.P.O Paniar Village, Dist. Gurdaspur, Punjab- 143531.

Yours Sincerely,

RSShah

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ABBREVIATIONS

AA	-	Absolute Alcohol
AAQM	-	Ambient Air Quality Monitoring
APC	-	Air Pollution Control
BOD	-	Biochemical Oxygen Demand
CER	-	Corporate Environmental Responsibility
COD	-	Chemical Oxygen Demand
Co-gen	-	Cogeneration
CPCB	-	Central Pollution Control Board
CTO	-	Consent to Operate
dB	-	Decibel
DDGS	-	Distillers Dried Grain Soluble
DO	-	Dissolved Oxygen
EAC	-	Expert Appraisal Committee
ECC	-	Emergency Control Centre
ECSS	-	Eco Chem Sales and Services
EHS	-	Environment Health and Safety
EIA	-	Environment Impact Assessment
EMC	-	Environmental Management Cell
EMP	-	Environmental Management Plan
ENA	-	Extra Neutral Alcohol
ETP	-	Effluent Treatment Plant
FMO	-	Factory Medical Officer
GOI	-	Government of India.
HSD	-	High Speed Diesel
IS	-	Indian Standards
ISO	-	International Standards Organization
KLD	-	Kilo liter per day
MEE	-	Multi Effect Evaporator
MoEFCC	-	Ministry of Environment Forest and Climate Change
MSMEs	-	Ministry of Micro, Small and Medium Enterprises
MW	-	megawatt
NAAQS	-	National Ambient Air Quality Standards
NABET	-	National Accreditation Board for Education and Training
NH	-	National Highway
OHC	-	Occupational Health Centre
OSHA	-	Occupational Health and Safety
P.O.	-	Post Office

PPCB	-	Punjab Pollution Control Board
PPEs	-	Personnel Protective Equipment
PSPCL	-	Punjab State Power Corporation Ltd.
PUC	-	Pollution Under Control
RA	-	Risk Assessment
RCC	-	Reinforced Cement Concrete
RO	-	Reverse Osmosis
RS	-	Rectified spirit
SCM	-	Standard Cubic Meter
SH	-	State Highway
SHW	-	Solid Hazardous Waste
SMF	-	Stack Monitoring Facility
SOP	-	Standard Operating Procedure
SPM		Suspended Particulate Matter
STP	-	Sewage Treatment Plant
TA	-	Technical Alcohol
TCD	-	Tons of Cane per Day.
TDS	-	Total Dissolved Solids
TOR	-	Terms of Reference
TPA	-	Ton per Annum
TPD	-	Ton per Day
TPH	-	Ton per Hour
TPM	-	Ton per Month
TSDF	-	Treatment, Storage, and Disposal Facility
V.P.O	-	Village Post Office
kW	-	Kilowatt
kVA	-	kilovolt-ampere
ata	-	atmosphere absolute
GCSML	-	The Gurdaspur Co-operative sugar mills Ltd.
RCC	-	Reinforced Cement Concrete

EXECUTIVE SUMMARY

1. Project Name and Location:

Name: Proposed project for 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant by The Gurdaspur Cooperative Sugar Mills Ltd.
Location: V.P.O Paniar Village, Dist. Gurdaspur, Punjab- 143531.

2. Products & Capacities. If expansion proposal then existing products with capacities and reference to early EC:

S.No.	Products & Co-products	Unit	Quantity
1.	**Sugar Unit (5000 TCD)**		
	Sugar	TPD	525
	Molasses	TPD	250
	Filter Cake	TPD	200
	Bagasse	TPD	1,425
2.	**Power Plant**		
	Co-generation	MW	28
	Spent wash Incineration Boiler based	MW	5.65
3.	**Molasses & Grain Distillery/ Ethanol Unit**		
	Absolute Alcohol	KLPD	120
	Carbon-di-oxide	TPD	93.60
	DDGS (Distillers Dried Grain Soluble)	TPD	52.65
	Fusel oil	LPD	131
	Technical Alcohol	LPD	3,930

3. Requirement of land, water, utilities, power, fuel with source of supply (quantitative):
Land for the proposed development of 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant is already in possession of The Gurdaspur Cooperative Sugar Mills Ltd. Hence, no new land will be acquired by the unit. Details of water, power, utilities, fuel with source of supply are given in below table:

S. No.	Components	Details	Source
1.	Fresh Water, KLD	**Domestic:** 50 KLD **Industrial:** 4603 KLD	Own Water Reservoir
2.	Power, kVA	**Sugar Unit:** 6.02 MW	Own 28 MW Co-generation Power Plant
		Co-generation Power Plant: 2.42 MW	Punjab State Power Corporation Limited
		Distillery/Ethanol Unit- during C Molasses operation: 3.46 MW	Own 5.65 MW Co-generation Power Plant
		Distillery/Ethanol Unit- During operation with grain as feedstock: 4.06 MW	Own 5.65 MW Co-generation Power Plant
Utilities			
1.	Steam Boiler- for sugar & Co-gen plant, TPH	145	In house
2.	Steam Boiler-for Distillery plant, TPH	45	In house
3.	Turbo generator, MW	1 no. 28 & 1 no. 5.65	In house
4.	Cooling Tower,	01 No. - 80 m^3/hr. (Vertical	In house

	m^3/hr.	Crystallisers), 8730 m^3/hr (condenser, TG and boiler), 140 m^3/hr. (Surplus Condensate Cooling towers), 2 No. 6000 m^3/hr. (for Injection water), Cooling Tower – 01 No. - 1600 m^3/hr (Distillation, MSDH), 840 m^3/hr (Fermentation section)	
Fuel			
1.	HSD for D. G. Set (2 nos. 1000 kVA & 1 no. 625 kVA), lit/hr.	565	Local dealer
2.	Bagasse for steam boiler, TPH	55.33 (Sugar plant- 145 TPH boiler) + 17.64 (Distillery Plant- 45 TPH boiler)	In house
3.	Concentrated spent wash, TPH (In case of C Molasses based Distillery operation)	16.71	In house

4 & 5. Process Description in brief, specifically indicating the gaseous emission, liquid effluent and solid/hazardous waste and Measures for mitigating the impact on the environment and mode of discharge or disposal:

The 5,000 TCD sugar plant and machineries consisting of Juice extraction system, Juice processing system for raw sugar and raw sugar purification by Phosphofloatation system to produce Sulphurless white sugar.

In-house generation of about 38,863 MT of molasses per annum and abundant availability of Broken rice in the vicinity of the plant will enable the company to implement Ethanol plant of 120 Kilo Litres Per Day (KLPD) capacity operating for a period of 300 days per annum. The proposed distillery will be multi product plant capable of producing Industrial grade rectified spirit and the Anhydrous Ethanol used for blending with gasoline.

28 MW bagasse based Cogeneration Plant and 5.65 MW Spent wash Incineration Boiler based will be installed.

Gaseous Emission

Flue gas emission

- The unit proposes to install one no. of 145 TPH capacity of steam boiler for Sugar Plant & Co-generation Plant. Bagasse will be used as fuel. 65 meters chimney & Electrostatic Precipitator will be installed with the boiler.
- The unit proposes to install one no. of 45 TPH capacity of Slop Fired boiler for Distillery/Ethanol Plant. Concentrated spent wash and Bagasse will be used as fuel. 83 meters chimney & Electrostatic Precipitator will installed with the boiler.
- The unit also proposes to install three numbers of D.G. sets (2 nos. of 1000-kVA capacity each+ 1 no. of 625-kVA capacity) as stand by. Height of chimney will be 6.5 meters above enclosure.

Liquid effluent

- Total industrial Waste Water Generation will be 2391 KLD, out of which 1320 KLD process water, 218 KLD RO Reject and 44 KLD Floor/equipment washing will be treated in ETP/MEE. 565 KLD from boiler/cooling tower blowdown will be treated in RO. MEE Condensate, 347 KLD RO Permeate, and 59 KLD Boiler Condensate will be recycled. Treated effluent from ETP/MEE will be used for irrigation in farm lands of the unit. Thus, there will be a zero liquid discharge.

- Sewage quantity of 45 KLD will be generated and it shall be treated in STP of 50 KLD capacity. Treated water will be used in gardening within plant premises.

Solid and hazardous waste

Hazardous waste generation

- Used/Spent Oil - 9 kL/ A; **Disposal**:- Used as lubricant in plant machineries

Non-hazardous waste generation

- Bagasse Ash- 20 TPD; **Disposal**:- Will be sold to brick manufacturer/ Mixed with pressmud and used as manure
- Incineration & Boiler Ash - 42 TPD; **Disposal:-** Will be sold to brick manufacturer/ Mixed with pressmud and used as manure
- ETP sludge - 1.5 TPD; **Disposal:-** Will be used for greenbelt development within premises
- Yeast sludge - 6.0 TPD; **Disposal:-** Will be used for greenbelt development within premises

6. Capital cost of the project, estimated time of completion:

- The total project cost for proposed project will be Rs. 665.24 Crores.
- It is estimated that Implementation of project will be completed within 12 months, considering EC obtained day as a 1st day of implementation.

7. Site selected for the project - natural of land – agricultural (single / double crop), barren, Govt. / private land, status of is acquisition, nearby (in 2-3 km) water body, population, with in 10 km other industries, forest. Eco-sensitive zones, accessibility:

- The proposed activity will be accommodated in the industrial area having proper industrial infrastructure. The land for the proposed project is already in the possession of The Gurdaspur Cooperative Sugar Mills Ltd.
- Inter - state boundary - Punjab and Himachal Pradesh - 12 km in E direction.
- Water body within 10 km radius of project site – Bari Doab canal @ 3.5 km in E direction.
- Nearby major industries – M/s. New Adarsh Industries, M/s. Sukrala Industries Pvt. Ltd., M/s. Hero Rubber Industry, M/s. Deban Agro. Industries

8. Baseline environmental data - air quality, surface and ground water quality, soil characteristic, flora and fauna, socio - economic condition of the nearby population:

Ambient Air Quality Monitoring

Sr. No.	Criteria Pollutants	Unit	Maximum Value	Minimum Value	Prescribed Standard
1.	PM_{10}	$\mu g/m^3$	75.1	63.3	100
2.	$PM_{2.5}$	$\mu g/m^3$	45.1	37.7	60
3.	SO_2	$\mu g/m^3$	7.7	4.9	80
4.	NO_2	$\mu g/m^3$	13.6	10.0	80
5.	CO	mg/m^3	<1.0	<1.0	2.0

All the results of ambient air quality parameters have been found within the limit as per NAAQS standards. Based on comparison study of results for tested parameters with NAAQS, it is interpreted that current ambient air quality of studied locations is well within the NAAQS limits and it can be considered satisfactory based on AQI index calculated. This interpretation is considered based on the results found for particular locations during the specific study period. The project will be developed on the private land and the nearest habitat to the project lies about 1 km project from the project. Due to the usage of the solid fuel in the boiler, there might be the chances of the incremental change in the current ambient air quality.

Noise Monitoring

Sr. No.	Parameter	Unit	Maximum Value	Minimum Value
1.	Ld (Day)	dB(A)	61.4	48.6
2.	Ln(Night)	dB(A)	56.4	43.2

Out of total 8 nos. of locations for noise monitoring 3 nos. of locations are monitored in the existing industry and 5 nos. of locations are monitored in surrounding villages within 3-4 km radius from the project site. Noise level in all the locations are within the standard norms prescribed by MoEF&CC. Noise level measured at villages is mainly due to vehicular movements of local people located within and nearby the villages. The nearby village surrounding to the project site is about 1 km away from the project site and results of the same are found within the prescribed norms during the baseline survey. Due to the project activities, there might be chances of incremental value in the noise levels due to increase in vehicular movement & plant activities. The interpretation can be considered based on the baseline survey conducted during the study period.

Soil Quality and Characteristics

Sr. No.	Parameter	Unit	Maximum Value	Minimum Value
1.	pH	-	8.37	6.92
2.	Electrical Conductivity	dS/m	0.20	0.12
3.	Exchangeable Sodium	meq/100gm	8.20	3.65
4.	Exchangeable Potassium	meq/100gm	38.87	17.13
5.	Total Nitrogen percentage	%	89.60	68.97

Based on soil analysis data it is concluded that soil at the project site is neutral in reaction. The soils are high in nitrogen status, medium in phosphorus and medium in available potassium status. Soil of Barren Land and Grass Land is also having medium concentration of Nitrogen and high availability of Potassium, these soils can also be brought in agricultural purpose after the addition of Phosphorous. The levels of total Fe, Cu, Cr, B and Zn are within the limits as per Dutch Pollutant Standard for Soil. Soil at the project site should be periodically monitored for EC, pH and ESP besides OC, available P and K. In the proposed project, there will be utilization of the treated wastewater generated from the process in the agricultural farming of Sugar Cane within the plant premises only. Due to usage of treated wastewater as irrigation water and excessive usage of manure will result to increase the organic carbon content, nitrogen & phosphorous and there is also chance of acidification in soil.

Ground water

Parameters	Unit	Minimum	Maximum
pH	--	6.35	7.56
TSS	mg/l	14	25
TDS	mg/l	275	502
Total Hardness	mg/l	198	378
Total Alkalinity	mg/l	182	361
Chlorides	mg/l	6	48
Sulphate	mg/l	17.9	99
Iron	mg/l	0.75	1.91

Based on comparison study of test results and summary report with drinking water norms as per IS: 10500 :2012, it is interpreted that all the results for ground water samples are beyond the desirable limit range but they are within the permissible limit except iron in Bhola, Ghulla, Nano Nagal & Paniar. Ground water samples collected from the villages Bhola, Ghulla, Nano Nagal & Paniar should not be used for drinking purpose and other ground water sources can be utilized in drinking purpose. It is suggested that, it is better that these water sources should be used for drinking purpose after proper treatment i.e. filtration, R.O. treatment. This water can be used for all domestic purposes as well as irrigation purposes.

Surface Water

Parameters	Unit	Minimum	Maximum
pH	--	6.84	7.21
TDS	mg/l	110	248
TSS	mg/l	8	12
Total Hardness	mg/l	88	160
Dissolved Oxygen	mg/l	5.4	5.8
COD	mg/l	10	21
BOD	mg/l	3	6
Total Nitrogen	mg/l	0.5	0.6
Iron	mg/l	0.09	0.81

Based on test result data comparison study with CPCB standard, it is interpreted that surface water quality of Upper Bari Doab Canal meet with the criteria B to E and Dala Lake meet with the criteria D & E. According to the classification, water sourced from Upper Bari Doab Canal can be used for outdoor bathing, drinking water source with conventional treatment followed by disinfection, Propagation of wild life, fisheries & Irrigation, industrial, cooling, controlled waste disposal, while the water sourced from Dala Lake can be used for Propagation of wild life, fisheries & Irrigation, industrial, cooling, controlled waste disposal. Bathing, washing and other activities were observed in most of lakes/ponds located in study area. Results of COD and BOD also indicate towards the organic contamination in surface water body due to Bathing, washing and other activities. DO level for all the locations are >4.0 mg/L. DO level >4.0 mg/L is considered suitable for the survival of aquatic life and <4.0 mg/L is not considered suitable for aquatic life survival. The wastewater from the proposed project is planned to utilize for irrigation purpose in own sugar cane farms within the plant premises and hence, there will be least possibility for surface water contamination due to the proposed project.

Ecology and Biodiversity

The proposed project comes under the private land and the study area is majorly covered with agricultural land and range land. The soils of the district are alluvial and fertile. It is divided into three zones, i.e. sub mountainous, kandi and plain. The major crops cultivated are Rice, Maize, Sesamum, Sugarcane, Wheat & Rapeseed and Mustard. Fruit crops are Mangos, Litchi, Kinnow, Guava, Orange & Malta, Amla, Pear, Plum, Peach, Lemon, Ber, etc. and vegetables are Potato, Onion, Winter Vegetables and Summer Vegetables. Among the enumerated flora in the study area, none of them were assigned any threat category by Red data book of Indian Plants. None of the sighted floral species can be assigned endemic species category of the study area. Common faunal species has been noted during the primary survey. During the survey, it is observed that there is presence of a bird sanctuary within the study area and it is having vast range of bird species, which are listed in the IUCN Red data book. As per IUCN Red List there are 23 nos. of Avifauna likely to be found at the Bird Sanctury located within the study area, out of which 3 nos. of avifaunal species listed as vulnerable species as per IUCN Red list and remaining are listed as least concern species. Among the reptiles, Indian Cobra (Naja naja), and Common rat snake (Ptyas Mucosus) were provided protection as per Schedule-II of Wild life protection act, (1972). Among mammals; Common Mongoose (Herpestes edwardsi), is a schedule –II animals. Conservation plan for such protected species should be submitted to concerned forest depart of the region

Socio economic
All the respondents across all socio-economic groups, age, gender and locations have expressed their views about the location. According to them, all villages are having basic infrastructural facilities but some villages need to be improved in some areas like, sanitation, road, etc. For sanitation, village panchayats can use Swachh Bharat Mission scheme. It will improve quality of life by increasing their employment opportunities and also by bringing about a positive change, like; employment, developmental activities, indirect employment, etc., while some are not having any idea about the upcoming project and its impacts. Most of the villages are having educational institutes up to secondary and higher secondary schools. Students needs to commute to the main hub in nearby vicinity for further studies. The study area consisting majority of the area as an agricultural land and primary profession of the people in the study area is agricultural farming. Almost all the villages have more than 50 % people as non-workers. People's willingness and ability to be employed in the production activities need to be given importance. The respondents have suggested measures which need to be taken up for welfare of the people. The Company needs to undertake various activities in education, infrastructure development, and health and environment area as a part of Corporate Social Responsibility (CSR) and Corporate Environment Responsibility (CER).

9. Identification of hazardous in handling processing and storage of hazardous material and safety system provided to mitigate the risk:

After identifying hazards in handling processing and storage of hazardous material both Qualitative and Quantitative risk has been analyzed. Mitigation measures like periodical training on fire drill and using PPEs, conducting emergency response drill on yearly basis, training drivers for transportation of hazardous goods, providing fire extinguishers etc.

10. Likely impact of the project on Air, Water, Land, Flora-fauna nearby population:

After considering all possible pollution potential from proposed operation and pollution prevention measures/technologies to be installed by the proponent, environmental management activities recommended by proponent; it has been concluded that the proposed project would not have any considerable impacts on environment as well as socio-economic and ecological conditions of the project area.

11. Emergency preparedness plan in case of natural or in plant emergencies:

On-site and off- site emergency plan will been prepared by safety committee along with their roles and responsibilities, mutual aids arrangements, roles and responsibilities of stake holders including stake holders etc.

12. Issues raised during public hearing (if applicable) and response given:

Considering the products and location of the project, it is noticed that the proposed project falls under the item no. 5(g), 5g(a), 1(d) & 5(j) as Category-'A' according to EIA Notification, SO 1533 amended on 14th September 2006. Public hearing is applicable for the proposed project.

13. Occupational Health Measures:

- Personal protective gears and equipments such as safety shoes, safety goggles, hand gloves, gum boots, safety helmet, and breathing apparatus set kit will be provided to the employees
- Medical surveillance for the workers will be carried (once in six month) out.
- Fire squad team will be formed for handling any emergency situation & regular training of squad team will be conducted.
- Safety awareness programs will be conducted periodically.

14. Post Project Monitoring Plan:

- Post project environmental monitoring will be done as per MoEFCC / CPCB / PPCB guidelines by following recommended / standard method approved by MoEFCC / CPCB.
- 16 Lakhs / annum budget has been allotted environment monitoring.

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CHAPTER 1

INTRODUCTION

1.0 PRELUDE

India is the second largest sugar producer in the world with Brazil being the largest producer. However, in terms of consumption of sugar, India stands out to be the number one in the world. The Indian sugar industry is the country's second largest agro-processing industry, with a production capacity of over 33 million Metric Tonnes of white crystal sugar annually. India's sugarcane cultivation area accounts for only about 2.2-2.7% of India's cropped area, with significant annual volatility and thus the country's potential for increasing sugar cane production is almost unlimited.

Moreover, the growth of sugar demand by food industries and other non-household users, estimated to account for about 65% to 70% of total consumption, could provide additional impetus for the long-term growth in demand, specifically for refined sugar.

Electricity is the most essential input for the growth & development of any sector. Rapid growth of India is the consequent result of such availability of power in the past and present rising to and of power demand is the consequent result of the desire to keeping pace with the past progress.

Bagasse is a by-product from sugar industry, which can be effectively used as fuel in Cogeneration Power Plant to produce power. With the advantages like no transportation of fuel, reduction in transmission losses, eco-friendly power generation, etc. sugar plants could perform as supplementary power generating companies and make any country move towards self-reliance in power sector.

India is set to become the third- largest market for ethanol in the world and, the country has tripled ethanol demand between 2017 to 2021.

Molasses is one of the by-product of sugar industry, which is used to produce rectified sprit/ alcohol for making liquor & fuel. Molasses has been efficiently used to produce bio-ethanol for blending with petroleum as a fuel. To achieve the target of 20% ethanol blending in petrol, India needs to expand its ethanol production to 10.2 billion liters.

Looking at the above scenarios, the Gurdaspur co-operative sugar mills Ltd. propose to develop a Sugar Plant along with Co-generation Power Plant and Distillery/Ethanol Plant.

EIA studies are very important for any developmental activity to be taken into consideration to avoid adverse impacts and to ensure long-term benefits has led to the concept of sustainability.

The Government of India, as per its policies has given emphasis on sustainable development as a part of any developmental activity. Along with industrial growth, environmental protection is an integrated criterion for this concept. In line with these policies, Ministry of Environment, Forests and Climate Change (MoEFCC), New Delhi has defined 'Environmental Clearance' (EC) framework under the Environmental Protection Act, 1986. As per the EIA Notification - 2006, prior EC is required for establishing/expanding the industry/development projects.

The Gurdaspur Co-operative sugar mills Ltd. is a unit of Punjab state federation of Co-operative sugar mills. The existing capacity of sugar plant is 2,000 TCD to produce plantation white sugar by

double sulphitation process. Due to olden technology and age, efficiency of plant and machineries are far behind the current technology leading to potential losses.

In view of the above complications, the unit wishes to dismantle the existing 2000 TCD unit and propose to develop new 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant at V.P.O Paniar, Dist. Gurdaspur, Punjab.

1.1 PURPOSE OF THE REPORT

The purpose of this report is to identify environmental aspects of the proposal, expected impact on environment and their mitigation by adopting suitable measures for proposed new project. As per the latest EIA Notification of Ministry of Environment and Forests, Govt. of India (MoEFCC) dated 14th September 2006 and its amendments, the proposed project is covered under the 5(g), 5g(a), 1(d) & 5(j) as Category-'A' which prior Environmental Clearance (EC) from Expert Appraisal Committee (EAC) is necessary. Public hearing is applicable, which will be conducted as per guidelines.

Based on the ToR conditions stipulated by EAC vide letter No.IA-J-11011/502/2021-IA-II(I) dated 8th December 2021, EIA report has been prepared. A copy of ToR Letter is enclosed as **Annexure I.**

1.2 IDENTIFICATION OF PROJECT AND PROJECT PROPONENT

The Gurdaspur Co-operative Sugar Mill is one of the elite family members of Sugarfed Punjab, under the department of co-operation. The unit started in 1978, is primarily engaged in the manufacture of crystalline White Sugar, and allied products.

The Gurdaspur Co-Operative Sugar Mill, Gurdaspur was initially registered by the name of Punjab Khand Udyog Limited, Gurdaspur vide Punjab Govt's. letter No. 21, Dated 04-04-1977 and had started its first sugar cane crushing season in the year 1980-81.

This Sugar Mill was registered by Co-Operative Society vide registration No. 171, Dated 30-10-1987 with Co-operative Department. The Govt. of Punjab merged this sugar mill in the Co-operative Sector in the year 1991-92 and its name was changed "The Gurdaspur Coop Sugar Mills Ltd., Gurdaspur". Initially till 30-6-1981, total expenditure of 5.25 cr. was incurred to install this Mill. The Mill started its first crushing season in the year 1980-81 and thereafter running continuously.

This Sugar Mill's installed capacity was 1250 TCD (Tons of cane per day). Keeping in view the availability of sugar cane in Mills area in abundance, it's installed capacity was increased from 1250 TCD to 2000 TCD in year 1987.

The Gurdaspur Co-Op Sugar Mills. Ltd., is operating 2000 TCD sugar mill with valid CTO under Air Act, 1981 Vide letter no. CTO/Renewal/GRP/2018/7086711 valid upto 31/03/2023 and under Water Act, 1974 Vide letter no. CTOW/Renewal/GRP/2018/7087223 valid upto 31/03/2023. However, the existing unit will be completely dismantled before operation of new Greenfield plant of 5000 TCD Sugar Plant along with 33.65 MW Co-gen Plant and 120 KLPD Distillery/Ethanol Plant.

Now, The unit wishes to dismantle the existing 2000 TCD unit and propose to develop new 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant at V.P.O Paniar, Dist. Gurdaspur, Punjab.

Background of promoters

Sr. No.	Name	Designation
1.	Sh. Mahinderpal Singh	Chairman
2.	Sh. Ravinder Singh	Vice-Chairman
3.	Sh. Ajit Singh	Director
4.	Sh. Rajinder Singh	Director
5.	Sh. Daljit Singh	Director
6.	Sh. Rajinder Pal Singh	Director

Table 1.1: Name and Contact Details for the Proposed Project

S. No.	Item	Details
1.	Name	S.K Malhotra
2.	Designation (Owner/Partner/CEO)	Dy. Chief Accounts Officer
3.	E-mail	gsugarmills@yahoo.com
4.	Telephone No.	+91 - 6280859484
5.	Registered and Correspondence Address	**The Gurdaspur Cooperative Sugar Mills Ltd**. V.P.O Paniar Village, Dist. Gurdaspur, Punjab-143531.

1.3 BRIEF DESCRIPTION OF PROJECT

1.3.1 Nature, Size and Location of the project

Proposed new project is for 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant at V.P.O Paniar Village, Dist. Gurdaspur, Punjab- 143531.

As per the amended EIA Notification-2006: proposed project is covered under the 5(g), 5g(a), 1(d) & 5(j) as Category-'A'. Hence, Environmental clearance is required. For the proposed project, the company intends to procure the best available technology.

Proposed project coordinate is as under:

- Latitude: 32°5'34.63"N
- Longitude: 75°27'36.14"E

Location map of the project site is depicted as **Figure 1.1**.

Figure 1.1 Location map of the Project

1.3.2 Importance to the Country and Region

Indian Sugar Industry:

Sugar industries development is the backbone to economic development of the nation. In India, Sugar industry is the second largest agro-based industry and it contributes significantly to the socio economic development of the nation. Indian sugar industry is also a major sector to create employment, probably 7.5 per cent in Indian economy. The sugar industry plays a leading role in the global market being the world's second largest producer after Brazil, producing nearly 15 and 25 percent of global sugar and sugarcane respectively. The sugar industry produces around 300-350

million tonnes (Mt) cane, 20-22 Mt white sugar and 6-8 Mt jaggery and khandsari to fulfill the domestic consumption of sweeteners.

The Indian sugar industry is self-sufficient in its vigor needs and also makes surplus exportable power through cogeneration. The various byproducts of the sugar industry also contribute to the economic growth of the nation to promote a number of supplementary industries. Sugarcane has emerged as a multi-product crop used as a basic raw material for the production of sugar, ethanol, paper, electricity and besides a cogeneration of ancillary products. The feeding of cattle of sugarcane is an important source of bio-energy and more demand in rural areas. Molasses is an important nourishing stock for distilleries. The ethanol requirement of the country is going up increasingly. In the sugar industry, production of electricity using bagasse was the typical option and use of bagasse as an alternative raw material for wood pulp for economic and environmental sustainability.

Co-generation power projects have now proven to be highly successful in sugar industry. Integration of sugar mill operations with value added by-products such as Ethanol/RS/ENA would further improve the economy of the industry.

Indian Ethanol Industry

India is the fourth largest producer of ethanol in the world and the second largest in Asia. Most of the Indian distilleries use sugarcane molasses as raw material. The demand for potable alcohol has been ever increasing with more liberal attitude of ethanol blending with petrol/motor fuel. The requirement of ethanol/ industrial alcohol has increased manifold. If 5 % blending is made mandatory all over the country, the sugar factory molasses availability in the country may not be adequate for meeting the total requirement of ethanol including its use for potable liquors and other industrial uses. However, the notification no. G.S.R.705(E) dated 27th October, 2004, Ministry of Petroleum and Natural Gas, Government of India, mandates that 5% ethanol-blended petrol (E5), conforming to Bureau of Indian Standards specifications which may grow to 20%. The sugarcane farmers in the region and state will be directly benefitted by assuring stability of sugar industries, reasonable return for the molasses and then passing a significant part of the same to farmers. Fuel ethanol is able to save valuable foreign exchange on import of fossil fuel.

1.4 REGULATORY FRAMEWORK AND NEED OF EIA STUDY

S. No.	Activity	Legal
1.	Transportation of raw material and products	▪ The Air (Prevention and Control of Pollution) Act, 1981 and Rules, 1982, as amended to date ▪ The Motor Vehicles Act, 1988 & The Central Motor Vehicle rules, 1989 ▪ The Environment (Protection) Act, 1986 and Rules, 1986, as amended to date ▪ Noise Pollution (Regulation and Control) Rules, 2006 (as amended).
2.	Storage of product and raw material	▪ The Air (Prevention and Control of Pollution) Act, 1981 and Rules, 1982, as amended to date. ▪ Manufacture, Storage and Import of Hazardous Chemicals Rules, 2000 (as amended). ▪ Chemical accidents (Emergency Planning, preparedness and response) Rules, 1996
3.	Manufacturing/operational • Boiler • Process unit • Cooling tower • D.G. Set	▪ The Factories Act, 1948, ▪ National Policy on Biofuel 2018 ▪ The Water (Prevention and Control of Pollution) Act, 1974 and Rules, 1975, as amended to date, ▪ The Air (Prevention and Control of Pollution) Act, 1981 and Rules, 1982, as amended to date,

		▪ The Environment Protection Act, 1986 and Rules, ▪ Manufacture, Storage and Import of Hazardous Chemicals Rules, 2000 (as amended), ▪ Indian Boiler Act, 1923 & Rules, ▪ The Bureau of Indian Standards Act, ▪ The Custom Act, 1962, ▪ Environment Impact Assessment Notification, dated 14th September 2006, as amended to date,
4.	Treatment Technology • ETP • RO • MEE • STP • Scrubber	▪ The Air (Prevention and Control of Pollution) Act, 1981 and Rules, 1982, as amended to date. ▪ Manufacture, Storage and Import of Hazardous Chemicals Rules, 2000 (as amended). ▪ Hazardous and Other wastes (Management and Trans boundary Movement) Rules, 2016. ▪ The Water (Prevention and Control of Pollution) Act, 1974 and Rules, 1975, as amended to date.
5.	Greenbelt Development	▪ CPCB guidelines for greenbelt development
6.	Corporate Environment Responsibility	▪ Office memorandum dated 1st May, 2018 for Corporate Environment Responsibility.
7.	Recruitment	▪ Public Liability Insurance Act, 1991 and Rules, 1991 as amended to date, ▪ Minimum Wages Act, 1948 ▪ Contract Labour Act, 1970

1.5 SCOPE OF THE EIA STUDY

Detailed EIA / EMP report has been prepared in line with the ToR issued by MoEFCC, New Delhi vide letter No.IA-J-11011/502/2021-IA-II(I) dated 8th December 2021 and as per generic structure given in EIA Notification - 2006 (Appendix III & IIIA). The baseline studies required for EIA report has been conducted as per the Office Memorandum issued by MoEFCC dated 27.08.2017. The report includes collection of baseline data with respect to major environmental components, viz. air, noise, water, land, biological and socio - economic components for one season.

1.6 STRUCTURE OF EIA REPORT

The generic structure of the EIA report as per the guideline provided by MoEFCC is illustrated in the following tabulated format.

Table 1.2: Structure of EIA report

S. No.	EIA Structure	Contents
1.	Introduction	▪ Purpose of the Report ▪ Identification of project and project proponent ▪ Brief description of nature, size, location of the project and its importance to the country, region. ▪ Scope of the study – details of regulatory scoping carried out (As per terms of reference).
2.	Project Description	▪ Type of project ▪ Need of the project ▪ Location details showing general location, specific location, project boundary and project site layout. ▪ Size or magnitude of operation ▪ Project description including drawings showing project layout, components of project etc. ▪ Proposed schedule for implementation, ▪ Technology and process description, ▪ Schematic representations of the feasibility drawings which give information important for EIA purpose. ▪ Description of mitigation measures incorporated into the project to meet

S. No.	EIA Structure	Contents
		environmental standards, environmental operating conditions, or other EIA requirements.
3.	Description of the Environment	▪ Study area, period, components and methodology, ▪ Establishment of baseline for valued environmental components, as identified in the scope, ▪ Study Period: December 2021 to February 2022, ▪ Base maps of all environmental components,
4.	Anticipated Environmental Impacts and Mitigation Measures	▪ Details of Investigated Environmental impacts due to project location, possible accidents, project design, project construction, regular operations. ▪ Measures for minimizing and / or offsetting adverse impacts identified. ▪ Assessment of significance of impacts (Criteria for determining significance, assigning significance), ▪ Impact scores and mitigation measures, ▪ Air quality modelling, ▪ Air quality index,
5.	Analysis of Alternatives (Technology and Site)	In case, the scoping exercise results in need for alternatives: ▪ Analysis of alternatives and other technology, ▪ Selection of alternative,
6.	Environmental Monitoring Program	▪ Technical aspects of environmental monitoring for the effectiveness of mitigation measures (including measurement methodologies, frequency, location, data analysis, reporting schedules, emergency procedures, detailed budget and procurement schedules).
7.	Additional Studies	▪ Risk Assessment ▪ Disaster management plan
8.	Project Benefits	▪ Physical benefits ▪ Ecological benefits ▪ Social benefits ▪ Other tangible benefits
9.	Environmental Cost Benefit Analysis	▪ Not applicable as it is not recommended on scoping stage and project is located in Notified Industrial Area.
10.	Environment Management Plan	▪ Description of the administrative aspects of ensuring that mitigation measures are implemented and their effectiveness monitored, after approval of the clearance. The chapter consists of: - Mitigation measures for impacts, - Pollution prevention plan, - Greenbelt development plan, - Waste management plan, - Environment management cell, - Budgetary provisions for EMS.
11.	Summary and Conclusion	▪ Overall justification for implementation of the project,
12.	Disclosure of Consultant Engaged	▪ The names of the consultants engaged with their brief resume and nature of consultancy rendered.

1.7 Terms of Reference Compliance

TOR COMPLIANCE

ToR Letter No. : No.IA-J-11011/502/2021-IA-II(I) dated 08th December 2021 under Schedule 5(g), 5g(a), 1(d) & 5(j), Category–"A" as per EIA Notification 2006 and its Amendment thereof **The Gurdaspur Cooperative Sugar Mills Ltd.** are planning to set-up a new project for 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant at V.P.O Paniar Village, Dist. Gurdaspur, Punjab- 143531

A		Standard ToR	Reply	Citation
1.	**Executive Summary**		Executive Summary of the EIA is incorporated.	Page V to IX
2.	**Introduction**			
	i.	Details of the EIA Consultant including NABET accreditation.	Eco Chem Sales & Services is a NABET accredited consultant, having NABET certificate no. NABET/EIA/2023/SA 0156 valid up to 15th March, 2023.	Annexure VIII, Page 283
	ii.	Information about the project proponent.	The Gurdaspur Co-operative Sugar Mill is one of the elite family members of Sugarfed Punjab, under the department of co-operation. The unit started in 1978, is primarily engaged in the manufacture of crystalline White Sugar, and allied products. This Sugar Mill's installed capacity was 1250 TCD (Tons of cane per day). Keeping in view the availability of sugar cane in Mills area in abundance, it's installed capacity was increased from 1250 TCD to 2000 TCD in year 1987.	Section 1.2, Page 4, Chapter 1.
	iii.	Importance and benefits of the project.	Sugar industries development is the backbone to economic development of the nation. Indian sugar industry is also a major sector to create employment, probably 7.5 per cent in Indian economy. Sugarcane has emerged as a multi-product crop used as a basic raw material for the production of sugar, ethanol, paper, electricity and besides a cogeneration of ancillary products. India is the fourth largest producer of ethanol in the world and the second largest in Asia. Most of the Indian distilleries use sugarcane molasses as raw material. The demand for potable alcohol has been ever increasing with more liberal attitude of ethanol blending with petrol/motor fuel	Section 1.3.2, page 6, Chapter 1 and page 239, Chapter 8,
3.		**Project Description**		
	i.	Cost of project and time of completion.	Project cost - Rs. 665.24 Crores. Time - 12 Months	Table 2.5, Page 37, Chapter 2.

<table>
<tr><td></td><td>ii.</td><td>Products with capacities for the proposed project.</td><td>
<table>
<tr><th>S.No.</th><th>Products & Co-products</th><th>Unit</th><th>Quantity</th></tr>
<tr><td>1.</td><td colspan="3">Sugar Unit (5000 TCD)</td></tr>
<tr><td></td><td>Sugar</td><td>TPD</td><td>525</td></tr>
<tr><td></td><td>Molasses</td><td>TPD</td><td>250</td></tr>
<tr><td></td><td>Filter Cake</td><td>TPD</td><td>200</td></tr>
<tr><td></td><td>Bagasse</td><td>TPD</td><td>1,425</td></tr>
<tr><td>2.</td><td colspan="3">Power Plant</td></tr>
<tr><td></td><td>Co-generation</td><td>MW</td><td>28</td></tr>
<tr><td></td><td>Spent wash Incineration Boiler based</td><td>MW</td><td>5.65</td></tr>
<tr><td>3.</td><td colspan="3">Molasses & Grain Distillery/ Ethanol Unit</td></tr>
<tr><td></td><td>Absolute Alcohol</td><td>KLPD</td><td>120</td></tr>
<tr><td></td><td>Carbon-di-oxide</td><td>TPD</td><td>93.6</td></tr>
<tr><td></td><td>DDGS (Distillers Dried Grain Soluble)</td><td>TPD</td><td>52.65</td></tr>
<tr><td></td><td>Fusel oil</td><td>LPD</td><td>131</td></tr>
<tr><td></td><td>Technical Alcohol</td><td>LPD</td><td>3,930</td></tr>
</table>
</td><td>Table 2.2, Page 35 Chapter 2</td></tr>
<tr><td></td><td>iii.</td><td>If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.</td><td>Not applicable as proposed project is a greenfield project.</td><td>--</td></tr>
<tr><td></td><td>iv.</td><td>List of raw materials required and their source along with mode of transportation.</td><td>Raw material will be sourced through local market/ in-house generation. The transportation of raw material will be done by road through trucks. List of raw materials along with quantity are incorporated in EIA report.</td><td>Section 2.3.1, Page 36, Chapter 2.</td></tr>
<tr><td></td><td>v.</td><td>Other chemicals and materials required with quantities and storage capacities.</td><td>Details of Other chemicals and materials required with quantities and storage capacities are incorporated in EIA report.</td><td>Section 7.2.2, Page 172, Chapter 7.</td></tr>
<tr><td></td><td>vi.</td><td>Details of Emission, effluents, hazardous waste generation and their management.</td><td>• Flue gas emissions like PM, SO_2 and NO_X will be emitted from Steam Boilers and D.G. Sets.
• 45 KLD generated Sewage and it will be treated in STP of 50 KLD capacity.
• 2391 KLD industrial effluent will be generated, treatment scheme is incorporated in EIA/EMP report.
• Hazardous waste like Used Oil (9 kL/A) will be used as lubricant in plant</td><td>Air emission
• Section 2.5.1, Page 53, Chapter 2.
Wastewater
• Section 2.5.2,</td></tr>
</table>

			machineries. • Non-hazardous like Bagasse Ash (20 TPD), Incineration & Boiler Ash (42 TPD) will be sold to brick manufacturer/ Mixed with pressmud and used as manure, ETP sludge (1.5 TPD) & Yeast sludge (6.0 TPD) will be used for greenbelt development within premises.	Page 55, Chapter 2. **Solid waste** • Section 2.5.3, Page 55, Chapter 2
	vii.	Requirement of water, power, with source of supply, status of approval, water balance diagram, Man - power requirement (regular and contract)	• Total Fresh Water requirement: 4653 KLD (Fresh: 2887 KLD + Recycled: 1766 KLD), Source: Water reservoir • Power requirement : 15.96 MW Source: Own Co-generation Power Plant/Punjab State Power Cooperation Limited. • Water balance diagram is given in Chapter no 2 of EIA report. • Manpower requirement: Construction Phase: 100 - 125 Nos. Operation Phase: 332 Nos. (121-Direct + 211- Indirect)	Section 2.3.4, 2.3.5 and 2.3.7, Page 40 - 43. Chapter 2.
	viii.	Process description along with major equipments and machineries, process flow sheet (Quantitative) from raw material to products to be provided.	Process description of proposed products along with process flow sheet, mass balance is incorporated in EIA report.	Section 2.4; Page 44, Chapter 2.
	ix.	Hazard identification and details of proposed safety systems.	Qualitative & quantitative risk assessment has been carried out for the proposed project. Fire, explosion, toxic release or combinations of them are the hazards associated with industrial plants using hazardous chemicals. Details of safety system are incorporated in EIA report.	Section 7.3 and 7.4, Page 179 and 191, Chapter 7

	x.	Expansion/modernization proposals: a) Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing / existing operation of the project from SPCB shall be attached with the EIA-EMP report.	Not applicable as proposed project is new project.	--
		b) In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification 2006 shall be provided. Copies of Consent to Establish / No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.	Not applicable as proposed project is new project.	--
4.		**Site Details**		
	i.	Location of the project site covering village,	Proposed unit is located at V.P.O Paniar, Dist. Gurdaspur, Punjab- 143531.	Section 2.1.1,

<table>
<tr><td></td><td></td><td>Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.</td><td>Justification for selecting the site are as follows:
• Proximity of raw material and electricity.
• No rehabilitation and resettlement.
• Proximity to road network.
• Availability of labour from surrounding.</td><td>Page 29, Chapter 2.
Section 2.1.2, Page 30, Chapter 2</td></tr>
<tr><td></td><td>ii.</td><td>A toposheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet (including all eco-sensitive areas and environmentally sensitive places).</td><td>Study area of radius 10 km and site location falls in I43V8 and I43V12 map of scale 1:50000 is prepared for study.</td><td>Figure 3.1 Page 62, Chapter 3</td></tr>
<tr><td></td><td>iii.</td><td>Details w.r.t. option analysis for selection of site.</td><td>Details of alternative site selection study have been incorporated in EIA report.</td><td>Page 161, Chapter 5</td></tr>
<tr><td></td><td>iv.</td><td>Co-ordinates (Lat-Long) of all four corners of the site.</td><td><table>
<tr><th>Corner</th><th>Latitude</th><th>Longitude</th></tr>
<tr><td>A</td><td>32° 5'33.70"N</td><td>75°27'25.09"E</td></tr>
<tr><td>B</td><td>32° 5'45.31"N</td><td>75°27'31.29"E</td></tr>
<tr><td>C</td><td>32° 5'45.25"N</td><td>75°27'54.71"E</td></tr>
<tr><td>D</td><td>32° 5'23.62"N</td><td>75°27'45.34"E</td></tr>
<tr><td>E</td><td>32° 5'23.92"N</td><td>75°27'43.81"E</td></tr>
<tr><td>F</td><td>32° 5'21.75"N</td><td>75°27'43.75"E</td></tr>
<tr><td>G</td><td>32° 5'21.40"N</td><td>75°27'36.10"E</td></tr>
<tr><td>H</td><td>32° 5'20.04"N</td><td>75°27'35.93"E</td></tr>
<tr><td>I</td><td>32° 5'20.16"N</td><td>75°27'18.70"E</td></tr>
<tr><td>J</td><td>32° 5'22.33"N</td><td>75°27'19.67"E</td></tr>
<tr><td>K</td><td>32° 5'21.96"N</td><td>75°27'29.12"E</td></tr>
<tr><td>L</td><td>32° 5'23.68"N</td><td>75°27'29.38"E</td></tr>
<tr><td>M</td><td>32° 5'23.90"N</td><td>75°27'31.04"E</td></tr>
<tr><td>N</td><td>32° 5'25.67"N</td><td>75°27'30.87"E</td></tr>
<tr><td>O</td><td>32° 5'25.32"N</td><td>75°27'33.59"E</td></tr>
<tr><td>P</td><td>32° 5'26.89"N</td><td>75°27'33.61"E</td></tr>
<tr><td>Q</td><td>32° 5'27.92"N</td><td>75°27'30.99"E</td></tr>
<tr><td>R</td><td>32° 5'33.59"N</td><td>75°27'31.10"E</td></tr>
</table></td><td>Section no 2.1.1, Page 29, Chapter 2</td></tr>
<tr><td></td><td>v.</td><td>Google map - earth downloaded of the project site.</td><td>Google map showing short view and long view of project site are incorporated in EIA report.</td><td>Figure 2.1 & 2.2, Page 31, Chapter</td></tr>
</table>

<table>
<tr><td></td><td></td><td></td><td></td><td>2.</td></tr>
<tr><td></td><td>vi.</td><td>Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area / estate / complex, layout of Industrial area indicating location of unit within the Industrial area / estate.</td><td>Layout map indicating proposed storage area, plant area, greenbelt area, utilities etc. is incorporated in EIA report.</td><td>Figure 2.4, Page 39, Chapter 2.</td></tr>
<tr><td></td><td>vii.</td><td>Photographs of the proposed and existing plant site. If existing, show photographs of plantation/greenbelt, in particular.</td><td>Photographs of proposed plant site are incorporated in EIA report.</td><td>Figure 2.3, Page 32, Chapter 2.</td></tr>
<tr><td></td><td>viii.</td><td>Land use break-up of total land of the project site (identified and acquired), government/ private-agricultural, forest, wasteland, water bodies, settlements, etc. shall be included. (not required for industrial area).</td><td>Area break-up of total land 3,92,545 m^2 of the project site is incorporated in EIA report.
<table>
<tr><th>S. No</th><th>Particulars</th><th>Area in m^2</th></tr>
<tr><td>1.</td><td>Production area</td><td>25,274</td></tr>
<tr><td>2.</td><td>Raw material and finish product storage area</td><td>15,173</td></tr>
<tr><td>3.</td><td>Office & Laboratory area</td><td>374.25</td></tr>
<tr><td>4.</td><td>Utility area</td><td>3674</td></tr>
<tr><td>5.</td><td>Hazardous/solid waste storage area</td><td>3,590</td></tr>
<tr><td>6.</td><td>ETP area</td><td>3620</td></tr>
<tr><td>7.</td><td>Storage Tanks</td><td>8345</td></tr>
<tr><td>8.</td><td>Greenbelt area</td><td>1,37,391</td></tr>
<tr><td>9.</td><td>Security cabin</td><td>361</td></tr>
<tr><td>10.</td><td>Parking</td><td>213</td></tr>
<tr><td>11.</td><td>Agriculture Area</td><td>70,585</td></tr>
<tr><td>12.</td><td>Open space & internal road area</td><td>1,23,945</td></tr>
<tr><td></td><td>Total</td><td>3,92,545</td></tr>
</table></td><td>Table 2.6, Page 38, Chapter 2.</td></tr>
<tr><td></td><td>ix.</td><td>A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area.</td><td>Major industries within study area (10km radius)
• M/s. New Adarsh Industries,
• M/s. Sukrala Industries Pvt. Ltd.
• M/s. Hero Rubber Industry</td><td>Table 2.1, Page 32, Chapter 2.</td></tr>
</table>

			• M/s. Deban Agro. Industries Land use details of the study area are incorporated in EIA report.	
	x.	Geological features and Geo-hydrological status of the study area shall be included.	Geological features and Geo-hydrological status of the study area is incorporated.in EIA report.	Section 3.7, Page 82, Chapter 3.
	xi.	Details of Drainage of the project upto 5km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (Mega green field projects).	Site does not fall within 1 km radius of any major river.	Figure 3.11, Page 81, Chapter 3.
	xii.	Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.	Proposed land area of 3,92,545 m^2 is already in possession with Gurdaspur Sugar Mills. Land document is incorporated in EIA report.	Annexure II Page 277
	xiii.	R&R details in respect of land in line with state Government policy	Not Applicable	--
5.		**Forest and wildlife related issues (if applicable)**		
	i.	Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)	No forest Land is involved.	--
	ii.	Land use map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha)	Not Applicable	--

	iii.	Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.	Not Applicable	--
	iv.	The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden-thereon.	Not Applicable	--
	v.	Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area.	Not Applicable	--
	vi.	Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife.	Not Applicable	--
6.		**Environmental Status**		
	i.	Determination of atmospheric inversion level at the project site and site-specific micrometeorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.	Project site and site-specific micrometeorological data has been incorporated in EIA report. Temperature- 2.5 to 36 ^{o}C Relative humidity - 21.0 to 100.0 % Wind speed – 0.0 to 18.0 km/h	Section 3.3, Page 64, Chapter 3.

	ii.	AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based on CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.	AAQ data (except monsoon) at 8 locations for PM_{10}, $PM_{2.5}$, SO_2, NO_X, and CO has been incorporated. The monitoring stations are based on CPCB guidelines and taken into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.	Section 3.4, Page 69, Chapter 3.
	iii.	Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with - min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.	AAQ measurement for 12 weeks of all stations as per frequency given along with min., max., average and 98% values for each of the AAQ parameters is given in EIA report.	Section 3.4.4, Page 72.
	iv.	Surface water quality of nearby River (100m upstream and downstream of discharge point) and other surface drains at 8 locations as per CPCB/MoEFCC guidelines.	Surface water quality of Upper Bari Doab Canal, Dala Lake has been incorporated in EIA report.	Section 3.10.5.1, Page 100, Chapter 3.
	v.	Whether the site falls near to polluted stretch of river identified by the CPCB/MoEFCC, if yes give details.	No	--
	vi.	Ground water monitoring at minimum at 8 locations shall be included.	Ground water monitoring at 08 locations were conducted. Details of major parameters are as given below: pH: 6.35 – 56 TDS: 275 – 502 mg/L Total Hardness: 198 – 378 mg/L Total Alkalinity: 182 – 361 mg/L Chloride: 6.0 – 48.0 mg/L	Section 3.10.4, Page 92, chapter 3.

	vii.	Noise levels monitoring at 8 locations within the study area.	Noise monitoring done for 08 locations. Details are as given below: Day Time: 47.2 – 64.8 dB (A) Night Time: 42.1 – 59.2 dB (A)	Section 3.5, Page 74, Chapter 3.
	viii.	Soil Characteristic as per CPCB guidelines.	Soil monitoring at 4 locations were conducted. Characteristic of major parameters are given below: pH: 6.92 – 8.37 Organic Carbon : 0.853– 1.05% Total Nitrogen: 68.97– 88.4% Total Phosphorous: 2.67– 5.96 mg/100g Exchangeable Calcium: 8.32– 17.27 meq/100 g Exchangeable Magnesium: 1.38– 7.9 meq/100 g	Section 3.9, Page 86, Chapter 3.
	ix.	Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement *etc*.	Traffic study of the area on the roads viz. NH-54 has been done. Impact on traffic has been analyzed. Adequate parking arrangement has been done at project site by the unit.	Section 3.8, Page 85, Chapter 3.
	x.	Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.	No rare, threaten and endangered species has been recorded in the study area.	Section 3.11, Page 101, Chapter 3.
	xi.	Socio-economic status of the study area.	Details of socio economic status have been incorporated in EIA report.	Section 3.12, Page 111, Chapter 3.
7.		**Impact and Environment Management Plan**		
	i.	Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AAQ Modelling shall be done using inputs of the specific terrain characteristics	AERMOD view Gaussian plume dispersion model is been used. The air quality contours are plotted on a location map showing the location of project site and maximum incremental GLC of pollutant is incorporated in EIA / EMP report.	Section 4.4.1.1 Page 142, Chapter 4

		for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for Modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.		
	ii.	Water Quality Modelling - in case of discharge in water body.	Not applicable, as the project will be Zero Liquid Discharge (ZLD).	--
	iii.	Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor cum-rail transport shall be examined.	Details of impact of the transport of the raw materials and end products on the surrounding environment are incorporated. All the raw materials are locally available and will be transported by closed covered trucks. LOS values have been calculated based on traffic data for NH-54 and it has been found 0.43. LOS value indicates that the performance of NH-54 is good with respect to traffic load. The LOS value from the proposed project will be the almost same as before i.e. “C” “Good” for the National Highway falling in the study area.	Section 3.8, Page 85, Chapter 3.
	iv.	A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E (P) Rules.	• Total industrial Wastewater Generation will be 2391 KLD, out of which 1320 KLD process water, 218 KLD RO Reject and 44 KLD Floor/equipment washing will be treated in ETP/MEE. 565 KLD from boiler/cooling tower blowdown will be treated in RO. MEE Condensate, 347 KLD RO Permeate, and 59 KLD Boiler Condensate will be recycled. Treated effluent from ETP/MEE will be used for irrigation in farm lands of the unit. Thus, there will be a zero liquid discharge. • Sewage quantity of 45 KLD will be generated and it shall be treated in STP of 50 KLD capacity. Treated water will be used in gardening within plant premises.	Section 2.5.2 & 10.2 Page 55 & 244, Chapter 2 &10.
	v.	Details of stack emission and action plan for control of emissions to meet standards.	Details of stack emission and action plan for control of emissions to meet standards are incorporated.	Section 2.5.1, Page 53, Chapter 2.

	vi.	Measures for fugitive emission control.	Measures for fugitive emission control are incorporated in EIA report.	Section 10.1.2 Page 243, Chapter 10.
	vii.	Details of hazardous waste generation and their storage, utilization and management. EMP shall include the concept of waste - minimization, recycle / reuse / recover techniques, energy conservation, and natural resource conservation.	Details of hazardous waste generation and their storage, utilization and management, concept of waste - minimization, recycle / reuse / recover techniques, energy conservation and natural resource conservation are incorporated in EIA report.	Section 2.5.3, 10.9.1 Page 55 & 261, Chapter 2 & 10.
	viii.	Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.	Not Applicable	--
	ix.	Action plan for the green belt development plan in 33% area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.	Total greenbelt of 1,37,391 m^2 (35% of the total plot area) will be developed. Gurdaspur Sugar Mills will plant 37,783 Nos. of trees and 75,566 Nos. of shrubs. Detailed Green belt development plan giving details of species, width of plantation, planning schedule etc. is been incorporated in EIA report.	Section 10.7, page 256, Chapter 10.
	x.	Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.	Detailed rain water harvesting plan has been prepared and the same is incorporated in EIA Report.	Section 10.9.1.2, page 261, Chapter 10.
	xi.	Total capital cost and recurring cost/annum for environmental pollution control	Total capital cost for EMP is 1790.24 Lakhs and Recurring cost is 48.65 Lakhs/Month.	Section 10.10, Page 263, Chapter

		measures shall be included.		10.
	xii.	Action plan for post-project environmental monitoring shall be submitted.	Detail action plan for post project monitoring has been incorporated.	Table 6.2, Page 166, Chapter 6.
	xiii.	Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.	Onsite and Offsite Disaster Management Plan including Risk assessment by assuming, Tank leakage and catastrophic rupture scenario has been incorporated.	Section 7.6, Page 210, Chapter 7.
8.		**Occupational Health**		
	i.	Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers.	Budget of Rs. 190 Lakhs is allocated for occupational health and safety. Detailed Plan for occupational health and safety has been incorporated in EIA.	Section 10.5, Page 254, Chapter 10.
	ii.	Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre-placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.	Not Applicable as proposed project is a new project	--
	iii.	Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the	Not Applicable as proposed project is a new project	---

		company has adopted to keep them within PEL so that health of the workers can be preserved.		
	iv.	Annual report of health status of workers with special reference to Occupational Health and Safety.	Not Applicable as proposed project is a new project	--
9.		**Corporate Environment Policy**		
	i.	Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.	Yes. Gurdaspur Sugar Mills have well laid Environment Policy.	Annexure IV, Page 279
	ii.	Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms /conditions? If so, it may be detailed in the EIA.	Yes. Details are incorporated in EIA report.	--
	iii.	What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.	Hierarchical system of the company to deal with environmental issues has been incorporated in EIA report. Expertise in the field of environment will be recruited to do regular compliance and to report higher management regarding gaps/lapses if identified. Reporting mechanism of the same is incorporated in the EIA report.	Section 10.11.3, Page 265, Chapter 10.
	iv.	Does the company have system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report.	Yes, company will provide system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders.	Section 10.11.3, page 265, Chapter 10.

10		Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.	Infrastructure facilities such as Drinking water facility, sanitation, rest room etc. will be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.	--
11		**Enterprise Social Commitment (ESC)**		
		I. Adequate funds (at least 2.5% of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan shall be included. Socio-economic development activities need to be elaborated upon.	A budget of Rs. 665.24 Lakhs i.e. 1 % cost of the proposed project as per OM of MoEFCC vides F. No. 22-65/2017-IA.III dated 1/05/2018 is allocated for Corporate Environment Responsibility (CER) under proposed project and will be implemented in next 5 year.	Section 10.6, Page 255, Chapter 10.
12		Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.	No litigation pending against the project.	--
13.		A tabular chart with index for point wise compliance of above TOR.	Complied	--
B.	**Specific ToR for Distillery**			
1.		List of existing distillery units in the study area along with their capacity and sourcing of raw material.	There are no existing distillery units in the study area.	--

2.	Number of working days of the distillery unit.	Distillery unit- 300 days/A	Table 2.11, Page 46, Chapter 2.
3.	Details of raw materials such as molasses/grains, their source with availability.	Details of Raw materials along their source is incorporated in EIA Report	Section 2.3.1, page 36, Chapter 10.
4.	Details of the use of steam from the boiler	The Sugar and cogeneration consists of a high pressure and high temperature based Cogeneration system. This high-pressure system is configured with a 145 TPH boiler and a 28 MW extraction-cum-condensing turbogenerator. Under 5000 TCD crushing, the 145 TPH boiler will generate 145 TPH of steam.	Section 2.3.5, page 42, Chapter 2.
5.	Surface and Ground water quality around proposed spent wash storage lagoon, and compost yard.	Regular Environment Monitoring will be carried out in both construction as well as operation phase. Detail Plan is explained in chapter 6 of EIA report.	Section 6.1, page 165, Chapter 6.
6.	Plan to reduce spent wash generation within 6-8 KL/KL of alcohol produced.	Spent wash action plan is explained in chapter 10 of EIA Report.	Section 10.2.2, Page 244, Chapter 10.
7.	Proposed effluent treatment system for molasses/grain based distillery (spent wash, spent lees, condensate and utilities) as well as domestic sewage and scheme for achieving zero effluent discharge (ZLD)	Details of ETP system to achieving zero effluent discharge (ZLD) are incorporated in chapter 10 of EIA report	Section 10.2.2, Page 244, Chapter 10.
8.	Proposed action to restrict fresh water consumption within 10 KL/KL of alcohol production	Water consumption details are given in chapter 2 of EIA report to restrict fresh water consumption within 10 KL/KL of alcohol production	Section 2.3.4, Page 40, Chapter 2.
9.	Details about capacity of spent wash holding tank, material used, design consideration. No. of piezometers to be proposed around spent wash holding tank.	Details of Distillery plant specifications are described in chapter 2 of EIA report.	Section 2.4.2, Page 46, Chapter 2.
10.	Action plan to control ground water pollution	Detail EMP to control ground water pollution during construction and operation phase are described in chapter 10 of EIA report.	Section 6.1, page 165, Chapter 6.
11.	Details of solid waste management including management of boiler ash, yeast, etc. Details of incinerated spent wash ash generation and its disposal.	Details of solid waste management including management of boiler ash, yeast, etc. has been incorporated in EIA Report.	Section 2.5.3, Page 55, Chapter 2,
12.	Details of bio-composting yard (if applicable).	Not Applicable	--

13.	Action plan to control odour pollution.	Detailed Odor Control Plan is incorporated in EIA Report.	Section 10.8, Page 259,
14.	Arrangements for installation of continuous online monitoring system (24x7 monitoring device)	Continuous online monitoring system will be installed for stacks and connected to CPCB server .	--
C.	**Specific ToR for Sugar**		
1.	Complete process flow diagram describing each unit, its processes and operations in production of sugar, along with material and energy inputs and outputs (material and energy balance).	Detail process flow chart is described in detail in chapter 2 of EIA report.	Section 2.4, Page 44, Chapter 2,
2.	Details on water balance including quantity of effluent generated, recycled & reused. Efforts to minimize effluent is charge and to maintain quality of receiving water body.	Details on water balance including quantity of effluent generated, recycled & reused is incorporated in EIA Report.	Section 2.5.2, Page 55, Chapter 2,
3.	Details of effluent treatment plant, inlet and treated water quality with specific efficiency of each treatment unit in reduction in respect to fall concerned / regulated environmental parameters.	Details of effluent treatment plant is incorporated in EIA Report.	Section 10.2.2, Page 244,
4.	Number of working days of the sugar production unit.	Sugar unit: - 150 days/A	Table 2.10, Page 44, Chapter 2.
5.	Details of the use of steam from the boiler	The steam requirement for production of AA from fermented wash during C Molasses operation is 23.74 TPH. During operation with Broken rice, the steam requirement will be 27.3 TPH.	Section 2.3.5, Page 41, Chapter 2,
6.	Details of proposed source-specific pollution control schemes and equipments to meet the national standards	Based on predicted impacts, EMS is described in detail chapter 10 of EIA report.	Section 10.10, Page 263,
7.	Collection, storage, handling and transportation of molasses,	Details of storage tank of molasses & Alcohol are incorporated in EIA Report.	Table 2.4, Page 37, Chapter 2,
8.	Collection, storage and handling of bagasse and pressmud.	Details of collection, storage and handling of bagasse and pressmud are incorporated in EIA Report.	Table 2.3, Page 36, Chapter 2,
9.	Fly ash management plan for coal based and bagasse and action plan	Fly ash management plan for bagasse is incorporated in EIA Report.	Section 10.1.2, Page 243, Chapter 10.

10.	Details on water quality parameters such as Temperature, Colour, pH, BOD, COD, Total Kjeldhal Nitrogen, Phosphates, Oil & Grease, Total Suspended Solids, Total Coli form bacteria etc.	Details of water quality analysis results are discussed in detail in chapter 3 of EIA report	Section 3.10, Page 91, Chapter 3.
11.	Details on existing ambient air quality and expected, stack and fugitive emissions for PM10, PM2.5, SO2*, NOx*, etc., and evaluation of the adequacy of the proposed pollution control devices to meet standards for point sources and to meet AAQ standards. (*-As applicable)	Details of air quality analysis results are discussed in detail in chapter 3 of EIA report	Section 3.4, Page 69, Chapter 3.
D.	**Specific ToR for Grain Based distilleries for Ethanol Blended Petrol**		
1.	Details on requirement of raw material (naphtha/gas feedstock), its source of supply and storage at the plant.	Details on requirement of raw material, its source of supply and storage at the plant are incorporated in EIA Report.	Table 2.3, Page 36, Chapter 2,
	Complete process flow diagram for all products with material balance.	Detail process flow chart is described in detail in chapter 2 of EIA report.	Section 2.4, Page 44, Chapter 2,
	Brief description of equipments for various process (cracker, separation, polymerization etc)	Brief description of equipments for various process is attached as Annexure.	Annexure V, Page 280
	Details of proposed source-specific pollution control schemes and equipments to meet the national standards.	Based on predicted impacts, EMS is described in detail chapter 10 of EIA report.	Section 10.10, Page 263,
	Details on VOC emission control system from vents, stacks, fugitive emissions and flare management, etc.	Details on VOC emission control system from fugitive emissions is incorporated in EIA Report.	Section 3.4.4, Page 68, Chapter 3.
	Details on proposed LDAR protocol.	Not Applicable	--
	Ambient air quality should include hydrocarbon (methane and non-methane), VOC and VCM (if applicable).	Ambient air quality results are incorporated in EIA Report.	Section 3.4, Page 69, Chapter 3.
	Action plan to meet the standard prescribed under EPA for petrochemical complex.	Not Applicable	--
	Risk Assessment & Disaster Management Plan	Risk Assessment & Disaster Management Plan is incorporated in EIA Report.	Section 7.2, Page 170, Chapter 7.

	Identification of hazards	Details are provided in Chapter-7 of EIA Report.	Section 7.2, Page 170, Chapter 7.
	Consequence Analysis	Details are provided in Chapter-7 of EIA Report.	Section 7.2, Page 170, Chapter 7.
	Measures for mitigation of risk.	Details are provided in Chapter-7 of EIA Report.	Section 7.2, Page 170, Chapter 7.

1.8 SUMMARY

The Gurdaspur co-operative sugar mills Ltd. is a unit of Punjab state federation of co-operative sugar mills. The existing capacity of sugar plant is 2,000 TCD to produce white sugar by double sulphitation process. Due to olden technology and age, efficiency of plant and machineries are far behind the current technology leading to potential losses.

Now, the unit wishes to dismantle the existing 2000 TCD and propose to develop new 5000 TCD Sugar Plant along with 33.65 MW Cogeneration Power Plant and 120 KLPD Distillery/Ethanol Plant at V.P.O Paniar, Dist. Gurdaspur, Punjab.

As per the latest EIA Notification of Ministry of Environment and Forests, Govt. of India (MoEFCC) dated 14th September 2006 and its amendments, the proposed project is covered under the 5(g), 5g(a), 1(d) & 5(j) as Category-'A' for which prior Environmental Clearance (EC) is necessary. Based on the TOR conditions stipulated by EAC vide letter No.IA-J-11011/502/2021-IA-II(I) dated 8th December 2021, EIA report has been prepared. Public hearing is applicable, which will be conducted as per guidelines.

CHAPTER 2

PROJECT DESCRIPTION

2.0 GENERAL

This chapter described type, need, location, size or magnitude of project, operational activities, technology to be used and other related activities. It also provides a condensed description of the aspects which are likely to cause environmental effects to the surrounding environment and mitigation measures provided to meet environmental standards. Capital investment provided for environmental management plan to achieve the statutory norms.

2.1 PROJECT DESCRIPTION

The Gurdaspur Cooperative Sugar Mills Ltd. is proposing development of a new 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant at V.P.O Paniar, Dist. Gurdaspur, Punjab- 143531. The Gurdaspur co-operative sugar mills is a unit of Punjab State Federation of Co-operative Sugar Mills.

The Gurdaspur Co-Op Sugar Mills. Ltd., is an operating sugar plant with an installed capacity of 2000 TCD having valid CTO under Air Act, 1981 Vide letter no. CTO/Renewal/GRP/2018/7086711 valid upto 31/03/2023 and under Water Act, 1974 Vide letter no. CTOW/Renewal/GRP/2018/7087223 valid upto 31/03/2023. However, the existing unit will be completely dismantled before operation of new Greenfield plant of 5000 TCD Sugar Plant along with 33.65 MW Co-gen Plant and 120 KLPD Distillery/Ethanol Plant.

Proposed unit will be developed in 3,92,545.0 m^2 area. Total land is already in the possession of Gurdaspur Co-Op Sugar Mills. Ltd. The unit is committed to providing high-quality products of international standards, which will endeavour to meet the requirements of today's modern world by fulfilling the needs of clients in India and across the world.

2.1.1 Location, Type and Size of Project

Proposed project is to be developed at V.P.O Paniar, Dist. Gurdaspur, Punjab- 143531. Short and long view of the project site are provided in Google earths are depicted as **Figure 2.1 and 2.2** respectively.

Project boundary of the unit marked on Google earth having following co-ordinate:

Corner	Latitude	Longitude
A	32° 5'33.70"N	75°27'25.09"E
B	32° 5'45.31"N	75°27'31.29"E
C	32° 5'45.25"N	75°27'54.71"E
D	32° 5'23.62"N	75°27'45.34"E
E	32° 5'23.92"N	75°27'43.81"E
F	32° 5'21.75"N	75°27'43.75"E
G	32° 5'21.40"N	75°27'36.10"E
H	32° 5'20.04"N	75°27'35.93"E
I	32° 5'20.16"N	75°27'18.70"E
J	32° 5'22.33"N	75°27'19.67"E
K	32° 5'21.96"N	75°27'29.12"E
L	32° 5'23.68"N	75°27'29.38"E

M	32° 5'23.90"N	75°27'31.04"E
N	32° 5'25.67"N	75°27'30.87"E
O	32° 5'25.32"N	75°27'33.59"E
P	32° 5'26.89"N	75°27'33.61"E
Q	32° 5'27.92"N	75°27'30.99"E
R	32° 5'33.59"N	75°27'31.10"E

Project site photographs are depicted as **Figure 2.3.**

2.1.2 Site Section Criteria

Site selection was guided by many factors like availability of infrastructures, land, water sources, fuel, transportation, power etc.

Specific site selection criteria consider for the project is given below:

- The land for the proposed project is already in the possession of Gurdaspur Sugar Mills Ltd.
- The project is very well connected to National Highway no. 54 and Northern Railways
- Easy availability of infrastructure facilities.
- No prime agricultural land / forest land needed to be converted for industrial use.
- Area where proposed site is to be located has no history of natural calamities like floods, cloud burst, earthquake etc.
- Proximity to raw material suppliers.
- The human resource required for the proposed project will be easily available. Also, the same will be met from surrounding areas.

In addition to the above, the following factors within the study area have also been considered:

- There is no Notified National Park or Wild Life Sanctuary within 10 km radius of the project site.
- There are no metropolitan cities.
- There are no ecologically sensitive areas within 10 km radius of the project site.

Figure 2.1 Google Earth Short view

Figure 2.2 Google Earth Long view of Project Site

Main Gate

Sugar and Co-gen Plant area

Proposed Distillery/Ethanol Plant area

Greenbelt Area

Figure 2.3 Project Site Photographs

2.1.3 Salient Features

Physical environment setting in the vicinity of the project site have been given below at **Table 2.1.**

Table 2.1 Physical Environmental setting in the vicinity of the site

S. No.	Particulars	Description	Distance and Direction
1.	Latitude and Longitude of the site	32°5'34.63"N 75°27'36.14"E	--
2.	Elevation above Mean Sea Level (MSL)	272 m	--
3.	Nearest Village	Paniar	At 1.5 km in E
4.	Nearest City/Town	Dinanagar	At 3.70 km in N
5.	Nearest District	Gurdaspur	At 7.80 km in SW
6.	Nearest Highways	NH – 54	At 0.02 km in W

7.	Nearest Railway station	Gurdaspur	At 6.50 km in SW
8.	Nearest Airport	Amritsar	At 75.0 km in SW
9.	State, National boundaries	Punjab and Himachal Pradesh	At 12.0 km in E
10.	Nearest River	Ravi River	At 12.0 km in NW
11.	Nearest Sea	None	None within 10 km radius of project site
12.	Archaeological site	None	None within 10 km radius of project site
13.	National park/ Wildlife sanctuary/ Marine sanctuary/ Reserve forest	Gurdaspur Bird Sanctuary	At 6.0 km in W
		Lala Mohan Lal National Park	At 7.7 km in W
14.	Nearby Industries	• M/s. New Adarsh Industries, • M/s. Sukrala Industries Pvt. Ltd. • M/s. Hero Rubber Industry • M/s. Deban Agro. Industries	Within 10 km radius of project site
15.	Sensitive Receptors	• Columbus Child Care Hospital, Dinanagar – 4.0 km, North direction, • Yash Hospital, Gurdaspur – 4.2 km, South West direction, • Sri Advait Gurukul Heights School Gurdaspur – 5 km, South West direction • Government Primary Smart School, Sherpur – 5.5 km, South West direction	

2.1.4 Need of the Project

Sugar and Co-gen Plant

Due to the aging of the plant with olden technology, down time and losses leads to instability between the plant operation and cane cultivation. Plant suffers from non-profitability. So, the formers are being diverted to other non-profitable crops. To ensure profitability to formers, it is necessary to boost the famer's confidence and to bring back them towards sugar cane cultivation.

Considering the above scenario, the plant management decided to install new sugar 5000 TCD plant with high efficient latest technology machineries and with upgraded capacity to minimize the losses. Accordingly, proposed sugar plant shall be of capable of crushing 5,000 Tons per day and produce sulphurless white sugar. Due to elimination of hazardous sulphur for clarification process, sugar produced shall be less in sulphur content, encouraging the sale market.

Bagasse based Cogeneration for surplus power generation in Indian sugar industry offers a number of advantages both to the users and to the country. Apart from helping in bridging the gap between the demand and the supply in the power sector, the bagasse based Cogeneration offers an environmentally friendly solution for additional power generation, helps in saving the fossil fuels and improves the financial position of the sugar factory. With the advantages like no transportation of fuel, reduction in transmission losses, eco-friendly power generation, etc. sugar plants could perform as supplementary power generating companies and make any country move towards self-reliance in

power sector. The management of GCSML having a very progressive outlook has realized the potential for Cogeneration in Sugar Plants.

Distillery/Ethanol Plant

Government of India (GOI) made 5% ethanol blending to gasoline in 9 states and 5 union territories in January 2003. In September 2006 this mandate was extended to a few more states and Union territories. In September 2008, the GOI made blending mandatory across all the states and union territories. In 2008 a proposal to increase the blending to 10% was made and subsequently in 2009, a proposal to increase the blending to 20%, by the year 2017, was made. It is estimated that with the current consumption of gasoline, the country needs about 1050 Million Litres of anhydrous alcohol to meet with the mandated 5% blending. On the same basis, a 10% blending will need 2100 Million Litres and a 20% blending will need 4200 Million Litres of anhydrous alcohol. The installed production capacity, in the country, for anhydrous alcohol production is about 2 billion litres per annum. Many of the ethanol distillery plants have put up the facility for the production of anhydrous alcohol, but have not been using the facility because of the low off-take.

With the foregoing discussions it is clear that the actual production of ethanol is lower than that required to meet with the requirements of the potable alcohol industry and the requirements of OMCs' even with 10% blending. So, with the demand for ethyl alcohol set to increase, in the alcoholic beverages industry and in blending segment the future looks very promising for the Alcohol industry. However, as seen earlier there will be a limitation from the point of view of molasses availability and with the possible future pressure against the use of food grains for the production of alcohol and the demand for alcohol increasing, the alcohol produced with molasses or even cane juice or "B" Heavy molasses as feed stocks will probably have a vast market and it is likely the shortage of alcohol will also push up the prices of alcohol.

The project would also help the company to support the Indian economy in the following way:

- Potential increase in Job opportunities for the Local surroundings.
- Boost to the Local service providers and the overall improvement in the economic activities like Local raw materials Suppliers, Transporters, contractors, clearing and forwarding agents and other allied suppliers.

Demand - Supply Gap

The Government of India has a set an indicative target of 20% blending of ethanol with petrol & also for diesel with biodiesel across the country by 2017. Given the mandatory blending & projected demand for petrol in India, ethanol demand for blending is estimated at 5, 10 & 20% blending mandates.

Domestic/Export Market & Export Possibility

Local as well as international market is available for sugar. Electricity will be used in in-house & exported to the local grid of PSPCL. Government of India has already permitted the petrol blending @ 10% will be mandatory in near future up to 20%.

Projections of demand of ethanol (Million Liters)

Year	Total supply of petrol (billion liters)	Ethanol Demand for Blending (Billion Liters)		
		5%	10%	20%
2018-19	31	1.57	3.14	6.28
2019-20	33	1.65	3.30	6.60
2020-21	35	1.73	3.46	6.92

2.2 PRODUCT DESCRIPTION

List of proposed products to be manufactured are mentioned in Table - 2.2 below:

Table 2.2 List of Products along with capacity

S.No.	Products & Co-products	Unit	Quantity
1.	**Sugar Unit (5000 TCD)**		
	Sugar	TPD	525
	Molasses	TPD	250
	Filter Cake	TPD	200
	Bagasse	TPD	1,425
2.	**Power Plant**		
	Co-generation	MW	28
	Spent wash Incineration Boiler based	MW	5.65
3.	**Molasses & Grain Distillery/ Ethanol Unit**		
	Absolute Alcohol	KLPD	120
	Carbon-di-oxide	TPD	93.6
	DDGS (Distillers Dried Grain Soluble)	TPD	52.65
	Fusel oil	LPD	131
	Technical Alcohol	LPD	3,930

2.2.1 Transportation of Products

Standard packing of the final finished product will be packed in sack bags or jumbo bags, HDPE drum and transported to the domestic and export market through truck as per the customer requirements.

2.3 RESOURCE REQUIREMENT

Various resources like raw materials, capital investment, land, utilities, power, fuel, water, manpower etc. will be utilized to carry out production activities. Simply production is converting resources into finished product.

2.3.1 Raw Material Requirement

Raw material will be sourced through local market. The transportation of raw material will be done by road through trucks. Detailed raw material requirement along with estimated quantity are given in **Table 2.3.**

Table 2.3 Details of Raw Material

S.No.	Name of Raw Material	Consumption	Physical state	Means of Storage	Source
1.	Sugar cane	5,000 TPD	Solid	Cane Yard	Local Market / Own field
2.	Lime	11.00 TPD	Liquid	Tanks/Drums	Local
3.	Bagasse for steam boiler	Sugar plant: 55.33 TPH, Distillery/Ethanol Plant: 17.64 TPH	Solid	Bagasse yard	Sugar plant/Local
4.	Concentrated spent wash for steam boiler	16.71 TPH	Liquid	Tank	In-house
5.	C-Molasses	543 TPD	Liquid	Tanks	Sugar Plant
6.	Phosphoric Acid	25.00 LPD	Liquid	Drums	Local Market
7.	Magnafloc	5.00 kg/day	Solid	Bag	Local Market
8.	Broken rice	301 TPD	Solid	Broken rice Yard	Local Market
9.	Alpha enzyme	177.53 kg/day	Liquid	Drums	Local Market
10.	Beta enzyme	236.74 kg/day	Liquid	Drums	Local Market
11.	Hydrochloride Acid (30%)	5.00 kL/A	Liquid	Drums	Local Market
12.	Caustic Soda	3000.00 TPA	Liquid	Drums	Local Market
13.	Viscosity Reducer	10.00 kg/day	Liquid	Drums	Local Market
14.	Urea and DAP	408.00 kg/day	Solid	Bag	Local Market
15.	Antifoam Oil	144.00 kg/day	Liquid	Drums	Local Market
16.	Sulphuric Acid	960.00 kg/day	Liquid	Tanks/Drums	Local Market
17.	Nitric Acid	408.00 kg/day	Liquid	Tanks/Drums	Local Market
18.	Sodium Metasulphate	3.60 kg/day	Solid	Bag	Local Market
19.	Anti-Sealant	3.6 kg/day	Liquid	Drums	Local Market
20.	Bio-Dispersant	3.60 kg/day	Liquid	Drums	Local Market
21.	Hydro Choric Acid (33%)	180 kg/day	Liquid	Tanks/Drums	Local Market
22.	Morpholine (85%)	3.60 kg/day	Liquid	Drums	Local Market
23.	Polymer for Sludge Thickening	0.24 kg/day	Liquid	Drums	Local Market
24.	Scale & Corrosion Inhibitor	14.40 kg/day	Liquid	Drums	Local Market
25.	Carob Hydrazine	0.10 kg/day	Liquid	Drums	Local Market
26.	Carob Tri-sodium Phosphate	1.44 kg/day	Solid	Bag	Local Market
27.	Sodium Hypochlorite (6%)	1080 kg/day	Liquid	Tanks/Drums	Local Market

Table 2.4 Storage Tank Details

Material	Mode of Storage	Maximum Quantity Stored
Raw material		
Molasses	Tank	3 X 4000 MT + 4 X10,000 MT
Syrup storage tank	Tank	11 X 35 m^3
Molasses receiving tank	Tank	1 X 750 MT
Hydrochloric acid	Tanks/Drums	200 kgs.
Lime storage	Tank	2 X 30 m^3
Product		
Anhydrous Alcohol daily receiver	Tank	3 X 125 kL
Anhydrous Alcohol bulk storage tanks	Tank	4 X 1500 kL
Anhydrous Alcohol Issue tank	Tank	1 X 350 kL
Technical Alcohol daily receiver	Tank	2 X 15 kL
Technical Alcohol bulk storage	Tank	1 X 120 kL
Fusel oil storage tank	Tank	1 X 10 kL

2.3.2 Project Cost

Total cost for the proposed project will be Rs. 665.24 Crore, which includes cost of land, building and civil work, plant and machinery purchase, utility/plant machineries, Environment Management System and others are mentioned in **Table 2.5.**

Table 2.5 Estimate of Project Cost

S.No.	Particulars	Cost in Rs. (Lakhs)	
		Sugar & Co-gen Plant	Distillery/Ethanol Plant
1.	Buildings & Civil Works	5,866	1,210
2.	Plant & Machinery	28,854	20,340
3.	Environmental Management System (Water/Air/Hazardous waste/ Occupational health/safety, PLC system, fire hydrant and green belt)	1000	1000
5.	Miscellaneous	5,224	3030
	Total Project Cost	**40,944**	**25,580**
CER activity (1% of capital investment as project is Greenbelt)		**665.24**	

2.3.3 Land

Proposed project will be developed in 3,92,545 m^2 area. Existing structures within plant premises will be completely demolished. All the basic amenities such as office and laboratory area, toilet block and others, parking area will be provided. Construction of administration building, plant building, raw material storage area, finished products storage area, utilities area, treatment facility, fire hydrant and other ancillary amenities shall be undertaken within the plot area. Proposed project will be developed in accordance with local development plan and used for industrial purpose. Plot allotment letter is attached as **Annexure II**. Bifurcation of plot area is mentioned in **Table 2.6** below:

Table 2.6 Land breakup of the project site

S. No	Particulars	Area in m^2	Area in %
1.	Production area	25,274	6.44
2.	Raw material and finish product storage area	15,173	3.87
3.	Office & Laboratory area	374.25	0.10
4.	Utility area	3674	0.94
5.	Hazardous/solid waste storage area	3,590	0.91
6.	ETP area	3620	0.92
7.	Storage Tanks	8345	2.13
8.	Greenbelt area	1,37,391	35.00
9.	Security cabin	361	0.09
10.	Parking	213	0.05
11.	Agriculture Area	70,585	17.98
12.	Open space & internal road area	1,23,945	31.57
	Total	**3,92,545**	**100.00**

Layout plan showing location of manufacturing unit, storage area, wastewater treatment plant, water storage area, emergency vehicle location, assembly point, greenbelt area, internal road, entry and exit gate etc. is depicted as **Figure 2.4.**

Figure 2.4 Plant Layout

2.3.4 Water

Total water requirement will be 4653 KLD (Fresh: 2887 KLD + Recycled: 1766 KLD) which will be met by own water reservoir. Break-up of the water balance is given in table 2.7.

Table 2.7 Water consumption

S.No.	Particulars	Water Consumption KLD	Remarks
A.	**Domestic**	50	--
B.	**Industrial**		
1.	Processing	120	--
2.	Boiler	166	--
3.	Cooling	4,271	--
4.	Floor/Equipment washing	46	--
	Total Industrial	**4,603**	--
	Total (A+B)	**4,653**	--
C.	**Gardening**	**40**	Treated water from STP will be used

Figure: 2.5 Water Balance Diagram

2.3.5 Power Requirement

Sugar and cogeneration Plant

With the installation of the 28 MW Cogeneration plant, the total power generation in the Cogeneration plant, under 5000 TCD crushing will be 28,000 kW. The total power requirement of the sugar plant including the power consumption in the mill drives, other pumps and auxiliary systems is estimated to be 6020 kW for the crushing rate of 5000 TCD.

The power requirement of the 145 TPH boiler auxiliaries, 28 MW TG auxiliaries and the plant auxiliary systems, is estimated to be 2420 kW.

The total in-house power requirement of the sugar plant from the Cogeneration plant and the auxiliaries of the Cogeneration systems works out to 8440 kW. This leaves a surplus of 19560 kW, to be exported to PSPCL's Grid.

Distillery/Ethanol Plant

The total power requirement for the distillery and co-generation plant is given below during C Molasses operation:

- Distillery Process requirement : 2100 kW
- Boiler and other utilities : 1360 kW
- Total (operating reqt.) : 3460 kW

With 5650 kW of generation under the operation of the distillery, there will be a surplus power of 2190 kW available for export.

During operation with grain as feedstock, the power consumption for distillery and cogeneration plant is given below:

- Distillery Process requirement : 2700 kW
- Boiler and other utilities : 1360 kW
- Total (operating reqt.) : 4060 kW

With 5650 kW of generation under the operation of the distillery, there will be a surplus power of 1590 kW available for export.

The break-up of Power requirement for the proposed plant is given in table 2.8 below:

Table 2.8 Power Requirement

Sr. No.	Unit	Power Requirement (MW)	Source
1.	Sugar Unit	6.02	Own 28 MW Co-generation Power Plant
2.	Co-generation auxiliaries	2.42	Punjab State Power Corporation Limited
3.	Distillery/Ethanol Unit- during C Molasses operation	3.46	Own 5.65 MW Co-generation Power Plant
4.	Distillery/Ethanol Unit- During operation with grain as feedstock	4.06	Own 5.65 MW Co-generation Power Plant

2.3.5 Steam Requirement

Sugar and cogeneration Plant

The plant consists of a high pressure and high temperature based Cogeneration system. This high-pressure system is configured with a 145 TPH boiler and a 28 MW extraction-cum-condensing turbogenerator. Under 5000 TCD crushing, the 145 TPH boiler will generate 145 TPH of steam.

Out of the total steam generated, 91 TPH is used for meeting the steam requirement at sugar plant, 9.54 TPH will be used for meeting the requirement of the deaerator of the 145 TPH boiler, 11.62 TPH steam will be taken to the High pressure feed water heater (I), the balance of 9.64 TPH steam will be taken to the High pressure feed water heater (II).

Distillery/Ethanol Plant

The steam requirement for production of AA from fermented wash during C Molasses operation is 23.74 TPH. During operation with Broken rice, the steam requirement will be 27.3 TPH. This includes the steam requirement for spent wash concentration from approximately 16.11% (C Molasses) w/w solids to 60 % w/w solids in the stand alone evaporation system. In addition to the above, the Spent wash fired boiler is provided with deaerator which requires steam for deaeration purposes and also for heating the combustion air in the steam air pre-heater.

Considering all the above, the spent wash fired boiler is sized for this project to have a output of 45 TPH at 45 ata & 400^{0}C. The steam produced in the boiler will be fed to the turbo alternator for power generation. The extraction steam of turbine shall be slightly superheated, which will be used for meeting the distillery plant steam requirements.

2.3.6 Utilities and Fuel Requirement

The requirement of utilities & fuel for the proposed project has been estimated based on plant operation capacity and is given in **Table 2.9**:

Table 2.9 Details of utilities and fuel

S. No.	Particulars	Details
Utilities		
1.	Steam Boiler for sugar & Co-gen plant, TPH	145
2.	Steam Boiler-for Distillery/Ethanol plant, TPH	45
3.	Turbo generator, MW	1 no. 28 & 1 no. 5.65
4.	Cooling Tower, m^3/hr.	1 No. - 80 m^3/hr. (Vertical Crystallisers), 8730 m^3/hr (condenser, TG and boiler), 140 m^3/hr. (Surplus Condensate Cooling towers), 2 No. 6000 m^3/hr. (for Injection water), Cooling Tower – 01 No. - 1600 m^3/hr. (Distillation, MSDH), 840 m^3/hr. (Fermentation section)
5.	D.G Set (Standby), kVA	2 nos. 1000 & 1 no. 625
Fuel		
1.	Bagasse for steam boiler, TPH	55.33 (Sugar plant- 145 TPH boiler) + 17.64 (Distillery/Ethanol Plant- 45 TPH boiler)

2.	Concentrated spent wash for steam boiler, TPH (In case of C Molasses based Distillery/Ethanol operation)	16.71
3.	HSD for D.G Set, lit/hr.	565

Bagasse balance

With the bagasse percentage in cane being 28.5%, on an average, and with the crushing rate of 227.27 TPH (5000 TCD in 22 Hours) of cane, the bagasse generated will be 64.77 TPH. Out of this about 1.14 TPH of bagasse will be set aside for accommodating the bagacillo required for juice filtration, the losses during the conveying, windage and to meet with the additional bagasse requirement during the startup of the boilers. The balance of 63.63 TPH of bagasse is available for usage in the high pressure boiler of 145 TPH during the seasonal operation, the boiler consumes 55.33 TPH of bagasse. This leaves a surplus of 8.34 TPH of bagasse, which will be utilized in proposed Distillery plant in the same complex for consumption as supporting fuel in its Slop fired Boiler.

The distillery boiler will require about 16.71 TPH of concentrated Spent wash along with approximately 8.34 TPH of bagasse during C Molasses operation for generating 45 TPH of steam required for the plant. During operation with Broken rice, the Boiler will consume 17.64 TPH of Bagasse to generate 45 TPH of steam in which 8.34 TPH will be the Bagasse available from Sugar mill and the remaining 9.3 TPH will be bought out bagasse.

Bagasse Composition and GCV of bagasse

Carbon	23.5%
Hydrogen	3.25%
Oxygen	21.75%
Moisture	50%
Ash	1.5%
GCV with 50% moisture	2272 kcals/kg

Typical analysis of 60% w/w solids concentrated Spent wash

Carbon	19.2%
Hydrogen	2.1%
Oxygen	16.5%
Moisture	40%
Sulphur	1.05%
Nitrogen	1.85%
Ash	19.3%
Gross calorific value	1584 kcals/kg

2.3.7 Manpower

There are possibilities to generate employment during the construction as well as operation phase of the proposed project. Local skilled and semi-skilled workers will be hired during construction phase, thus no need to provide housing facility to workers. 100-125 nos. of people will get direct employment during construction phase. During operation phase, manpower requirement will be 332 nos. (121-Direct + 211- Indirect)

2.4 MANUFACTURING PROCESS AND FLOW DIAGRAM

2.4.1 Technical details for Sugar Plant

Figure: 2.6 Sugar Plant Process Flow Diagram

Table 2.10: Design parameters of the proposed Sugar plant

S.No.	Description	Quantity
1.	Crushing capacity (22 Hrs.)	5,000 TCD
2.	Hourly crushing rate based on which equipments have been designed	227.27 TCH
3.	No. of days of cane crushing operation (season)	150
4.	Cane crushed per season (MT) With 95% PLF	7,77,260
5.	Plant down time	5 % (max.)
6.	Sugar recovery (Average) Total Losses (Maximum)	10.50% 2.00%
7.	Sugar grades manufactured	'M' - 80% S' - 20%
8.	Fibre % cane	14.00
9.	Pol % cane	12.50
10.	Bagasse % cane	28.50
11.	Moisture % bagasse (Less than)	50.00
12.	Final Molasses % cane ('C' Molasses)	5.00

13.	Added water % fibre	250 to 270
14.	A-Massecuite % Cane	28.00
15.	B-Massecuite % Cane	13.00
16.	C-Massecuite % Cane Refinery Massecuite % Cane	9.00 24.00
17.	Filter cake % cane	4.00
18.	Cane preparatory Index	89%±1
19.	RME (Minimum)	96.00%
20.	RBHR (Minimum)	90.00%
21.	Process steam requirement on cane (2.5-ata and 127°C temperature).	40.00%
22.	Power for the sugar plant process excluding Cogen plant and including power requirement for workshop, etc	26.5 kw/T of cane
23.	Sugar plant off-season power requirement including power requirement for colony, workshop, etc	26.5 kw/T of cane

The new 5,000 TCD sugar plant and machineries consisting of Juice extraction system, Juice processing system for raw sugar and raw sugar purification by Phosphofloatation system to produce Sulphurless white sugar.

Juice Extraction:

The cane received in the factory yard shall be weighed & unloaded by hydraulic grab unloaders and hydraulic tippler through auxiliary carrier in to the cane carrier. Sugar cane feed by cane carrier to preparatory devices and prepared cane is milled in mills comprising four numbers three roller mills with toothed under feed roller. The process of fine cane preparation with long fiber, which has impact on overall extraction, shall be performed by knife sets and heavy duty swing fibrizer. The process of juice extraction from prepared cane shall be performed at mills through multi washing & compression between grooved rollers. Juice collected from mills shall be screened and pumped for processing. Residual substance bagasse with minimum moisture from last compression mill shall be delivered to steam generators to use as a fuel. The mills will install modern design turbine drive, feeding devices, compound imbibition system to achieve more than 95% juice from sugar cane.

Juice Processing:

The raw juice after being heated to 70-72°C is treated with milk of lime solution for removal of impurities from juice in a continuous defecation vessel. Treated juice on boiling (102°C) is fed to continuous clarifier from which the clear juice is decanted while the settled impurities known as mud are sent to Rotary vacuum filters installed for filtering muddy juice. Filter cake is discharged as manure to fields. Filtrate from vacuum filters is recycled to Defecation vessel.

The clear juice of 12 to 13 brix is concentrated in a multiple effect evaporators to yield syrup of about 70 brix. Extracted syrup from the juice evaporation system is sent to the pan station for crystallization of raw sugar.

Sugar crystal will be made in vacuum pan boiling stage. The massecuite (crystals containing boiled mass) from the pan is dropped in crystallizers and subsequently centrifuged in centrifugal machines

for isolating sugar crystals from mother liquor (Molasses), which again is sent to pan for boiling and re-crystallization. Three massecuite boiling scheme for crystallization is adopted in raw sugar plant to ensure maximum recovery of raw sugar in crystal form. The final mother liquor referred to as final molasses ('C') is sent to distillery being economically unsuitable for further recovery of sugar. Reject molasses from refinery plant is recycled to raw sugar plant pan station and boiled in Raw 'A' pans to improve sugar recovery. (Whenever required, raw sugar can be bagged in 50 kg bags or 1 T bags without processing further)

Raw sugar from centrifugal is filtered and purified by Phosphofloatation process. Every stage of operation will be automated and integrated through DCS control system to ensure best process controls, efficient operations and consistent quality of sugar.

Detailed Flow Diagram from cane preparation to sugar packing are attached as **Annexure-III**.

2.4.2 Technical details for Ethanol/Distillery Plant:

Figure: 2.7 Ethanol/Distillery Plant Process Flow Diagram

Table 2.11: Design parameters of the proposed Ethanol/Distillery

S.No.	Description	Quantity
1.	AA Production	120 KLPD
2.	Total Spirits production	131 KLPD
3.	Distillery Products	Absolute Alcohol
4.	Distillery by products	Carbon-di-oxide DDGS Fusel oil Technical Alcohol
5.	No. of days of plant operation	300
6.	No. Of days of Operation with C Molasses	75

7.	No. Of days of Operation with Broken Rice	75
8.	Analysis considered for Final (C) Molasses	14.00
	a. Total Reducing Sugars (TRS) in %	45
	b. Total Fermentable Sugars (TFS) in %	40
	c. Total Solids in %	83.5
9.	C Molasses required per day (MT)	543
10.	Total spirit production in litres per ton of C molasses	241
11.	C Molasses required for 75 days of Distillery operation (MT)	38,863
12.	C Molasses available from GCSML Sugar Mill (MT)	38,863
13.	Starch Content in Broken Rice (%)	66.23
14.	Broken Rice required per day (MT)	301
15.	Total spirit production in litres per ton of Broken Rice	434.86
16.	Broken Rice required for 225 days of Distillery Operation (MT)	64317.3
17.	Process steam required for wash to AA production and concentration of spent wash to 60% at 4.5 ata & 155 Deg.C (TPH)	27.3
18.	Operating power requirement for Distillery plant	2700 kW
19.	Operating power requirement for Slop fired cogeneration plant	1360 kW
20.	Total process water requirement under Molasses based operation	1300 TPD
21.	Total DM water requirement under Molasses based operation & Co-gen plant (without recycling)	135 TPD

The various sections involved in the process of Manufacture of Alcohol in a multi-product zero effluent discharge distillery are:

- Molasses receiving, Storage and Handling Section
- Grain receiving, storage and handling section
- Liquefaction and saccharification section
- Feed stock weighing, distribution and Fermentation Section.
- Decantation and Evaporation
- DDGS drying section
- Absolute alcohol production section.
- AA and Technical Alcohol Daily Receiver & Bulk Storage Section
- Spent wash concentration plant.
- Utilities comprising of Boiler, TG, DM water plant, Cooling towers, compressed air system and Electrical Section
- Laboratory, stores.
- Firefighting and alarm systems for the plant
- Civil and structural work for the complete plant

Manufacturing Process

Molasses Mode:

The production of alcohol from molasses is based on the property of some specific microorganisms in metabolizing the sugar content of molasses into alcohol. The activity is generally termed as Fermentation. This practice of molasses fermentation into alcohol is widely prevalent all over the world in both the cane sugar and beet sugar industries. Being a biological and renewable source molasses continues to occupy a predominant position as a feed stock of alcohol production in the world, though other sources like food grains, dilute cane juice etc. are also widely used for this purpose.

Grain Mode:

The production of alcohol from grain is based on the property of some specific enzymes in metabolizing the starch content to glucose and then glucose to alcohol. These activities are generally termed as Fermentation. This practice of fermentation of glucose into alcohol is widely prevalent all over the world in cane sugar, beet sugar and grain based distilleries. Being a biological and renewable source molasses continues to occupy a predominant position as a feed stock of alcohol production in the world, though other sources like corn, dilute cane juice etc. are also widely used for this purpose. The grain based distillery is gaining momentum because of superior quality of alcohol and also to avoid pollution to the environment.

Different plant sections of the Ethanol distillery:

Exclusive sections for Grain Mode:

Grain storage:- Grain storage can be planned with Twenty (20) days storage preferably in silos. There will be three (3) numbers of 3000 MT capacity of each silos will be installed in the distillery premises.

Grain handling and milling:- Grain is lifted by bucket elevator and feeds to the pre-cleaner. The pre-cleaner removes light impurities before stored into the silo. From the pre-cleaner another bucket elevator lifts the grain and unloaded into grain silo. Another bucket elevator lifts the grain and feeds to vibratory precleaner. The pre-cleaner removes light impurities like straws, stem and fine dust. Grain from precleaner is fed by gravity to magnetic separator where the iron particles are removed. It is fed by gravity to de-stoner where the heavier particles like stones are removed. From destoner grain is fed by gravity to hammer mill where grain is converted to flour.

Liquefaction and saccharification:- The flour from the mill during grain processing is mixed homogenously in the mixing tank where process water, with process condensate from evaporator and thin stillage is used for dilution. Some quantity of liquefying enzyme (Alphaamylase) is added here. The slurry is cooked in the jet cooker. The slurry is pumped to a jet cooker where with steam the slurry is instantly cooked by raising the temperature of slurry to 105 Deg C. The slurry is cooked for a specific period by allowing specific retention time in coil. The cooked slurry is pumped to liquefaction tank where liquefying enzyme (Alphaamylase) is added and the starch is converted to dextrin's (Glucose polymer). The converted dextrin's is taken to saccharification tank where saccharifying enzyme (Glucoamylase) is added and the dextrin (glucose polymer) is converted to dextrose (glucose

media). Then the Glucose media is cooled and pumped to fermentation section where the glucose is fermented in the fermenter.

Wet cake from decanter and concentrated Stillage from evaporator is mixed in a tank and taken to the dryer where the maximum amount of moisture is removed and collected as a Distillers Dried Grain Solids (DDGS). It contains 88-90% w/w solids. The DDGS produced from the distillery will be used as a raw material for fish feed plant.

Exclusive sections for Molasses Mode:

- Molasses Bulk Storage Tanks.
- Molasses handling system
- Molasses pumps, pipings and related accessories
- Molasses unloading pit

Common for Grain and Molasses mode

- **Fermentation Section:-** Consisting of fermenter system which can operate on batch mode. This section shall also include molasses weighing, yeast propagation and activation, tank for fermented wash holding etc.
- **Multi Pressure Wash to RS Distillation Section:** Consisting of three column distillation unit with columns operating on different pressures. This will be an automated plant with DCS based instrumentation.
- **Molecular Sieve Dehydration Section:** Two bed molecular sieve dehydration units for the production of Fuel ethanol plant, based on pressure swing adsorption principle.
- **Raw Spent Wash Evaporation Section:** Consisting of an independent falling film and forced circulation or only forced circulation evaporation system. This will achieve spent wash concentration of up to 55 – 60% w/w solids.
- **Condensate Treatment Section –** Based on UASB, aeration, clarification and cross flow membrane technology to recover re-usable water which can be used in process.
- Concentrated spent wash incineration boiler and a matching turbo generator.
- Utilities for the above sections including cooling towers, cooling water recirculation pumps, water treatment plant and instrument air compressor etc.
- **Product Storage Section –** Consisting of alcohol daily receivers, bulk storage, alcohol transfer pumps, delivery meters etc.

2.4.3 Technical details for Co-generation Power Plant

The Cogeneration scheme proposed envisages the addition of one no. of 145 TPH capacity Travelling Grate boiler with the outlet steam parameters of 110 ata and 535 Deg.C, with the feed water inlet temperature of 210 Deg.C. It is also planned to add one extraction (two uncontrolled extractions and one controlled extraction) condensing turbo generator of 28 MW nominal capacity. The Cogeneration plant will be designed with all the auxiliaries for the new 145 TPH boiler and the new 28 MW turbo generator and with all the auxiliary plant and systems like the fuel and ash handling system, Cooling water system, feed water system, Raw water and DM water system, Instrument air system, Electrical system and EHV transmission system for its successful operation.

The scheme is configured to optimize the power generation, by using minimum possible bagasse during the cane crushing season. Addition of the deaerator and high pressure feed water heaters in

the feed water circuit improve the cycle efficiency considerably. Step-down transformers will be provided to step down the 11 kV voltage to 415 V for feeding the sugar and Cogeneration plant equipment and auxiliaries. The surplus power from the turbogenerator will be stepped up to 66 kV for paralleling with PSPCL's Grid The new 28 MW Cogeneration turbine will be provided with a controlled extraction at 3.2 ata for meeting the 2.7 ata process steam requirements of the sugar plant. There will be two uncontrolled extractions, the first one at 22.2 ata, and the second one at 9.5 ata mainly to meet with the High pressure feed water heating requirements. The proposed Cogeneration plant at GCSML will generate an aggregate power of 28000 kW during season. The plant will export 19560 kW during season to the PSPCL's grid after meeting the complete internal requirements for the GCSML's sugar plant, and cogeneration plant (including the losses).

Table 2.12: Design parameters of the proposed Cogeneration power plant

Sr. No.	Design Parameters	Total
1.	Boiler capacity, TPH	145
2.	Pressure, kg/cm^2	110
3.	Temperature, °C	535
4.	Turbine capacity, MW	28
5.	Turbine type	One extraction (two uncontrolled extractions and one controlled extraction) condensing
6.	Season operation, days	150
7.	Fuels used for season operation	Bagasse
8.	Fuel required, TPH	55.33
9.	Feed water temperature, °C	210

Figure: 2.8 Flow diagram of Cogeneration Plant

Cogeneration Scheme at the Distillery

❖ C Molasses based

The figure 2.9 (A) gives the scheme of the Cogeneration plant proposed at GCSML's Distillery during operation of the distillery with C molasses as feedstock. The boiler with the capacity of 45 TPH at 45 ata and 400 +5, -0 Deg.C, firing the concentrated Spent Wash and bagasse. The boiler will be designed for firing 16.71 TPH of conc. spent wash along with 8.34 TPH of bagasse to generate 45 TPH of steam. The entire steam will be fed to the extraction cum condensing Turbogenerator. The extraction will be at a pressure of 5.5 ata just for meeting the requirements of the deaerator, steam air preheater of the boiler, slop heating and for the process. The turbine will be operating with an exhaust pressure of 0.1 ata. with 45 TPH of input steam.

The Turbogenerator generates a gross power generation of 5650 kW. Out of the steam quantity extracted from the turbine, 23.74 TPH will be supplied to the distillery process including evaporator. From the extraction 4.28 TPH will be supplied to the steam coil air Pre heater, 6.75 TPH will be supplied to the deaerator, 0.6 TPH for slop atomizing & purging and 0.4 TPH for ejector. About 85% of the condensate of the steam supplied to the distillery process and the evaporation system returns back to the Cogeneration plant at 60 Deg.C. A make-up of 5.32 TPH is added to the deaerator at 30 Deg.C. The deaerated water temperature is maintained at 150 Deg.C, to eliminate the possibility of low temperature corrosion in the economizer. A steam air-preheater is proposed and the steam consumption in the same will be 4.28 TPH and the steam is drawn from the turbine extraction. The condensate from the steam air-preheater returns to the deaerator. The distribution of the steam generated is indicated in the below diagram:

Figure: 2.9 (A) Distillery Cogeneration Plant

Table 2.13: Design parameters of the proposed Cogeneration power plant

Sr. No.	Design Parameters	Total
1.	Boiler capacity, TPH	45
2.	Pressure, kg/cm^2	45
3.	Temperature, °C	400
4.	Turbine capacity, MW	5.65
5.	Turbine type	Extraction cum Condensing
6.	Season operation, days	150
7.	Fuels used for season operation	Bagasse & Concentrated spent wash
8.	Fuel required, TPH	Bagasse: 17.64
9.	Feed water temperature, °C	150

❖ **Broken rice based**

The figure 2.9 (B) gives the scheme of the Cogeneration plant proposed at GCSML's Distillery during operation of the distillery with broken rice as feedstock. The boiler with the capacity of 45 TPH at 45 ata and 400 +5, -0 Deg.C, firing only bagasse. The boiler will be designed for firing 17.64 TPH of bagasse to generate 45 TPH of steam. The entire steam will be fed to the extraction cum condensing Turbogenerator.

The extraction will be at a pressure of 5.5 ata just for meeting the requirements of the deaerator, steam air preheater of the boiler, slop heating and for the process. The turbine will be operating with an exhaust pressure of 0.1 ata. With 45 TPH of input steam, The Turbogenerator generates a gross power generation of 5300 kW. Out of the steam quantity extracted from the turbine, 27.3 TPH will be supplied to the distillery process including evaporator. From the extraction 4.28 TPH will be supplied to the steam coil air Pre heater, 6.75 TPH will be supplied to the deaerator, 0.6 TPH for slop atomizing & purging and 0.4 TPH for ejector. About 85% of the condensate of the steam supplied to the distillery process and the evaporation system returns back to the Cogeneration plant at60 Deg.C. A make-up of 2.92 TPH is added to the deaerator at 30 Deg.C. The deaerated water temperature is maintained at 150 Deg.C, to eliminate the possibility of low temperature corrosion in the economizer. A steam air-preheater is proposed and the steam consumption in the same will be 4.28 TPH and the steam is drawn from the turbine extraction. The condensate from the steam air-preheater returns to the deaerator.

Figure: 2.9 (B) Distillery Cogeneration Plant

Table 2.14: Design parameters of the proposed Cogeneration power plant

Sr. No.	Design Parameters	Total
1.	Boiler capacity, TPH	45
2.	Pressure, kg/cm^2	45
3.	Temperature, °C	400
4.	Turbine capacity, MW	5.65
5.	Turbine type	Extraction cum Condensing
6.	Season operation, days	150
7.	Fuels used for season operation	Bagasse
8.	Fuel required, TPH	Bagasse: 8.34
9.	Feed water temperature, °C	150

2.5 POLLUTION POTENTIAL AND ITS CONTROL MEASURES

Based on the overall process study / manufacturing details etc. following are the details of pollution potential v/s. mitigation measures for proposed unit by the company in areas of air pollution, wastewater management, hazardous waste handling and management respectively as per the details given below:

2.5.1 Air Environment

Flue gas emission:

- The unit proposes to install one no. of 145 TPH capacity of steam boiler for Sugar Plant & Co-generation Plant. Bagasse will be used as fuel. 65 meters chimney & Electrostatic Precipitator will be installed with the boiler.

- The unit proposes to install one no. of 45 TPH capacity of Slop Fired boiler for Distillery/Ethanol Plant. Concentrated spent wash and Bagasse will be used as fuel. 83 meters chimney & Electrostatic Precipitator will installed with the boiler.
- The unit also proposes to install three numbers of D.G. sets (2 nos. of 1000-kVA capacity each+ 1 no. of 625-kVA capacity) as stand by. Height of chimney will be 6.5 meters above enclosure.

Table 2.15 Details of Flue gas Emission

1. Sugar Plant & Co-generation

Sr. No.	Particulars	Details
1.	**Sugar Plant & Co-generation**	
	Capacity of Steam boiler	145 TPH
	Fuel Used	Bagasse
	Fuel Consumption	Bagasse – 55.33 TPH
	APC provided	Electrostatic Precipitator
	Height of chimney	65
2.	**Capacity of D.G set**	625 kVA (Standby)
	Fuel Used	HSD
	Fuel Consumption	135 lit/hr.
	APC provided	Stack height & Exhaust
	Height of Exhaust	6.5 m. above enclosure
	Expected Emission	PM: <150 mg/Nm^3 SOx: <100 ppm NOx: < 50 ppm

2. Distillery/Ethanol Plant

Sr. No.	Particulars	Details
1.	**Distillery/Ethanol Plant**	
	Capacity of Steam boiler- C Molasses based	45 TPH
	Fuel Used	Concentrated spent wash and Bagasse
	Fuel Consumption	Concentrated spent wash – 16.71 TPH along with Bagasse – 8.34 TPH
	APC provided	Electrostatic Precipitator
	Height of chimney	83
OR		
	Capacity of Steam boiler- Broken rice based	45 TPH
	Fuel Used	Bagasse
	Fuel Consumption	Bagasse - 17.64 TPH
	APC provided	Electrostatic Precipitator
	Height of chimney	83
2.	**Capacity of D.G set**	2 nos. 1000 kVA each (Standby)
	Fuel Used	HSD
	Fuel Consumption	215 lit/hr. for one D.G set
	APC provided	Stack height & Exhaust
	Height of Exhaust	6.5 m. above enclosure
	Expected Emission	PM: <150 mg/Nm^3 SOx: <100 ppm NOx: < 50 ppm

2.5.2 Water Environment

- Total industrial Wastewater Generation will be 2391 KLD, out of which 1320 KLD process water, 218 KLD RO Reject and 44 KLD Floor/equipment washing will be treated in ETP/MEE. 565 KLD from boiler/cooling tower blowdown will be treated in RO. MEE Condensate, 347 KLD RO Permeate, and 59 KLD Boiler Condensate will be recycled. Treated effluent from ETP/MEE will be used for irrigation in farm lands of the unit. Thus, there will be a zero liquid discharge.
- Sewage quantity of 45 KLD will be generated and it shall be treated in STP of 50 KLD capacity. Treated water will be used in gardening within plant premises.

Table 2.16 Wastewater Generation

S.No.	Particulars	Waste Water Generation (KLD)	Treatment
A.	**Domestic**	45	STP
B.	**Industrial**		
1.	Process	1,320	ETP followed by MEE
2.	Boiler	59	RO Plant
3.	Cooling Tower	794	RO Plant
4.	WTP waste (MGF Backwash, DM regeneration & RO Reject)	218	ETP followed by MEE
5.	**Total**	**2,391**	**-**
6.	**Total (A+B)**	**2,436**	**-**
7.	MEE Condensate	1,320	-
8.	RO Permeate	347	-
9.	Boiler Condensate	59	-

2.5.3 Solid / Hazardous / Non-Hazardous Waste

- All the Solid / Hazardous / Non-Hazardous Waste to be generated at the end of manufacturing process or waste treatment process will be packed separately as per approved packing given by Regulatory Authority and will also store in covered RCC storage pits.
- Management of wastes shall be done as per hazardous and other waste (Management and Trans boundary Movement), Rules 2016 of Environment Protection Act, 1986. Solid / hazardous waste generated from plant is mentioned in **Table 2.17.**

Table 2.17 Hazardous waste generation

S. No.	Type of Waste	Category	Quantity	Disposal
1.	Used Oil	Sch: I /5.1	9 kL/A	Generation, collection, storage, and used as lubricant in plant machineries

Table 2.18 Non-hazardous waste generation

S. No.	Type of Waste	Quantity	Disposal
1.	Bagasse Ash	20 TPD	Will be sold to brick manufacturer/ Mixed with pressmud and used as manure
2.	Incineration & Boiler Ash	42 TPD	Will be sold to brick manufacturer/ Mixed with pressmud and used as manure

3.	ETP sludge	1.5 TPD	Will be used for greenbelt development within premises
4.	Yeast sludge	6.0 TPD	Will be used for greenbelt development within premises

2.5.4 Noise Environment

- The sources of noise pollution at the site will be mainly from rotating equipment's, pumps, blowers, D.G. sets (stand-by) etc. General noise levels within plant are expected to remain below 75 dB (A). Rotating equipment & frequently blowing safety valves will be provided with silencers to meet with the norms for the noise levels.
- Hearing conservation program will be implemented. Period audiometric test will be carried out for early detection of hearing losses.
- Use of PPEs like earplugs and ear muffins will be made compulsory near high noise generating areas.
- Industry will develop 1,37,391 sq. m area of greenbelt in and around the periphery of the plant boundary. Greenbelt will help in attenuating the adverse effect of noise pollution in general.

2.6 OCCUPATIONAL HEALTH AND SAFETY

The project proponent is committed towards the health and safety of workers. All the necessary measure will be planned for occupational health of the employees. Safe operating procedures (SOP) for different works / activities will be in place.

Gurdaspur Sugar Mill is committed towards the health and safety of workers. Following key safety measures will be implemented in the proposed plant:

- Safety training using understandable language and vocabulary will be provided to the employees.
- Medical surveillance for the workers working in risk zone will be carried out regularly and annual report of the health status of workers for the same will be maintained
- Safe operating procedures (SOP) for different works / activities will be in place.
- Safe working Environment
- Safety sirens with alarm system in case of emergency will be provided.
- Emergency control room will be established.
- Assembly point will be provided.
- Sprinkler systems will be provided as per requirement.
- Fire hydrant system will be installed.
- Fire extinguishers will be provided.

2.7 IMPLEMENTATION SCHEDULE

Construction activity for proposed project will be started after getting Environmental Clearance (EC) from MoEFCC, New Delhi. It is estimated that proposed project will be completed within 12 months, considering all the necessary permission obtained day as a 1st day of implementation. Project implementation schedule describing various activities from erection to project commissioning is tabulated in **Table 2.19.**

Table 2.19: Project Implementation Schedule

Activity	Starting month	End month	Time Period in month											
			1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
WO for project activities and purchase of machineries and other utilities	1	2												
Construction activities	2	8												
Installation and commissioning of new machineries	9	11												
Unit in operation	12	-												

2.8 POLLUTION SOURCES AND ITS MITIGATION MEASURES

There will be impact due to proposed activities during construction or operation phase. Based on type of activities impacts may be long or short term. Impacts due to generated pollutant may be significant on environmental parameters if not mitigated properly. Project activities and cause of impact along with its characteristics are mentioned in **Table 2.20.**

Table 2.20 Anticipated Impacts during Operation Phase

	Environmental Attributes	Cause	Impact Characteristics			
			Nature	Duration	Reversibility	Intensity and Significance
Transportation (Vehicle Movement) and utilities operation	Air Quality	Stack & Exhaust Emissions i.e. NOx, SOx and PM. Fugitive emission	Negative	Short Term	Irreversible	**Low:** • Due to vehicular movement only for loading / unloading of raw material and finished goods during crushing season. • Development of concrete roads. • Provision of APC's.
	Noise Levels	Noise Generation	Negative	Short Term	Irreversible	**Low:** • Due to limited activities and using noise reduction devices in Plant & machineries. • Provision of PPEs.
	Risk and Hazards	Failure of transport vehicles. Explosion during operation of utilities.	Negative	Short Term	Irreversible	**High:** • Due to loss of life & property • Damage to Environment
Product and raw material handling, storage and processing	Noise Levels	Noise Generation from process machineries and reaction vessels	Negative	Long Term	Irreversible	**Low**: • Due to regular maintenance of process, storage equipments/machineries and using noise reduction devices • Provision of PPEs
	Air Quality	Flue gas generation	Negative	Long Term	Irreversible	**Low:** • Due to installation of ESP and adequate stack height to boilers
	Risk and Hazards	Catch fire accidents	Negative	Short Term	Irreversible	**High:** • Due to manpower injury, fatal accidents and loss of properties.
		Leakage and spillage from pipelines or storage containers	Negative	Short Term	Irreversible	**High:** • Due to corrosion, leaching, burn injuries and loss of properties.
		BLEVE effect, amputation and fall injuries	Negative	Short Term	Irreversible	**High:** • Due to various operational activities manually as well as mechanically.
	Water Quality	Process water, Floor washing due to spillage / leakage from	Negative	Short Term	Reversible	**Low:** • Due to proper treatment, storage,

	Environmental Attributes	Cause	Impact Characteristics			
			Nature	Duration	Reversibility	Intensity and Significance
		raw material or products handling				loading / unloading practice, regular maintenance of process equipment's and machineries. • Well-designed internal drainage system • Zero Effluent Discharge scheme.
Solid/ Hazardous Waste Disposal	Land and Soil	Generation of Solid Waste	Negative	Short Term	Reversible	**Low:** Proper collection and maximum utilization within plant.
Green Belt Development	Ecology	Planting of Trees	Positive	Long Term	Reversible	**High:** Positive Impact
	Air Quality	Dust barrier	Positive	Short Term	Reversible	**Medium:** Positive Impact
	Noise	Noise barrier	Positive	Short Term	Reversible	**Medium:** Positive Impact
	LU / LC	Conservation of Land	Positive	Long Term	Reversible	**Medium:** Positive Impact
	Soil	Increase in soil fertility	Positive	Long Term	Irreversible	**Medium:** Positive Impact
	Water	Water consumption	Negative	Long term	Irreversible	**Low:** Due to water circulation & recycle
Employment Generation	Socio Economic Status	Direct and Indirect employment	Positive	Long term	Irreversible	**High:** The project will generate substantial employment from nearby areas.

2.9 SUMMARY

The Gurdaspur Cooperative Sugar Mills Ltd. is planning to set-up a new 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant at Paniar Village, Dist. Gurdaspur, Punjab-143531.Total cost of the proposed project will be Rs. 665.24 Crores. Proposed project will be developed in 3,92,545 m^2 area.

As per the amended EIA Notification-2006: proposed project is covered under the 5(g), 5g(a), 1(d) & 5(j) Category-'A'. Hence, Environmental clearance is required.

Total power requirement for the proposed project will be 11.9 MW. Power supply will be from own 33.65 MW Co-generation Power Plant & Punjab State Power Corporation Limited. Surplus power will exported to PSPCL's Grid.

The total fresh water requirement will be 2887 KLD which will be met by own water reservoir.

Total industrial Waste Water Generation will be 2391 KLD. The plant will operate with zero effluent discharge scheme. Sewage quantity of 45 KLD will be generated and it shall be treated in STP of 50 KLD capacity. Treated water will be used in gardening.

100 - 125 nos. of people will get direct employment during construction phase and around 332 nos. technical people will get direct and other contractor worker will get indirect employment during operation phase.

Management of generated wastes will be done as per HW (Management, Handling and Tran's boundary Movement) rules, 2016.

CHAPTER 3

DESCRIPTION OF THE ENVIRONMENT

3.0 GENERAL

The term 'baseline' refers to conditions existing before development against which subsequent changes can be referenced. Environmental parameters during a pre-project period is considered for the purpose of determining the range of variation of the system and establishing reference points against which changes can be measured.

Baseline Monitoring studies are carried out to:

- Identify environmental conditions which might influence project design decisions (e.g. site layout, structural or operational characteristics);
- Identify sensitive issues or areas requiring mitigation or compensation;
- Collect input data for analytical models and predict effects due to proposed project;
- Provide proposed environmental monitoring programs.

The proposed project is for setting up the new 5000 TCD sugar plant along with the 33.65 MW co-gen plant and 120 KLPD distillery/ethanol plant. Before operation of the new plant the existing 2000 TCD sugar plant will be completely demolished. Looking at the project activities, it is assumed that there will be chances of impact on ambient air, noise environment, soil environment, water environment, ecology & biodiversity and socio-economic aspects.

Present baseline environmental study has been carried out for the study region within 10 km radius from the project site for the environmental components viz. Ambient Air Quality, Noise Environment, Land Environment, Geology & Hydrogeology, Water Environment, Ecology & Biodiversity and Socio-economic Environment. An exhaustive attempt has been made in the current chapter to disclose all possible baseline status of environmental quality in the study area, which further serves as the basis for identification, prediction and evaluation of impacts. Villages covered within study region are shown in the **Figure 3.1.**

Figure 3.1: Study Area Map

3.1 BASELINE STUDY AREA AND PERIOD

The baseline environmental study has been conducted for the study region within 10 km radius of the Project Site for the period from 1st December 2021 to 28th February 2022.

3.2 METHODOLOGY

Locations were decided for the survey and monitoring of the study area. Before the selection of locations, a desktop study was carried out to select the sampling locations in such a way so that they can be selected as per the survey guidelines of various agencies like CPCB and BIS. To identify the feasibility of monitoring locations, field area experts had visited the sites and they had submitted their site visit reports with respect to suitability of locations for monitoring/ survey. After the submission of survey report locations were finalized for starting the monitoring and survey. Looking to the extent of impact, 5 km radius was considered as core zone and rest 5 km radius was considered as buffer zone. All the locations have been selected within 10 km radius from the project site as per the requirement of TOR and environmental samples were collected from the selected locations of the study area. Before starting the survey activity for ecology and bio-diversity, secondary data were used as reference during the desktop survey for listing the species of study zone and planning the survey. In case of socio economy, secondary data have also been used for deciding the parameters to be surveyed during socio economic data collection. As a secondary source of data, for Ecology and Biodiversity survey various publications by the government of India and literature available on internet site were used.

3.2.1 Frequency of Sampling

Details of frequency of environmental sampling considered for the study are illustrated in **Table 3.1**.

Table 3.1: Frequency of Environmental Monitoring

Attributes	Sampling		
	Locations	Parameters	Frequency
A. Air Environment			
Micro-meteorological Data	--	Temperature, Relative Humidity, Precipitation, Wind direction, Wind Speed.	Hourly data for the period 1st December 2021 to 28th February 2022
Ambient Air Quality	8 numbers of locations in the study area of 10 km radius.	$PM_{2.5}$, PM_{10}, SO_2, NO_x, CO	24 hour basis, twice a week during study period
B. Noise	8 numbers of locations in the study area of 10 km radius.	Noise Levels in dB (A).	Once in Study Period.
C. Water			
Ground Water	Samples from 8 numbers of locations within 10 km radius from the project site.	Physical, Chemical, Microbiological and Heavy Metal.	Once in Study Period.
Surface Water	Samples from 2 numbers of locations within 10 km radius from the project site.	Physical, Chemical, Microbiological and Heavy Metal.	Once in Study Period.
D. Soil Quality	Samples from 8 numbers of locations within 10 km radius from the project site.	Physical, Chemical Characteristics, Soil Texture.	Once in Study Period.

3.2.2 Method of Environmental Sampling and Analysis

The methods adopted for environmental sampling and analysis are illustrated in following **Table 3.2.**

Table 3.2: Method of Environmental Sampling and Analysis

Attributes	Methods	
	Sampling/Preservation	Analysis/data analysis
A. Air Environment		
Micro-meteorological Data	Data collected on hourly basis using wind monitor as per CPCB Guideline.	IS 8829 and CPCB Guideline
Ambient air quality	As per IS: 5182, CPCB & AWMA.	As per IS:5182, CPCB & AWMA
B. Noise	Instrument: Sound level meter	IS 9989 & CPCB guideline.
C. Water		

Ground Water, Surface Water & Marine Water	Standard Methods for Examination of Water and Wastewater, 23rd edition, APHA 2017.	IS 3025 & Standard Methods for Examination of Water and Wastewater, 23rd edition, APHA 2017.
D. Soil Quality	IS 2720, Soil Testing in India (Department of Agriculture & Cooperation).	IS 2720, Laboratory developed Method as per NABL requirement and Book - Soil Testing in India (Department of Agriculture & Cooperation).

3.3 MICROMETEOROLOGY

The prevailing micrometeorological condition at project site plays an important role for the prediction regarding the transport and dispersion of air pollutants. Micrometeorological data were collected by using the wind monitor as per CPCB guideline which was installed at the project site to collect the data for temperature, relative humidity, wind speed, wind direction and precipitation. All the micrometeorological data were collected on hourly basis. Data for precipitation was nil, as it was dry season. Minimum-maximum data for temperature, relative humidity and wind speed of the study area are presented in **Table 3.3.**

Table 3.3: Meteorological Condition of Study Area

Month	Temperature (^oC)		Relative Humidity (%)		Wind Speed (km/hr)	
	Min.	Max.	Min.	Max.	Min.	Max.
December '21	2.5	23.5	36.0	100.0	0.0	9.0
January '22	3.0	21.0	50.0	100.0	0.0	18.0
February '22	15.0	36.0	21.0	96.0	0.0	10.0

3.3.1 Temperature

During the study period minimum temperature was recorded 2.5 ^oC on 18th day of December, 2021 and maximum temperature was recorded as 36.0 ^oC on 23rd day of February, 2022. Temperature data were collected on hourly basis during the study period. Variation of temperature is graphically presented in Figure 3.2.

3.3.2 Humidity

Humidity affects the nature and characteristics of pollutants in the atmosphere as it is the measure of amount of moisture in the atmosphere. Humidity helps suspended particulate matter to coalesce and grow in size to settle under the gaseous pollutants by providing them aqueous medium. During the study period minimum Humidity was recorded 21% on 28th day of February, 2022 and maximum Humidity was recorded as 100% on several days in the study period. The variation in humidity is represented graphically in Figure 3.3.

3.3.3 Wind Speed and Wind Direction

Hourly wind speed data were collected for the period 1st December 2021 to 28th February 2022 with the help of wind monitor. The rate of dispersion, diffusion and transportation of pollutants in the atmosphere mainly depend on wind speed and its direction. Wind direction and velocity data have been collected during the study period. Dominant wind directions in the study period were from N - S during the study period. Wind speed was observed from 0.0 to 9.0 km/hr. in the month of December 2021, 0.0 to 18.0 km/hr. in the month of January 2022 and from 0.0 to 10.0 km/hr. in the Month of

February 2022. Minimum detection range of the wind speed for the wind monitor was 0.1 km/hr. and data below the minimum detection range has been considered as 0.0 km/hr. Month-wise maximum and minimum wind speed data are tabulated in **Table 3.3.**

3.3.4 Wind Rose

Wind rose diagram is a graphical representation of the magnitude and direction of wind speed considering all the directions. From the knowledge of wind rose one can easily predict the direction and extent of spreading of the gaseous and particulate matter from the source. Wind rose diagram has been prepared by using hourly wind velocity and dominant wind direction data and is presented in **Figure 3.4.**

Figure 3.2 Graphical Presentation for the month wise Temperature Variation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
|---|---|---

Figure 3.4 Wind Rose Diagram

3.3.5 Interpretation of Micrometeorological Data

Dominant wind direction was N to S. Wind speed was observed from 0.0 to 18.0 km/hr., where minimum detection limit of wind monitor was 0.1 km/hr. Calm condition was approx. 25.00 % of total data collected for wind speed. Based on wind direction and wind speed; it is interpreted that the chances of maximum dispersion of air pollutant will be in S direction during the period of December 2021 to February 2022. Comparative study for micrometeorological data was conducted with the past 10 years' data available on internet site timeanddate.com and it was noticed that all meteorological parameter follows the almost similar trend and there was no considerable change in the micrometeorological data..

3.4 AIR ENVIRONMENT

Air is essential requirement for the entire living organism on the earth. There is a large deterioration on air environment due to industrial process and flue gas emission. In general, air quality is being deteriorated day by day due to the anthropogenic activities and burning of non-conventional fuels. Ambient air quality data may be helpful for deciding the condition of air as well as in mitigating the impacts on air. Ambient air quality monitoring was carried out for the assessment of the existing status of background air quality in the study area. This will be useful for assessing the conformity of the ambient air quality to the standards even after commencement of the proposed project.

3.4.1 Selection of Sampling Locations

Following points were considered during the selection of Ambient Air Quality Monitoring locations.

- Topography/terrain of the study area,
- Densely populated areas within the region,
- Location of surrounding Industries,
- Representation of regional background,
- Facility for Ambient Air Monitoring,
- Representation of valid cross – sectional distribution in downwind direction,
- Avoidance of proximity of roads, construction activity or any other perturbing activity which may be temporary in nature, which may lead to some erroneous conclusions.
- Availability of manpower, electricity, approach, sturdy structure and protection of samplers.
- Dominant Wind Direction.

To establish the baseline status around the project site of the study region, monitoring was conducted for 8 numbers of locations within the study region during the period of 1st December 2021 to 28th February 2022. At the time of location selection previous micrometeorological data available on the internet site worldweather.com was referred and general wind pattern in the study region was considered for the selection locations so that minimum one location can be established in the upwind direction and maximum locations in downwind direction. In this particular case, 1 no. of location has been selected at project site, 2 nos. of locations have been selected in upwind directions and 2 nos. of locations has been selected in downwind direction, remaining 3 nos. locations have been selected in the crosswind direction. The locations were selected in/surrounding the human settlement within the study area. Sampling team was appointed with one FAE and Technical Assistant to carry out Ambient Air Quality Monitoring for 8 numbers of locations within 10 km radius from the project site.

Ambient Air Quality monitoring locations are presented in **Figure 3.5** and **Table 3.4.** The photographs of ambient air quality monitoring locations are presented in **Figure 3.6**.

Figure 3.5 Map showing the Study Region location of Ambient Air

Table 3.4: Ambient Air Quality Monitoring Locations for Study Region

Code	Location	Distance/Direction	Latitude and Longitude	Selection Criteria
A1	Project Site	--	32° 5'29.94"N 75°27'36.95"E	--
A2	Sahowal	2.18 km / SE	32° 4'37.68"N 75°28'32.71"E	Crosswind
A3	Saidipur	8.90 km / N	32°10'17.55"N 75°28'8.36"E	Upwind
A4	Talwandi	6.91 km / NNE	32° 9'6.30"N 75°28'46.71"E	Upwind
A5	Bhola	3.41 km / W	32° 5'44.11"N 75°25'27.92"E	Crosswind
A6	Paniar	1.24 km / WSW	32° 5'25.92"N 75°26'49.98"E	Crosswind
A7	Mokha	3.70 km / S	32° 3'30.28"N 75°27'49.18"E	Downwind
A8	Bhangwan	5.57 km / S	32° 2'29.10"N 75°27'29.77"E	Downwind

Project Site (A1)

Sahowal (A2)

Saidipur (A3)

Talwandi (A4)

Bhola (A5)

Paniar (A6)

Mokha (A7) **Bhangwan (A8)**

Figure 3.6: Photographs of Ambient Air Quality Monitoring Locations

3.4.2 Frequency and Parameters for Sampling

Samples were collected on 24 hr. basis for PM2.5, PM10, SO_2, NOx, CO. Duration of sampling was decided as per the CPCB guideline and probability of concentration for said parameters. After the completion of sampling, samples were brought to the laboratory in ice box and filter box for analysis. Frequency of sampling was twice a week during study period.

3.4.3 Methodology for Sampling and Analysis

Samples were collected by using the PM10 and PM2.5 micron dust sampler. Reference of sampling and analysis are presented in Table 3.5.

Table 3.5: Details of Analysis Method

Sr. No.	Parameters	Test Method
i.	Particular matter ($PM_{2.5}$)	SOP No. WI/5.4/02-B/03, Issue No.1 Date:01/01/2010, CPCB Guideline
ii.	Particulate Matter (PM_{10})	IS 5182 (Part 13):2006/Reaffirmed 2012
iii.	Sulphur Dioxide (SO_2)	IS 5182 (Part 2):2001/Reaffirmed 2012
iv.	Oxide of Nitrogen (NO_x)	IS 5182 (Part 6):2006
v.	Carbon monoxide (CO)	Methods of Air Sampling & Analysis AWMA, APHA (CO Analyser)

3.4.4 Quality of Ambient Air

Minimum, maximum, average and 98th percentile values for the parameters PM2.5, PM10, SO_2, NO_X and CO are tabulated in Table 3.6 to describe the quality of Ambient Air.

Table 3.6: Summary of Ambient Air Quality Result

Location	Statistics	PM10 µg/m^3	PM2.5 µg/m^3	SO_2 µg/m^3	NO_2 µg/m^3	CO mg/m^3
A1	Minimum	64.9	38.9	5.2	10.6	<1.00

Location	Statistics	PM10 µg/m^3	PM2.5 µg/m^3	SO_2 µg/m^3	NO_2 µg/m^3	CO mg/m^3
	Maximum	75.1	45.1	7.3	13.4	<1.00
	Average	69.8	41.9	6.5	12.4	--
	98th Percentile	74.9	44.9	7.3	13.4	--
A2	Minimum	63.1	38.0	5.0	10.3	<1.00
	Maximum	73.0	43.9	7.0	13.2	<1.00
	Average	67.7	40.7	6.3	12.1	--
	98th Percentile	72.9	43.9	7.0	13.1	--
A3	Minimum	62.3	37.9	5.3	10.7	<1.00
	Maximum	73.2	43.8	7.7	13.6	<1.00
	Average	67.3	40.5	6.6	12.6	--
	98th Percentile	72.6	43.7	7.5	13.6	--
A4	Minimum	63.0	37.7	5.2	10.5	<1.00
	Maximum	73.6	43.6	7.3	13.2	<1.00
	Average	68.0	40.5	6.4	12.2	--
	98th Percentile	73.2	43.4	7.2	13.2	--
A5	Minimum	63.2	37.8	4.9	10.5	<1.00
	Maximum	73.9	43.7	7.2	13.2	<1.00
	Average	68.3	40.7	6.2	12.2	--
	98th Percentile	73.4	43.6	7.1	13.2	--
A6	Minimum	63.7	38.3	5.1	10.0	<1.00
	Maximum	74.3	44.2	7.2	12.9	<1.00
	Average	68.8	41.1	6.3	11.8	--
	98th Percentile	73.9	44.1	7.1	12.8	--
A7	Minimum	64.4	38.6	5.1	10.5	<1.00
	Maximum	74.8	44.5	7.2	13.2	<1.00
	Average	69.3	41.5	6.3	12.2	--
	98th Percentile	74.5	44.5	7.1	13.2	--
A8	Minimum	64.2	38.2	5.1	10.2	<1.00
	Maximum	74.2	44.3	7.2	13.0	<1.00
	Average	68.9	41.2	6.2	12.0	--
	98th Percentile	74.1	44.2	7.0	13.0	--
NAAQS Standard		**100.0**	**60.0**	**80.0**	**80.0**	**2.00**

3.4.5 Summary of Ambient Air Quality

- During the study $PM_{2.5}$ was observed in the range of 37.7-45.1 µg/m^3. Maximum concentration of $PM_{2.5}$ was found at Project Site and minimum at Talwandi Village.
- PM_{10} was observed in the range of 63.3-75.1 µg/m$^{3.}$ Maximum concentration of PM_{10} was found at Project site and minimum at Saidipur Village.
- SO_2 concentration was observed in the range of 4.9-7.7 µg/m^3, which is well within the standard limit.
- NO_x concentration in was observed in the range of 10.0-13.6 µg/m^3, which is well within the standard limit.
- CO was found in the range of below the detection limit except the project site and the same is well within the limit as per NAAQS.
- Results of all the parameters are found within the NAAQS permissible limit.

3.4.6 Interpretation of Ambient Air Quality Data

All the results of ambient air quality parameters have been found within the limit as per NAAQS standards. Based on comparison study of results for tested parameters with NAAQS, it is interpreted that current ambient air quality of studied locations is well within the NAAQS limits and it can be considered satisfactory based on AQI index calculated. This interpretation is considered based on the results found for particular locations during the specific study period. The project will be developed on the private land and the nearest habitat to the project lies about 1 km project from the project. Due to the usage of the solid fuel in the boiler, there might be the chances of the incremental change in the current ambient air quality.

3.5 NOISE ENVIRONMENT

The objective of the baseline noise survey was to identify existing noise sources and to measure background noise levels at the sensitive receptors within the study area. Peoples' perception of noise varies depending on number of factors including their natural sensitivity and hearing ability, past experience of sound, cultural factors and the time of day at which sound is experienced. Continuous sound is perceived quite differently from intermittent sound at the same level. High or continuous noise levels may cause permanent loss of hearing ranging from reduced perception at certain frequencies to total deafness. At comparatively lower levels noise may have psychological effects including disturbance of sleep, annoyance and irritation.

3.5.1 Sources of Noise Pollution

The sources of noise pollution in the study area are industrial noise, noise due to commercial activities, noise generated by Community, Vehicular traffic etc.

3.5.2 Noise Level in the Study Area

Keeping in view of various local activities such as residential, commercial, agricultural and industrial activities, noise level monitoring was carried out with the help of sound level meter at 8 different locations. The locations are away from the major roads and major noise sources so as to measure the ambient noise levels. One-day monitoring was carried out at all the locations. Noise sampling

locations are presented in **Figure 3.7** and **Table 3.7**. Analysis results are presented in **Table 3.8** and **Table 3.9**. Photographs of noise monitoring during the study period is presented in **Figure 3.8**.

Figure 3.7: Map Showing the Study Region for Noise Locations

Table 3.7: Noise Monitoring Locations in the Study Region

Code	Location	Distance/Direction w.r.t to Project Site	Latitude and Longitude	Selection Criteria
N1	Project Site (Nr. Main Gate)	--	32° 5'36.95"N 75°27'27.50"E	Industrial Area
N2	Project Site (Nr. Admin Building)	--	32° 5'34.01"N 75°27'35.36"E	Industrial Area
N3	Project Site (Nr. Utility Area)	--	32° 5'36.24"N 75°27'36.32"E	Industrial Area
N4	Bhola	3.44 km / W	32° 5'42.51"N 75°25'27.18"E	Silence Area
N5	Gulla	2.73 km / SW	32° 4'31.45"N 75°26'26.43"E	Silence Area
N6	Sahowal	2.13 km / SE	32° 4'39.38"N 75°28'32.02"E	Silence Area
N7	Paniar	1.19 km / WSW	32° 5'29.77"N	Silence Area

Code	Location	Distance/Direction w.r.t to Project Site	Latitude and Longitude	Selection Criteria
			75°26'53.31"E	
N8	Rauwal	1.39 km / NE	32° 5'58.14"N 75°28'24.26"E	Silence Area

c

Project Site (Nr. Main Gate) (N1)

Project Site (Nr. Admin Building) (N2)

Project Site (Nr. Gardening Area) (N3)

Bhola (N4)

Gulla (N5)

Sahowal (N6)

Paniar (N7)

Rauwal (N8)

Figure 3.8: Photographs of Noise Monitoring at various locations

Table 3.8: Noise Monitoring Report during day time

Code	L_{min} dB	L_d dB(A)	L_{max} dB	Limit dB(A) as per Noise Pollution (Regulation and Control) Rules, 2000
N1	59.1	61.4	64.8	**75**
N2	58.2	60.8	63.4	**75**
N3	58.8	61.2	64.4	**75**
N4	47.3	48.6	49.3	**50**
N5	48.2	48.8	49.4	**50**
N6	47.9	48.9	49.2	**50**
N7	47.2	48.6	49.1	**50**
N8	48.1	48.7	51.2	**50**

Table 3.9: Noise Monitoring Report during night time

Code	L_{min} dB	L_n dB(A)	L_{max} dB	Limit dB(A) as per Noise Pollution (Regulation and Control) Rules, 2000
N1	53.9	56.4	59.2	**70**
N2	52.8	55.4	58.1	**70**
N3	53.5	55.8	58.9	**70**
N4	42.6	43.2	43.8	**45**
N5	43.2	43.8	43.9	**45**
N6	42.9	43.4	43.4	**45**
N7	42.2	43.6	43.1	**45**
N8	43.1	43.9	44.7	**45**

Note: Day time –6.00 am to 10.00 pm, Night time – 10.00 pm to 6.00 am

Table 3.10 Ambient Noise Monitoring Standards for Different Areas/Zones

Regulation	Category	Limits in dB(A) L_{eq}	
		Day Time	Night Time
The Noise Pollution (Regulation and Control) Rules, 2000 and its subsequent amendments	Industrial	75.0	70.0
	Commercial	65.0	55.0
	Residential	55.0	45.0
	Silence	50.0	45.0

Note:

- Leq denotes the time weighted average of the level of sound in decibels on scale A, which is relatable to human hearing. Day Time: 6:00 AM to 10:00 PM and Night Time: 10:00 PM to 6:00 AM.
- Area comprising not less than 100 m around Hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority.

3.5.3 Summary of Noise Data

- Average noise level was recorded 60.8 dB (A) to 61.4 dB (A) at Project Site during day time and it is 55.4 dB (A) to 56.4 dB(A) during night time.
- Average noise level was recorded 48.6 to 48.9 dB(A) at silence zone during day time and it is 43.2 to 43.9 dB(A) during night time.

3.5.4 Interpretation of Noise Data

Out of total 8 nos. of locations for noise monitoring 3 nos. of locations are monitored in the existing industry and 5 nos. of locations are monitored in surrounding villages within 3-4 km radius from the project site. Noise level in all the locations are within the standard norms prescribed by MoEFCC. Noise level measured at villages is mainly due to vehicular movements of local people located within and nearby the villages. The nearby village surrounding to the project site is about 1 km away from the project site and results of the same are found within the prescribed norms during the baseline survey. Due to the project activities, there might be chances of incremental value in the noise levels due to increase in vehicular movement & plant activities. The interpretation can be considered based on the baseline survey conducted during the study period.

3.6 LAND ENVIRONMENT

3.6.1 Land Use Pattern of the Study Area

Studies on land use aspects of eco system play an important role to identify sensitive issues and to take appropriate action for maintaining ecological homeostasis in the region. The main objective of this section is to provide a baseline status of the area, so that temporal changes due to the proposed project on the surroundings can be assessed in future.

Data Used: United States Geological Survey (USGS) Satellite Data: Land sat 8 cloud free data has been used for Land use /Land cover analysis, Satellite Sensor–OLITIRS multi-spectral digital data has been used for the preparation of land use/ land cover map of present study. Survey of India reference map on 1:50,000 scales have been used for the preparation of base map and geometric correction of satellite data. Ground trothing has been carried out to validate the interpretation accuracy and reliability of remotely sensed data, by enabling verification of the interpreted details and by supplementing with the information, which cannot be obtained directly on satellite imagery.

Methodology: The methodology used for the study consists of following components.

Methodology Adopted for Thematic Data Extraction from the Satellite Imageries

ERDAS image processing 10.0 software and ARC/GIS 10.0 software were used for the project. ERDAS 10.0 image processing software was used for digital processing of the spatial data. Digital image processing techniques were applied for the mapping of the land use land cover classes of the provided area from the satellite data. Methodology used for land use classification and mapping is presented in **Figure 3.9**. Land use map is presented in **Figure 3.10**. Land Use Statistic (10 km) is presented in **Figure 3.11** and **Table 3.11.**

Figure 3.9 Methodology Used for Land use Classification

Figure 3.10: Land Use Map of the study area

Table 3.11: Land use Statistics (10 km)

%	Area Sq. km	Land Use	Land Cover	Area Sq. km	%
32.88	103.30	Range Land	Vegetation	12.50	3.98
			Tree Clad	26.08	8.30
			Scrub Land	33.54	10.68
			Grass Land	31.19	9.93
60.71	190.71	Agriculture	Fallow Land	69.31	22.06
			Crop Land	121.39	38.64
1.33	4.18	Waterbody	Waterbody	4.18	1.33
1.60	5.02	Barren Land	Barren Land	5.02	1.60
3.49	10.95	Settlement	Settlement	10.95	3.49
100	**314.15**	**Total**		**314.15**	**100**

(Source: Land use mapping and primary survey of the area)

Figure 3.11: Land use Statistics (10 Km)

Figure 3.12: Elevation Map

3.6.2 Drainage Map

A drainage Map describes that an area of land where all surface water from rain or from some other sources converges to a single point at a lower elevation, usually the exit of the basin, where the waters join another body of water, such as a river, lake, reservoir, estuary, wetland, sea, or ocean. This map tool is used to search for documents while viewing map features. Drainage Map of studied region is presented in **Figure 3.13**.

Figure 3.13: Drainage Map

3.6.3 Summary

The area surrounding the project site is largely by Agricultural Land including Crop land and Fellow Land, which is covering around 38.64% & 22.06% respectively of the total study area. Range Land Including Vegetation, Trees Clad, Scrub Land & Grass Land is covering around 3.98%, 8.30%, 10.68% & 9.93% respectively of the total study area. Water Body is covering around 1.33% of the total study area. Barren Land & Settlement is covering around 1.60% & 3.49% respectively of the total study area. Based on the land use statistics, the proposed project will not affect any land use pattern of the site location and hence, there will be no change in the land use pattern of the area, as the land has already been acquired by the industry.

3.7 GEOLOGY

All the Tehsils of the district namely Gurdaspur, Batala and Dera Baba Nanak are plain and similar to the rest of the Punjab plains in structure. The land scape of the district has varied topography

comprising undulating plan, the flood plains of the Ravi and the Beas and the upland plain. To its south lies an area of about 128 sq. kms which is highly dissected and is an undulating plain. Its elevation ranges from about 305 to 381 metres above sea level. It is traversed by a number of chaos and has an undulating topography. The flood plains of the Ravi and the Beas are separated from the upland plain by sharp river cut bluffs. They are low lying, with slightly uneven topography. Sand dominates in the soil structure of the flood plains, but it diminishes in both quantity and coarseness in the upland plain. The upland plain covers a large part of the district particularly. Its elevation ranges from about 305 metres above sea level in the north-east to about 213 metres above sea level in the south west, with a gentle gradient of about 1 metre in 1.6 km. This is the most important physiographic unit in the district.

The soils of the Gurdaspur district are loamy with a clay content below 10 percent. They contain small quantities of lime but the magnesia content is high. They are well supplied in potash and phosphoric acid but the quantities available are low. The agriculture is dependent to a large extent on the nature of its soils which in turn, is influenced materially by climatic factors. The soil of the district is quite alluvial and fertile. The district consists of three kinds of soils viz, Riarki, Bangar and Bet. The area of Dhariwal Ghuman, Qadian, Harchowal and Sri Hargobindpur is called Riarki. The western side of Kahnuwan lake up to Aliwal canal is called Bangar and the area between the rivers of Beas and Ravi is known as Bet. Near about 300 villages of the district fall in Bet Area. The cultivable waste land is fallow or covered with bushes or jungle which may not be put to any use. Lands under that ching grass bamboo, bushes, tree crops etc. which are not included under forests have been considered as cultivable waste.

3.7.1 Hydrogeology

The main aquifer group of the area is thick granular zones alternate with thick or thin clay lenses. The fresh aquifer is water table and extends all over the area is composed of coarser sediments. In the north eastern and northern part, there are 5-6 aquifers within 300m depth and ranges in the thickness from 20-65 m. These granular zones are laterally extensive in nature and composed of medium to coarse sands with gravel and pebbles cobbles etc. The clay beds area 5-12 m thick.

In the central part 5-6 prominent granular zones have been encountered within the depth of 375m bgl. The thickness of granular zones is variable from 20-95m and the clay beds varies from 3-14m thick.

Water levels of the area in pre monsoon period varies from 2.39 (Khani Khui) to 18-93. The shallowest water level area in the eastern and north eastern portion of Gurdaspur town. The deepest water levels are around Shri Hargobindpur and Fatehgarh Churrian. In the same way the post monsoon water levels are variable from 1.70 m (Behram pur) to 16.76 m (Sri Hargobindpur). By comparing the pre monsoon and post monsoon water levels, it is seen that area above 10m depth to water is quite reduced around Kalanaur and Sri Hargobindpur but the area of Dhar kalan block does not show much changes in the water levels because of Kandi /Siwaliks system and Hilly terrain. In the same way the area under water level in range of 2-5 m around Guurdaspur, Dinanagar, Narot Jaimal Singh is increased. It shows that there is extensive recharge by Ravi and Beas during monsoon.

Figure 3.14: Depth of Water Level (Pre-monsoon & Post-monsoon)

The monitoring of long term fluctuation for ten years reveals that in the pre monsoon period overall trend is declining in the ranges of 0.10 (Dinanagar) to 2.40 m/yr. (Quandian), where as in post monsoon the trend is declining to the tune of 0.66m (Pardori talab) to 6.39 m (Dhianpur). The pre monsoon trend of 0.10 - 2.4m/yr is very nominal and in the post monsoon 6.6 cm/yr to 64 cm/yr. From the above trend it seems that the Ravi & Beas are continuously recharging the area during pre-monsoon period because of perennial nature and in post monsoon the flow of the river is less here less recharge showing decline in water levels.

Source: CGWB, Gurdaspur District

3.7.2 Rainfall

The normal annual rainfall of the area is 1113mm which is unevenly distributed over Gurdaspur district. The south western monsoon (July to Sept) contributes about 80% of the rainfall and rest 20% occur during the non-monsoon period. The rain falls in the district increases from south west to north east. The highest annual rainfall of 1443mm i.e., 30% more than the normal was recorded in 1988 and lowest 615mm i.e. 44% less than the normal was experienced 1989.

3.7.3 Geomorphology and Soils

River Ravi, Beas, Chakki Khad and Sakki nala are the main drainage features of the district. Apart from the above small local nalas and called choes are the frequent features in the northern side of the district which ultimately in the northern side of the district which ultimately meets the main khads

and aluminates ultimately to the rivers Beas and Ravi. The district can be divided into three geomorophological Types-Hilly area, Piedmont zone and alluvial plain. Hilly area is predominately on the NE part of the district and called Siwalik which are mainly clays and clay with boulders. Dharkalan block is predominantly covered by hilly terrain, Piedmont comprises pebbles, cobbles drain from the Siwalik along with sand of medium to coarse grained gravel. The alluvial plain is sand intercalated with little clays deposited by mean dry rivers of Ravi and Beas

3.8 TRAFFIC STUDY

Traffic surveys aim to capture data that accurately reflects the real traffic situation in the area. It may be counting the number of vehicles using a road or collecting journey time information. Any development/Expansion of commercial project, directly or indirectly affect the traffic. Proposed project is adjacent to National Highway 54. Proposed project will attract to commercial vehicles as a result traffic load will also increase on highways. Traffic data helps in planning and design of road construction, renovation or maintenance works, and for assessing the economic feasibility of future road works. To assess the traffic load, 4 no. of surveyors were appointed to survey for National Highway 54.

Traffic data collected continuously for 24 hours by visual observation and counting of vehicles under three categories, viz., heavy motor vehicles, light motor vehicles and two/three wheelers. As traffic densities on the roads are high, two persons were deployed simultaneously at each station during each shift- one person on each of the two directions for counting the traffic. At the end of each hour, fresh counting and recording was undertaken. Total numbers of vehicles per hour under the three categories were determined. Traffic study is conducted on National Highway 54.

Figure 3.15: Photograph of traffic survey at NH-54

Table 3.12: Traffic Study Report

S. No.	Vehicles Distribution	No. of Vehicles/Day	Passenger Car Unit (PCU)	Total No. of Vehicle in PCU	Total No. of Vehicle (PCU)/Hour
		NH-54		NH-54	NH-54
1.	Cars	13208	1.0	13208	550
2.	Buses	2458	3.0	7374	307
3.	Trucks	2568	3.0	7704	321

S. No.	Vehicles Distribution	No. of Vehicles/Day	Passenger Car Unit (PCU)	Total No. of Vehicle in PCU	Total No. of Vehicle (PCU)/Hour
		NH-54		NH-54	NH-54
4.	Two wheelers	4328	0.5	2164	90
5.	Three wheelers	843	0.75	632	26
Total		**23405**	**--**	**31082**	**1294**

Table 3.13: Existing Traffic Scenario with respect to LOS

Road	V (Volume in PCU/h)	C (Capacity in PCU/h)	Existing V/C Ratio	LOS
NH-54	1294	3000	0.43	C

V/C	LOS	Performance
0.0-0.2	A	Excellent
0.2-0.4	B	Very Good
0.4-0.6	C	Good/Average/Fair
0.6-0.8	D	Poor
0.8-1.0	E	Very Poor

(Source: IRC 64 -1990 & IRC 106-1990)

3.8.1 Interpretation of Traffic Study

LOS values have been calculated based on traffic data on NH-54 and it has been found 0.43. LOS value indicates that the performance of NH-54 is good with respect to traffic load according to the IRC 64 -1990 & IRC 106-1990. Looking to the probability of increase in traffic volume it is interpreted that there will be minor increase in LOS.

3.9 SOIL QUALITY

The project location falls under Agro Climatic Zone of Sub-Mountainous Undulating Zone (PB-1) & Undulating Plain Zone (PB-2) and northern plain as per Agro Ecological Sub Region, characterized by Coarse loamy and fine loamy associations (50%), Fine loamy associations (35%) & coarse loamy soils (15%). The main source of irrigation in the region are canals and bore well. The major crops cultivated are Rice, Maize, Sesamum, Wheat & Rapeseed and Mustard. Fruit crops are Mangos, Litchi, Kinnow, Guava, Orange & Malta, Amla, Pear, Plum, Peach, Lemon, Ber, etc. and vegetables are Potato, Onion, Winter Vegetables and Summer Vegetables. **(Source: Agriculture Contingency Plan for Punjab State, District: Gurdaspur)**

During the study period, total 8 numbers of samples were collected from different locations within 10 km radius to assess the baseline status of soil within the study region. Analysis was also carried out for physico-chemical parameters as well as the parameters to define the texture class. Soil samples were collected by using Khurpi, Augar and Core cutter. Samples were brought to the laboratory in polythene bags. Standard procedures have been followed for soil sampling and analysis. Soil sampling locations are presented in **Figure 3.16** and tabulated in **Table 3.14**. Results are presented in **Table 3.15**. Photographs of the soil sampling are presented in **Figure 3.17.**

Figure 3.16: Map showing the soil sampling locations in the study region

Table 3.14: Soil Monitoring Locations in the study region

Code	Location	Distance/Direction w.r.t to Project Site	Latitude and Longitude	Selection Criteria
S1	Project Site	--	32° 5'35.26"N 75°27'31.52"E	--
S2	Bhola	3.23 km / W	32° 5'42.29"N 75°25'28.63"E	Agricultural Land
S3	Ghulla	2.95 km / SSW	32° 4'10.29"N 75°26'39.83"E	Grass Land
S4	Paniar	1.12 km / WSW	32° 5'26.92"N 75°26'50.15"E	Agricultural Land
S5	Sahowal	2.12 km / SE	32° 4'44.26"N 75°28'25.30"E	Agricultural Land
S6	Rauwal	1.55 km / ENE	32° 5'51.34"N 75°28'27.08"E	Grass Land
S7	Bhangwan	5.74 km / S	32° 2'29.04"N 75°27'30.86"E	Barren Land
S8	Talwandi	6.54 km / NNE	32° 8'57.24"N 75°28'48.72"E	Agricultural Land

Project Site

Bhola

Ghulla

Paniar

Sahowal

Rauwal

Bhangwan

Talwandi

Figure 3.17: Photographs of soil sampling

Table 3.15: Soil Sample Analysis Result

S. No	Parameters	Unit	S1	S2	S3	S4	S5	S6	S7	S8
1.	Water Holding Capacity	%	43.65	40.07	39.72	41.9	35.83	39.64	35.78	36.02
2.	Porosity	%	49.82	37.71	43.72	44.79	41.22	36.66	37.58	43.34
3.	Bulk Density	gm/cc	1.35	1.52	1.42	1.44	1.44	1.52	1.44	1.35
4.	**Particle Size Distribution**									
a.	Sand	%	22.40	22.8	23.8	32.1	34.61	34.1	29.5	30.4
b.	Silt	%	27.3	24.4	28.1	25.2	28.3	27.8	23.7	24.1
c.	Clay	%	50.31	52.8	48.1	42.69	37.11	38.10	46.8	45.5
5.	Texture	-	Clay	Clay	Clay	Clay loam	Clay loam	Clay loam	Clay loam	Clay
6.	Cation Exchange Capacity	meq/100 g	34.28	46.18	51.91	63.29	48.44	48.76	46.05	40.97
7.	pH	-	8.1	6.92	8.37	7.9	7.38	7.01	7.4	8.1
8.	Electrical Conductivity	dS/m	0.15	0.17	0.20	0.19	0.14	0.12	0.16	0.18
9.	Exchangeable Sodium percentage	%	10.65	13.99	15.8	11.44	10.28	14.77	12.42	14.89
10.	Exchangeable Calcium	meq/100g	10.03	17.27	9.38	14.8	8.32	12.63	16.03	10.74
11.	Exchangeable Magnesium	meq/100g	2.62	1.38	6.69	2.38	4.62	3.80	6.10	7.9
12.	Exchangeable Sodium	meq/100g	3.65	6.46	8.2	7.24	4.98	7.2	5.72	6.9
13.	Exchangeable Potassium	meq/100g	17.98	21.07	27.64	38.87	30.52	25.13	18.2	17.13
14.	Organic Carbon(OC)	%	1.05	0.95	0.853	0.92	0.945	0.894	0.89	0.997
15.	Total Nitrogen	%	89.60	78.10	68.97	79.30	79.36	79.42	76.83	88.4
17.	Nitrate N	mg/100gm	2.08	1.95	1.83	1.8	1.71	1.52	1.95	2.07
19.	Available Phosphorus	mg/100gm	3.29	3.52	5.96	3.32	2.78	3.32	4.26	2.67

S. No	Parameters	Unit	S1	S2	S3	S4	S5	S6	S7	S8
20.	Total Iron	mg/100gm	6.05	9.48	6.22	5.22	7.15	5.08	5.78	6.9
21.	Total Zinc	mg/100gm	2.21	1.99	2.4	2.15	2.2	2.2	1.9	1.69
22.	Total Copper	mg/100gm	0.76	0.91	1.34	1.08	1.07	1.03	0.95	1.21
23.	Available Boron	mg/100gm	1.8	2.05	1.93	1.74	1.97	1.47	1.3	1.94
24.	Total Chromium	mg/100gm	1.33	0.93	1.22	1.33	0.94	1.58	1.02	1.43

3.9.1 Summary of Soil Data

- The soils are categorized as clay loam to clay, which indicates that soils are having moderate drainage.
- The pH of the soil samples ranged from 6.92 to 8.37 during the study period. The soil EC varied from 0.12 to 0.20 dS/m and ESP ranged from 10.28 to 15.80. These parameters indicate that soils are neutral in pH (pH 6.92 to 8.37).
- Among exchangeable basic cations, predominance of Ca (8.32 to 17.27 meq/ 100 g soil) was seen followed by Magnesium (1.38 to 7.90 meq/100 g soil), Na (3.65 to 8.20 meq/100 g soil) and K (17.13 to 38.87 meq/100 g soil). The loss on ignition (0.85 to 1.05 % OC) indicate that soils are high (>0.75 % OC) in organic carbon status. This shows that soils are high in nitrogen status.
- Based on CEC (34.28 to 63.29 meq/100 g soil) soils are categorized as rich with respect to productivity.
- The results relating to total micronutrients (Fe, Zn, Cu and B) and total chromium do not show alarming concentrations in different soil samples.

3.9.2 Interpretation of Soil Data

Based on soil analysis data it is concluded that soil at the project site is neutral in reaction. The soils are high in nitrogen status, medium in phosphorus and medium in available potassium status. Soil of Barren Land and Grass Land is also having medium concentration of Nitrogen and high availability of Potassium, these soils can also be brought in agricultural purpose after the addition of Phosphorous. The levels of total Fe, Cu, Cr, B and Zn are within the limits as per Dutch Pollutant Standard for Soil. Soil at the project site should be periodically monitored for EC, pH and ESP besides OC, available P and K. In the proposed project, there will be utilization of the treated wastewater generated from the process in the agricultural farming of Sugar Cane within the plant premises only. Due to usage of treated wastewater as irrigation water and excessive usage of manure will result to increase the organic carbon content, nitrogen & phosphorous and there is also chance of acidification in soil.

3.10 WATER ENVIRONMENT

Water quality studies have been carried out in the study area to understand the availability of water resources, possibility of water contamination and existing water quality. Physical, Chemical and Microbiological factors influencing water quality are so interrelated that a change in any water quality parameter may trigger other changes in a complete network of interrelated variables. Selected water quality parameters for surface and ground water resources along with biological indicators within study region have been used for water environment and assessing the impact on it by proposed project. A study on water environment aspects of ecosystem plays an important role in environmental assessment to identify water related sensitive issues.

3.10.1 Reconnaissance

As a significant part of predefined framework of the present study water samples were collected from selected locations. The Reconnaissance survey was undertaken and monitoring locations were finalized based on:

- Presence, Location and uses of major water bodies in the region,
- Type and Location of Industrial/residential areas, their intake and effluent disposal locations,
- Likely areas that can represent baseline conditions.

3.10.2 Water Quality

With the start of water quality study, the water resources in the study area were divided into two categories for getting ideal upshot of baseline status of water quality of the region. These two categories as determined are:

- Ground water resources (tube well, open well, springs etc.)
- Surface water resources including ponds, river, canals.

3.10.3 Sampling and Analysis

All the water samples were collected and analyzed as per “Standard Methods for Examination of Water & Wastewater”, APHA 23rd edition, 2017. Water Samples for the analysis of physico-chemical parameters were collected in plastic carboy and parameter wise preserved onsite as per the technique defined in the book of APHA, 23rd edition, 2017. Temperature, pH and DO were analyzed onsite and samples were brought to the laboratory for the analysis of remaining parameters. Parameters were selected based on the Technical Guideline Manual and ToR granted to the unit.

3.10.4 Ground Water Resources

The ground water samples were collected from 8 nos. of location to assess the quality of ground water within the study region. Ground water sampling locations are presented in **Table 3.16** and **Figure 3.18**. Analysis results are presented in **Table 3.17**. Photographs of Ground Water Sampling are presented in **Figure 3.19.**

Figure 3.18: Map showing the Ground Water Sampling Locations in Study Region

Table 3.16: Details of Ground Water sampling locations

Code	Location	Distance/Direction w.r.t to Project Site	Latitude and Longitude	Source
GW1	Project Site	--	32° 5'35.03"N 75°27'32.11"E	Bore Well
GW2	Bhola	3.35 km / W	32° 5'44.32"N 75°25'31.41"E	Bore Well
GW3	Ghulla	2.68 km / SW	32° 4'29.30"N 75°26'29.30"E	Bore Well
GW4	Nano Nagal	2.65 km / E	32° 5'19.13"N 75°29'18.09"E	Bore Well
GW5	Paniar	1.30 km / WSW	32° 5'25.96"N 75°26'49.74"E	Bore Well
GW6	Rasulpur	2.29 km / SE	32° 4'47.45"N 75°28'47.18"E	Bore Well
GW7	Rauwal	1.36 km / ENE	32° 5'51.07"N 75°28'25.94"E	Bore Well
GW8	Sahowal	2.20 km / SE	32° 4'38.18"N 75°28'31.73"E	Bore Well

Project Site

Bhola

Ghulla

Nano Nagal

Paniar

Rasulpur

Rauwal

Sahowal

Figure 3.19: Photographs of Ground Water Sampling

Table 3.17 Ground water Analysis Results

S. No.	Parameters	Unit	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8	Drinking Water Specification IS 10500: 2012	
											Desirable Limit	Permissible Limit
1.	Temperature	^{0}C	25.2	26.4	24.8	25.3	25.6	24.9	25.0	25.4	--	--
2.	pH @ 25^{0}C	pH Unit	7.56	7.09	6.98	6.88	6.78	7.39	7.08	6.35	6.5 – 8.5	No Relaxation
3.	Colour	Hazen	<5	<5	<5	<5	<5	<5	<5	<5	5	15
4.	Odour	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	--
5.	TDS @ 180^{0}C	mg/L	275	372	502	432	469	336	398	287	500	2000
6.	Conductivity	µmho/cm	458	618	856	745	782	552	682	487	--	--
7.	Turbidity	NTU	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1	5
8.	TSS	mg/L	14	19	25	22	23	17	20	14	--	--
9.	Total Hardness as $CaCO_3$	mg/L	198	278	374	304	378	286	310	210	200	600
10.	Calcium	mg/L	57	76	89	51	51	54	68	48	75	200
11.	Total Alkalinity as CaCO3	mg/L	189	234	361	226	318	282	281	182	200	600
12.	Chloride	mg/L	39.2	18.0	20.0	48.0	23.0	6.0	27.0	28.0	250	1000
13.	Magnesium	mg/L	14.3	21.0	37.0	43.0	61.0	37.0	34.0	22.0	30	100
14.	Sulphate	mg/L	17.9	76.0	78.0	99.0	95.0	32.0	61.0	48.0	200	400
15.	Total Phosphorus (PO4-P)	mg/L	1.2	1.2	1.2	1.5	1.2	1.6	1.3	1.4	--	--

S. No.	Parameters	Unit	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8	Drinking Water Specification IS 10500: 2012	
											Desirable Limit	Permissible Limit
16.	Sodium	mg/L	28.2	21.0	35.0	32.0	23.0	18.0	28.0	21.0	--	--
17.	Potassium	mg/L	5.3	4.0	2.0	8.0	4.0	1.0	4.0	4.0	--	--
18.	Fluoride	mg/L	0.3	0.3	0.4	0.3	0.4	0.3	0.3	0.4	1.0	1.5
19.	Phenolic Compound	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.001	0.002
20.	Oil and Grease	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	--
21.	Dissolved Oxygen	mg/L	5.8	5.6	5.6	5.7	5.7	5.9	5.8	5.6	--	--
22.	Nitrate	mg/L	1.1	1.3	1.1	1.1	1.2	1.1	1.1	1.1	45	No Relaxation
23.	Total Nitrogen	mg/L	0.2	0.3	0.4	0.3	0.4	0.5	0.2	0.4	-	-
24.	Iron	mg/L	0.25	0.6	0.7	0.5	0.8	0.28	0.23	0.24	0.3	No Relaxation
25.	Copper	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	1.5
26.	Boron	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	1.0
27.	Chromium	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.05	No Relaxation
28.	Zinc	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	0.11	<0.1	0.13	5	15
29.	Total Coliform	Present/ Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Shall not be detectable in any100 ml of sample	

3.10.4.1 Summary of Ground Water Quality

During the baseline monitoring maximum values and minimum values pertaining to the major parameters along with their sampling locations are tabulated as below:

Parameters	Unit	Minimum		Maximum	
		Results	Sampling Location	Results	Sampling Location
pH	--	6.35	Sahowal	7.56	Project Site
TSS	mg/l	14	Project Site	25	Ghulla
TDS	mg/l	275	Project Site	502	Ghulla
Total Hardness	mg/l	198	Project Site	378	Paniar
Total Alkalinity	mg/l	182	Sahowal	361	Ghulla
Chlorides	mg/l	6	Rasulpur	48	Nano Nagal
Sulphate	mg/l	17.9	Project Site	99	Nano Nagal
Iron	mg/l	0.75	Rauwal & Sahowal	1.91	Ghulla

- Turbidity was found in the range of <1.0 NTU.
- Total Dissolved Solid (TDS) varies in the range of 275-502 mg/l & Conductivity varies in the range of 458-856 µmho/cm. The ratio of TDS to conductivity was observed 0.60 which is within the desired range.
- As microbiological parameters MPN analysis was also carried out and it was found absent.
- Heavy metal concentrations were observed below Indian Standard/Specification for drinking water IS: 10500-2012 in all the locations except iron

3.10.4.2 Interpretation of Ground Water Quality Data

Based on comparison study of test results and summary report with drinking water norms as per IS: 10500 :2012, it is interpreted that all the results for ground water samples are beyond the desirable limit range but they are within the permissible limit except iron in Bhola, Ghulla, Nano Nagal & Paniar. Ground water samples collected from the villages Bhola, Ghulla, Nano Nagal & Paniar should not be used for drinking purpose and other ground water sources can be utilized in drinking purpose. It is suggested that, it is better that these water sources should be used for drinking purpose after proper treatment i.e. filtration, R.O. treatment. This water can be used for all domestic purposes as well as irrigation purposes.

3.10.5 Surface Water

To assess the quality of Surface water, 2 numbers samples were collected from Dala Lake and Bari Daob Canal located within 10 km radius for the analysis of 33 physico-chemical and microbiological parameters. Only 2 numbers of surface water samples were collected due to non-availability of any other surface water body within the 10 km radius from the project site. Frequency of sampling was once during the study period. Sampling and analysis was carried out as per "Standard Methods for Examination of Water and Wastewater 23rd edition, 2017. Surface water sampling locations are presented in the **Table 3.18** and **Figure 3.20**. Analysis results are presented in **Table 3.19** & **3.20**. Photographs of Surface Water Sampling are presented in **Figure 3.21.**

Figure 3.20 Map showing the locations for Surface water

Table 3.18 Details of Surface Water Sampling Locations

Code	Location	Distance/Direction w.r.t to Project Site	Latitude and Longitude	Source
SW1	Upper Bari Doab Canal	3.75 km / E	32° 5'41.43"N 75°30'1.20"E	Canal
SW2	Dala Lake	5.37 km / WNW	32° 6'12.17"N 75°24'18.82"E	Lake

Upper Bari Doab Canal

Dala Lake

Figure 3.21: Photographs of Surface Water Sampling

Table 3.19 Surface water Analysis Results

S. No.	Parameters	Unit	SW1	SW2
1.	Temperature	^{0}C	25	25
2.	pH @ 25^{0}C	pH Unit	7.21	6.84
3.	Colour	Hazen	7	<5
4.	Odour	-	Unobjectionable	Unobjectionable
5.	TDS @ 180^{0}C	mg/L	110	248
6.	Conductivity	µmho/cm	184	409
7.	TSS	mg/L	8	12
8.	Total Hardness as $CaCO_3$	mg/L	88	160
9.	Calcium	mg/L	25	30
10.	Total Alkalinity as $CaCO_3$	mg/L	70	146
11.	Chloride	mg/L	16	15
12.	Magnesium	mg/L	6	20
13.	Sulphate	mg/L	10	58
14.	Total Phosphorus	mg/L	0.5	0.9
15.	Sodium	mg/L	7	28
16.	Potassium	mg/L	1	4
17.	Fluoride	mg/L	0.1	0.3
18.	Phenolic Comp.	mg/L	<0.01	<0.01
19.	Oil and Grease	mg/L	<0.1	<0.1
20.	Dissolved Oxygen	mg/L	5.4	5.8
21.	COD	mg/L	10	21
22.	BOD (3 days at 27 ^{0}C)	mg/L	3	6
23.	Nitrate	mg/L	1.1	1.4
24.	Total Nitrogen	mg/L	0.5	0.6
25.	Iron	mg/L	0.09	0.81
26.	Copper	mg/L	<0.05	<0.05
27.	Boron	mg/L	<0.1	<0.1
28.	Chromium	mg/L	<0.03	<0.02
29.	Zinc	mg/L	<0.1	<0.1

Table 3.20 Bacteriological Analysis of surface Water

Code	Total coliform	Faecal coliform	Escherichia coli	Fecal Streptococci
	Most Probable No (MPN): No/100 Ml			
SW1	36	30	<1.1	<1.1
SW2	42	34	<1.1	<1.1

Table 3.21 Inland Surface Water Classification (CPCB Standards)

Sr. No.	Characteristics	Class				
		A	B	C	D	E
1.	Dissolved Oxygen, mg/L, Min	6	5	4	4	-
2.	Biochemical Oxygen Demand, mg/ L Max	2	3	3	-	-
3.	Total Coliform Organisms* MPN/100 ml, Max	50	500	5000	-	-
4.	Total Dissolved Solids mg/L Max	500	-	1500	-	2100
5.	Chlorides (as CL), mg/L, Max	250	-	600	-	600
6.	Colour, Hazen Units, Max	10	300	300	-	-
7.	Sodium Absorption Ratio, Max	-	-	-	-	26
8.	Boron (as B) mg/L Max	-	-	-	-	2
9.	Sulphates (as SO_4), mg/L Max	400	-	400	-	1000
10.	Nitrates (as NO_3), mg/L Max	20	-	50	-	-
11	Free Ammonia (as N), mg/L Max	-	-	-	12	-
12.	Conductivity at 25^0C, micromhos/cm, Max	-	-	-	1000	2250
13.	pH value	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
14.	Iron (as Fe), mg/l, Max	0.3	-	50	-	-
15.	Fluorides (as F), mg/L, Max	1.5	1.5	1.5	-	-
16.	Copper (as Cu), mg/L, Max	1.5	-	1.5	-	-

* If the Coliform is found to be more than the prescribed tolerance limits, the criteria for Coliform shall be satisfied if not more than 20 percent of samples show more than the tolerance limit specified, and not more than 5 percent of samples show values more than 4 times the tolerance limits. Further, the facal Coliform should not be more than 20 percent of the Coliform.

Source: Indian Standard (IS: 2296 – 1982).

A' Drinking water surface without conventional treatment but after disinfection

B' Outdoor bathing (organized)

C' Drinking water source with conventional treatment followed by disinfection

D' Propagation of wild life, fisheries

E' Irrigation, industrial, cooling, controlled waste disposal

3.10.5.1 Summary of Surface Water Quality

- During the baseline monitoring maximum values and minimum values pertaining to the major parameters along with their sampling locations are tabulated as below:

Parameters	Unit	Minimum		Maximum	
		Results	Sampling Location	Results	Sampling Location
pH	--	6.84	Dala Lake	7.21	Upper Bari Doab

					Canal
TDS	mg/l	110	Upper Bari Doab Canal	248	Dala Lake
TSS	mg/l	8		12	
Total Hardness	mg/l	88		160	
Dissolved Oxygen	mg/l	5.4		5.8	
COD	mg/l	10		21	
BOD	mg/l	3		6	
Total Nitrogen	mg/l	0.5		0.6	
Iron	mg/l	0.09		0.81	

- MPN test was also carried out for the surface water sample and it was found positive. *E-coli* and *Streptococci* test was found negative in all samples.

3.10.5.2 Interpretation of Surface Water Quality Data

Based on test result data comparison study with CPCB standard, it is interpreted that surface water quality of Upper Bari Doab Canal meet with the criteria B to E and Dala Lake meet with the criteria D & E. According to the classification, water sourced from Upper Bari Doab Canal can be used for outdoor bathing, Drinking water source with conventional treatment followed by disinfection, Propagation of wild life, fisheries & Irrigation, industrial, cooling, controlled waste disposal, while the water sourced from Dala Lake can be used for Propagation of wild life, fisheries & Irrigation, industrial, cooling, controlled waste disposal. Bathing, washing and other activities were observed in most of lakes/ponds located in study area. Results of COD and BOD also indicate towards the organic contamination in surface water body due to Bathing, washing and other activities. DO level for all the locations are >4.0 mg/L. DO level >4.0 mg/L is considered suitable for the survival of aquatic life and <4.0 mg/L is not considered suitable for aquatic life survival. The wastewater from the proposed project is planned to utilize for irrigation purpose in own sugar cane farms within the plant premises and hence, there will be least possibility for surface water contamination due to the proposed project.

3.11 ECOLOGY AND BIODIVERSITY

Ecology is the branch of science for the study of the relations that living organisms have with respect to each other and their natural environment. Producer, consumer and decomposer govern whole cycle of ecology. Plant and animal both are interdependent to each other. Producer is necessary for each consumer. Plant plays their role in ecology as producer. Plant, animals and microorganism together with the environment in which they live make an independent unit called the Ecosystem.

Study of biological environment is an important aspect of EIA with respect to deciding about the conservation plan needed for the organisms depending on the availability and their status as per wild life protection act 1972 and red data book list. Biodiversity helps to makeup the structure of the ecosystem and habitats that support essential living resources like faunal and floral structures. Biodiversity also play an important role in maintaining oxygen in the air, enriching the soil, purifying water protecting from floods and erosion.
The main objective of the ecological survey is aimed to assess the vegetation types, identifying flora and fauna, rare and endangered species and evaluating the impact on this biodiversity. The objective

of ecological survey is also preparing the list of flora and fauna to decide whether the conservation plan is needed.

3.11.1 Study Area

Total 10 Km radius from the project site has been considered as study region. 5 Km radius from the project site has been considered as core zone and 10 Km as buffer zone. The study period of the baseline study has been considered from December 2021 to February 2022.

3.11.2 Methodology adopted for floral survey

A list was prepared with help of data available from the secondary source. Locations were decided on topo sheet of the particular area during the desktop study based on maximum probability of the floral species. Qualitative floral survey was conducted by adopting the method: opportunistic survey (personal observation) & inquiries from the local people. Data collected during the survey are summarized below.

3.11.3 Floral Biodiversity of the Study Area

Baseline survey was conducted for 10 km radius from the project site. Under the floral baseline study, survey for crops, trees, shrubs, herbs, climbers were conducted.

Keshopur Bird Sanctury
(Birds of Keshopur Chhamb Community Reserve Center)

3.11.3.1 Crops

The prevalent cropping systems of this area are the cumulative results of past and present decisions by individuals; these decisions are usually based on experience, tradition, expected profit, personal preferences and resources, and so on. The soils are loamy in the district with clay content below 10 percent. They contain small quantities of lime but the magnesia content is high. They are low in nitrogen, medium in phosphorus and medium to high in potash but the quantities available are low. The agriculture is dependent to a large extent on the nature of its soils which in turn, is influenced materially by climatic factors. The soils of the district are alluvial and fertile. It is divided into three zones, i.e. sub mountainous, kandi and plain. The major crops cultivated are Rice, Maize, Sesamum, Sugarcane, Wheat & Rapeseed and Mustard. Fruit crops are Mangos, Litchi, Kinnow, Guava, Orange & Malta, Amla, Pear, Plum, Peach, Lemon, Ber, etc. and vegetables are Potato, Onion, Winter Vegetables and Summer Vegetables.

3.11.3.2 Trees

Total 32 species of trees belong to 14 families were observed in the study area. Details of trees in the study region is tabulated in **Table 3.22**.

Table 3.22 Trees in the Study area

S. No.	Family and Scientific Name	Vernacular Name
1	**Apocynaceae**	
1/1	*Melia azedarach*	Bakrain
2/2	*Alstonia scholaris*	Chitwan
2	**Rutaceae**	
3/1	*Aegle marmelos*	Bel
4/2	*Murraya koenigii*	Gandhla
5/3	*Feronia limonia*	Bilan
3	**Fabaceae**	
6/1	*Albizia lebbeck*	Kala Siris
7/2	*Butea monosperma*	Palas/Dhak
8/3	*Cassia fistula*	Amaltas
9/4	*Dalbergia sissoo*	Shisham
10/5	*Delonix regia*	Gulmohar
11/6	*Acacia catechu*	Khair

12/7	*Bauhinia variegate*	Kachnar
13/8	*Ougeinia oojeinensis*	Sanan
14/9	*Acacia nilotica*	Kikar
15/10	*Acacia modesta*	Palahi
4	**Celastraceae**	
16/1	*Elaeodendron glaucum*	Mirgu
5	**Moraceae**	
17/1	*Ficus religiosa*	Pipal
18/2	*Ficus benghalensis*	Bargad
6	**Meliaceae**	
19/1	*Azadirachta indica*	Neem
20/2	*Melia azedarach*	Drek Barma (China Berry)
7	**Myrtaceae**	
21/1	*Eucalyptus hybrid*	Safeda
22/2	*Syzygium cumini*	Jamun
8	**Annonaceae**	
23/1	*Polyalthia longifolia*	Ashok
9	**Anacardiaceae**	
24/1	*Mangifera indica*	Mango/Aam
10	**Ebanaceae**	
25/1	*Diospyros cordifolia*	Kaindu
26/2	*Diospyros tomentosa*	Kinu
11	**Euphorbiaceae**	
27/1	*Putranjiva Roxburghii*	Putajan
28/2	*Mallotus philippinensis*	Kamal
29/3	*Emblica officinalis**	Aula
12	**Capparidaceae**	
30/1	*Crateva unilocularis*	Barns
13	**Malvaceae**	
31/1	Bombax ceiba	Semal
14	**Salicaceae**	
32/1	*Flacourtia ramontchi*	Kangu
Source: Primary survey and Forest Department, Gurdaspur District		

3.11.3.3 Shrubs

Total 13 species of Shrubs belong to 12 families are enumerated from the study area. Common Species details along with their scientific name are presented in **Table 3.23**.

Table 3.23 List of Shrubs in the study area

S.No.	Family name & Scientific Name	Vernacular Name
1	**Capparaceae**	
1/1	*Capparis sepiaria*	Hins
2	**Lythraceae**	

S.No.	Family name & Scientific Name	Vernacular Name
2/1	*Woodfordia fruticosa*	Dhwwin
3	**Malvaceae**	
3/1	*Helicteris isora*	Maror phalli
4	**Apocynaceae**	
4/1	*Carissa opaca*	Garna
5	**Acamthaceae**	
5/1	Adhatoda vasica	Basuti
6	**Sapindaceae**	
6/1	*Dodonaea Viscosa*	Mendru
7	**Verbenaceae**	
7/1	*Lantana camara*	Punchphuli
8	**Fabaceae**	
8/1	*Cassia sophera*	Kasunder
9/2	*Indigofera pulchella*	Moth
9	**Lamiaceae**	
10/1	*Colebrookea Oppositifolia*	Bhamber
10	**Tamaricaceae**	
11/1	*Tamarix dioica*	Jhau
11	**Rhamnaceae**	
12/1	*Ziziphus nummularia*	Beri
12	**Oleaceae**	
13/1	*Nyctanthes arbortristis*	Kuri
Source: Primary survey and Forest Department, Gurdaspur District		

3.11.3.4 Herbs

Total 5 species of Herbs belong to 4 families were enumerated from the study area. Details of the herbs with their family, scientific name and vernacular name are presented in **Table 3.24.**

Table 3.24 List of Herbs in the study area

S. No.	Family name & Scientific Name	Vernacular Name
1	**Musaceae**	
1/1	*Musa sapientum*	Banana/Kela
2	**Amaranthaceae**	
2/1	*Pupalia lappacea*	Chirchita
3	**Asteraceae**	
3/1	*Xanthium strumarium*	chotagokhru
4	**Solanaceae**	
4/1	*Datura metel*	Dhatura
5/2	*Solanum nigrum*	Mokoy
Source: Primary survey and Forest Department, Gurdaspur District		

3.11.3.5 Climbers

7 species of climbers belong to 5 families were enumerated from the study area.

Table 3.25 List of Climbers in the study area

S.No.	Family Name & Scientific Name	Vernacular Name
1.	**Colantraceae**	
1/1	*Calastrue peniculata*	Malkangni
2.	**Apocynacea**	
2/1	*Ichnocarpus frutescens*	Bakar Bel
3.	**Apocynaceae**	
3/1	*Vallaris heynei*	Dudhibel
3.	**Leguminosae**	
4/1	*Abrus precatorius*	Rattak
5/2	*Pueraria tuberosa*	Salohar
4.	**Vitaceae**	
6/1	*Ampelocissus latifolia*	Gidardakh
5.	**Menispermaceae**	
7/1	*Tinospora malabarica*	Giloe
Source: Primary survey and Forest Department, Gurdaspur District		

3.11.3.6 Grasses

Total 6 species of Grasses belonging to 2 families were recorded during the survey in the study area. The details of the grasses are presented in **Table 3.26**.

Table 3.26 List of Grass in the study area

S.No.	Family Name & Scientific Name	Vernacular Name
1	**Grarineae**	
1/1	*Aristida setacea*	Ghian
2	**Gramineae**	
2/1	*Alloteropsis cumicina*	Takri
3/2	*Alloteropsis cimicina*	Dhaul
4/3	*Dichanthium annulatum*	Panni (Ganni)
5/4	Eriophorum comosum	GhorBaggar
6/5	*Themeda anathera*	Lunji
Source: Primary survey and Forest Department, Gurdaspur District		

3.11.3.7 Rare and Endangered Flora

The IUCN Red List is the world's most comprehensive inventory of the global conservation status of plant and animal species. It uses a set of criteria to evaluate the extinction risk of thousands of species and subspecies. These criteria are relevant to all species and all regions of the world. With its strong scientific base, the IUCN Red List is recognized as the most authoritative guide to the status of biological diversity. Out of 17000 species of higher plants known to occur in India, nearly 614 higher plant species were evaluated by IUCN. Among them 247 species are under threatened category (IUCN, 2008).

Among the enumerated flora in the study area, none of them were assigned any threat category by Red data book of Indian Plants (Jain and Sastry, 1984; Nayer and Sastry, 1987; 1988,

1990; Oldfield et al., 1998; Kholia and Bhakuni, 2009) and Red list of threatened Vascular plants (IUCN, 2010).

3.11.3.8 Endemic Plants

De Candolle (1855), Swiss botanist, first used the concept of Endemic, which is defined as an area of a taxonomic unit, especially a species which has a restricted distribution or habitat, isolated from its surrounding region through geographical, ecological or temporal barriers. Out of 17000 species of known flowering plants of India nearly 5000 species are said to be endemic. Nearly 58 genera and 1932 taxa are found to be endemic to peninsular India (Nayar, 1980; Ahmedullah and Nayar, 1986; 1987; Jain 1992; Nayar, 1996; Vijaya Shankar et al., 2005; Nautiyal et al., 2009a, b; Shendage et al., 2010).

Among recorded plant species none can be assigned the status of endemic plant of this region.

3.11.4 Faunal Biodiversity of the Study Area

The role of fauna investigations in Environmental Impact Assessment (EIA) is to provide sufficient data to allow a complete identification, prediction and evaluation of potential impacts of proposed developments upon that flora and fauna.

The information collected provides people with the ability to assess conservation values of areas, understand the implications of changes in land use, document natural heritage, and assist in natural resource management.

Baseline survey was conducted for the documentation of Fauna with respect to Mammals, Birds, Reptiles, invertebrates and fishes.

3.11.4.1 Methodology adopted for faunal survey

Methodology adopted for faunal survey involve random survey, opportunistic observations, diurnal avifauna observation, active search for reptiles, faunal habitat assessment, active search for scats and foot prints, animal call, review of previous studies and pictorial representation before local people. Species of mammals, birds, reptile, amphibians and insects were identified and they are being represented under their respective headings and table.

3.11.4.2 Mammals

The mammals observed other than the domesticated ones are giant squirrel, common jackal, Indian fox and Indian grey mongoose. No Schedule I mammalian species was sighted during the survey details of mammals are tabulated in **Table 3.27.**

Table 3.27 List of Mammals in the Study area

S. No.	Scientific Name	Common Name	Schedule as per WPA 1972
1.	*Macaca mulatta*	Rhesus Monkey	Schedule II
2.	*Sus scrofa*	Wild Boar	Schedule III
3.	*Herpestes edwardsi*	Common Mongoose	Schedule II
4.	*Boselaphus tragocamelus*	Blue bull	Schedule III
5.	*Funambulus palmarum*	Squirrel	Schedule IV
6.	*Lapus nigricollis*	Rabbit	Schedule IV

7.	*Rattus rattus*	House rat	Schedule V
Source: Primary survey and Forest Department, Gurdaspur District			

3.11.4.3 Avifauna

Avifauna is an important part of the ecosystem which plays various roles as scavengers, pollinators, predators of insect pest, etc. They are also one of the bio-indicators of different status of environment and affected by urbanization, industrialization and human interference. The areas having good avifauna diversity signifies healthy ecosystem. They can be used as sensitive indicators of pollution and malfunction of ecosystem.

The survey for Avifauna was conducted early in the morning and evening time. Common species of avifauna observed during the survey were *Psittacula Cupatria*, *Columba Livia, Psittacula*, *Chysocolaptes Festivus*, And *Cantropus Senses*.

As a schedule I species Indian Peafowl was sighted at some places of the studied area. List of birds are presented in **Table 3.28.**

Table 3.28 List of Avifauna in the Study Area

S. No.	Scientific Name	Common Name	Schedule and Status
1.	*Corvusmacrorhynchos*	Jungle Crow	Schedule IV
2.	*Bubo Bengalensis*	Great horned Owl	Schedule IV
3.	*Pycnonotus Cafer*	Red vented bulbul	Schedule IV
4.	*Francolinus Francolinus*	Kala titar	Schedule IV
5.	*Gallinula Chloropus*	Water hen	Schedule II
6.	*Gallicrex Cinerea*	Wild cock	Schedule IV
7.	*Motacilla Alba*	White wagtail	Schedule IV
8.	*Accipiter Badius*	Shikra	Schedule IV
9.	*Acridotherestristis*	Common Myna	Schedule IV
10.	*Bubulcus Ibis*	Cattle egret	Cattle egret
11.	*Columba Livia*	Blue rock pigeon	Schedule IV
12.	*Corvus Splendens*	House crow	Schedule V
13.	*Passer Domesticus*	House sparrow	Schedule IV
14.	*Dinopium Benghalense*	lesser golden-backed woodpecker	Schedule IV
15.	*Eudynamys Scolopacea*	Koel	Schedule IV
16.	*Coracias Benghalensis*	Indian Roller	Schedule IV
17.	*Nycticorax Nycticorax*	Night Heron	Schedule V
18.	*Orthotomus Sutorius*	Common Tail	Schedule IV
19.	*Alcedoatthis*	Common King Fisher	Schedule IV
20.	*Vanellusleucurus*	White tailed lapwing	Schedule IV
21.	*Streptopelia Dineusis*	Spotted dove	Schedule IV
22.	*Gallinula Chloropus* #	Common moorhen (Indian Moorhen)	Not Listed
23.	*Mareca Strepera* #	Gadwall	Not Listed
24.	*Anas Acuta* #	Northern pintail	Not Listed

S. No.	Scientific Name	Common Name	Schedule and Status
25.	*Anas Crecca* #	Common Teal	Schedule IV
26.	*Mareca Penelope* #	Wigeons	Not Listed
27.	*Spatula Clypeata* #	shoveler	Not Listed
28.	*Phalacrocorax Carbo* #	Great cormorant (Large cormorant)	Schedule IV
29.	*Aythya Ferina* #	Common pochard	Not Listed
30.	*Sterna Aurantia* #	River tern	Not Listed
31.	*Larus Ridibundus* #	Black-headed Gull	Schedule IV
32.	*Chroicocephalus Brunnicephalus* #	Brown-headed Gull	Schedule IV
33.	*Hieraaetus Pennatus* #	Booted eagle	Not Listed
34.	*Circus Aeruginosus* #	Marsh Harrier	Not Listed
35.	*Egretta Garzetta* #	Little Egret	Schedule IV
36.	*Ardea Alba* #	Large Egret	Schedule IV
37.	*Ardea Intermedia* #	Median Egret	Schedule IV
38.	*Halcyon Smyrnensis* #	White-throated kingfisher	Schedule IV
39.	*Ardea Cinerea* #	Grey Heron	Schedule IV
40.	*Ardea Purpurea* #	Purple heron	Schedule IV
41.	*Anhingidae* #	Darters	Schedule IV
42.	*Tachybaptus Ruficollis* #	Dabchick	Not Listed
43.	*Microcarbo Niger* #	Little Cormorant	Schedule IV
44.	*Fulica Atra* #	Eurasian coot (Black Coot)	Schedule IV
Source: Primary survey and Forest Department, Gurdaspur District **Note:** # indicates the birds found in Keshopur Bird Sanctury.			

3.11.4.4 Reptiles

Reptiles play an important anthropogenic role in ecosystem and they may also be helpful to protect us from some diseases. In some areas, they help control the numbers of serious agricultural pests by consuming rodent and insect pests. Species identified during the survey are present in **Table 3.29** and Invertebrates are presented in **Table 3.30.**

Table 3.29 List of Reptiles in the Study area

Sr. No.	Scientific Name	Common name	Local Name	Schedule & Status
1	*Typhlina brahmina*	Blind snke/ common worm	Adasiyu	Not listed
2	*Lycodon aulicus*	Common wolf snake	Kadotaro	Not listed
3	*Ptyas mucosa*	Common rat snake	Dhaman	Schedule II (Part II)
4	*Chamaeleon zeylanicus*	Chameleon	Kachando	Schedule II (Part I)
5	*Mabuya carinata*	Common skink	--	Not listed
6	*Calotes versicolor*	Common garden lizard	Kachindo	Not listed
7	*Naja naja*	Indian Cobra	Naag	Schedule II (Part II)

Sr. No.	Scientific Name	Common name	Local Name	Schedule & Status
8	*Melanochelys trijuga*	Indian pond terrapin	Kachbo	Not listed
9	*Varanus bengalensis*	Minitor lizard	--	Schedule II (Part II)
10	*Dendrelaphis tristis*	Tree Snake	--	Not listed
11	*Coelognathus helena*	Trinket	--	Not listed
Source: Primary survey and Forest Department, Gurdaspur District				

3.11.4.5 Butterflies

Butterfly observed during the survey were belong to families Papilionidae, Pieridae and Nymphalidae. Occurance of these butterfly species were sighted from the buffer zone but not in the core zone.

Table 3.30 List of Butterflies in the Study Area

S. No.	Scientific Name	Common Name
1	**Papilionidae**	
1/1	*Papilio Polytes Linnaeus*	Common Mormon
2	**Pieridae**	
2/1	*Eurema Hecabe Linnaeus*	Common Grass yellow
3/2	*Catopsilia Pomona Fabricius*	Common Emigrant
4/3	*Catopsilia Pyranthe Linnaeus*	Mottled Emigrant
5/4	*Delias Eucharis Drury*	Common Jezebel
6/5	*Ixias Mariane Cramer*	White orange tip
7/6	*Ixias Pyrene Linnaeus*	Yellow orange tip
3	**Nymphalidae**	
8/1	*Danaus Genutia Cramer*	Stripped Tiger
9/2	*Hypolimanas Misippus Linnaeus*	Danaid egg fly
10/3	*Mycalesis Perseus Fabricius*	Common bush brown
Source: Primary survey and Forest Department, Gurdaspur District		

3.11.4.6 Rare and Endangered Fauna of Study Area

The IUCN Red List is the world's most comprehensive inventory of the global conservation status of plant and animal species. It uses a set of criteria to evaluate the extinction risk of thousands of species and subspecies as per wildlife protection Act (1972). As per IUCN Red List there are 23 nos. of Avifauna likely to be found at the Keshopur Bird Sanctury located within the study area, out of which 3 nos. of avifaunal species listed as vulnerable species as per IUCN Red list and remaining are listed as least concern species. **During the survey of fauna, no schedule I species were reported as Schedule I species under Mammals, Avifauna, Reptiles**. **There are no such species found in the study region during the study period, which was listed in the rare and endangered fauna.**

Among the reptiles, Indian Cobra (*Naja naja*), and Common rat snake (*Ptyas Mucosus*) were provided protection as per Schedule-II of Wild life protection act, (1972). Among mammals; Common Mongoose (*Herpestes edwardsi*), is a schedule –II animals. Conservation plan for such protected species should be submitted to concerned forest depart of the region.

3.11.4.7 Interpretation of Ecology and Biodiversity

The proposed project comes under the private land and the study area is majorly covered with agricultural land and range land. The soils of the district are alluvial and fertile. It is divided into three zones, i.e. sub mountainous, kandi and plain. The major crops cultivated are Rice, Maize, Sesamum, Sugarcane, Wheat & Rapeseed and Mustard. Fruit crops are Mangos, Litchi, Kinnow, Guava, Orange & Malta, Amla, Pear, Plum, Peach, Lemon, Ber, etc. and vegetables are Potato, Onion, Winter Vegetables and Summer Vegetables. Among the enumerated flora in the study area, none of them were assigned any threat category by Red data book of Indian Plants. None of the sighted floral species can be assigned endemic species category of the study area. Common faunal species has been noted during the primary survey. During the survey, it is observed that there is presence of a bird sanctuary within the study area and it is having vast range of bird species, which are listed in the IUCN Red data book. As per IUCN Red List there are 23 nos. of Avifauna likely to be found at the Bird Sanctury located within the study area, out of which 3 nos. of avifaunal species listed as vulnerable species as per IUCN Red list and remaining are listed as least concern species. Among the reptiles, Indian Cobra (Naja naja), and Common rat snake (Ptyas Mucosus) were provided protection as per Schedule-II of Wild life protection act, (1972). Among mammals; Common Mongoose (Herpestes edwardsi), is a schedule –II animals. Conservation plan for such protected species should be submitted to concerned forest depart of the region

3.12 SOCIO-ECONOMIC ENVIRONMENT

Socioeconomics (also known as socio-**economics** or **social economics**) is the social science that studies how economic activity affects social processes. In general, it analyses how societies progress, stagnate, or regress because of their local or regional economy, or the global economy.

In order to assess and evaluate the likely impacts arising out of any new or existing projects in socio-economic environment, it is necessary to gauge the apprehension of the people in the surrounding areas. Socio-economic survey serves as an effective tool for fulfilling this requirement.

The rapid industrialization of the study region has greatly influenced the socio economic and health environment in the villages. Increasing industrialization and population density has increased pressure on resources, civic amenities and public infrastructure. Economic conditions of the local people have improved with the increasing industrialization and greater employment opportunities.

The socio-economic environment includes demography structure, population density, literacy level, and employment levels. The data establish a baseline for the prediction of likely impacts of the proposed activity on the socio-economic environment. Secondary information pertaining to the study area villages was collected from Government Agencies, Census data for the year 2011, and statistical abstracts to compile the socio-economic data.

3.12.1 Socio-Economic Survey Methodology

Socio-economic survey tools provide a means of improving understanding of local resource management systems, resource use and the relative importance of resources for households and villages. They can also be used to elicit insights on interaction with government decision-making systems, community perceptions of trends and priority issues, and community-based institutions and their role in the sustainable use and conservation of natural resources.

Data Collection: Following steps were considered for the collection of primary data:

1. Identification of Study Area: The study area was identified before carrying out the survey. All the related information which could affect the prosperity, development & literacy were also collected.

2. Site Visit: Location wise survey plan & format for data collection were prepared for site visit. Data regarding Land Characteristics, Population, Literacy, Workers and Amenities were collected during the survey.

Analysis of Data: The data collected by primary survey were verified with secondary data collected from sources like Government Agencies, Census data for the year 2011, and statistical abstracts.

3.12.2 Demography

Almost all villages in the study area are experiencing a rapid growth of population due to industrialization. The total population of study region is summarized in **Table 3.31.**

3.12.3 Population Density

Population density in the study area varies from 17 – 6963 person/sq. km. Details of the same are tabulated in **Table 3.31**.

Table 3.31 Details of Population in Study Area

Villages	No. of Household	Total Population	Total area (Sq.km)	Population density (Person/sq.km)	Population 2021*
Villages in 3 km radius from the project site					
Paniar	883	4537	4.48	1012.72	5163
Jahangirpur	55	301	0.59	510.17	343
Maddowal	158	809	1.18	685.59	921
Bhabra	109	594	1.16	512.07	676
Sahowal	370	2071	1.09	1900.00	2357
Anandpur	75	359	0.42	854.76	408
Ali Chak	237	1179	2.13	553.52	1342
Rasulpur Gagrotian	173	833	1.06	785.85	948
Haripur	124	583	0.65	896.92	663
Lohgarh	137	681	0.58	1174.14	775
Gandhian	517	2696	2.21	1219.91	3068
Mirjanpur	68	331	0.65	509.23	377
Kolian	136	632	1.21	522.31	719
Villages in 3 km – 5 km radius from the project site					
Bhola	150	739	1.27	581.89	841
Dala	100	541	1.56	346.79	616
Matwan	159	863	2.08	414.90	982
Kharal	206	1030	1.72	598.84	1172
Baryar	706	3520	3.85	914.29	4005
Khojepur	317	1632	1.78	916.85	1857

Villages	No. of Household	Total Population	Total area (Sq.km)	Population density (Person/sq.km)	Population 2021*
Raowal	124	763	0.65	1173.85	868
Narad	180	989	1.43	691.61	1125
Hoshiarpur	9	46	0.47	97.87	52
Bhagoman	3	11	0.64	17.19	13
Sirkian	79	422	0.89	474.16	480
Kot Bhalla	104	633	1.04	608.65	720
Bhagwanpur	265	1395	2.86	487.76	1587
Bhatoya	449	2323	3.29	706.08	2643
Bara	52	276	0.82	336.59	314
Shahpur	94	534	1.24	430.65	608
Singowal	151	774	0.77	1005.19	881
Dina Nagar	4840	23976	14.36	1669.64	27282
Ismailpur	74	381	0.71	536.62	434
Taruwal	39	185	0.18	1027.78	211
Malian	176	996	2.39	416.74	1133
Niamta	104	564	0.61	924.59	642
Theh Mundian	2	12	0.41	29.27	14
Khuda Dadpur	75	409	0.48	852.08	465
Villages beyond 5 km radius from the project site					
Pahra	542	3189	3.26	978.22	3629
Ghurala	651	3107	2.02	1538.12	3535
Ghot Pokhar	793	3576	2.38	1502.52	4069
Bhattian	377	1968	2.71	726.20	2239
Warah	56	238	0.8	297.50	271
Ram Nagar	367	1771	2.42	731.82	2015
Gurdaspur	15175	75549	10.85	6963.04	85965
Hardo Bathwala	994	5241	2.7	1941.11	5964
Barnala	226	1119	1.17	956.41	1273
Abul Khair	432	2229	1.95	1143.08	2536
Hem Rajpur	363	1981	3.57	554.90	2254
Keshopur	109	535	1.59	336.48	609

Villages	No. of Household	Total Population	Total area (Sq.km)	Population density (Person/sq.km)	Population 2021*
Gidar Windi	140	673	0.72	934.72	766
Majithi	203	1042	1.2	868.33	1186
Wahla	26	136	0.72	188.89	155
Behrampur	1057	5432	3.3	1646.06	6181
Raipur	356	1757	2.27	774.01	1999
Niwan Dhakala	81	492	1.32	372.73	560
Pindi Rangran	322	1665	1.02	1632.35	1895
Bahmani	392	1893	4.03	469.73	2154
Munnanwali	217	1081	1.17	923.93	1230
Udhipur	198	1016	1.32	769.70	1156
Bala Pindi	230	1210	2.19	552.51	1377
Ballawar	220	1063	2.2	483.18	1210
Bahdo Chak	110	583	0.72	809.72	663
Khiyala	285	1526	2.63	580.23	1736
Saidipur	331	1629	1.98	822.73	1854
Tango Shah	236	1114	1.89	589.42	1268
Jhakhar Pindi	130	672	0.81	829.63	765
Awankha	1946	9722	11.3	860.35	11062
Parmanand	693	3192	3.85	829.09	3632
Namala	181	951	1.61	590.68	1082
Deeda	338	1729	1.42	1217.61	1967
Jangal	17	86	0.82	104.88	98
Ghesal	210	1072	0.99	1082.83	1220
Chechian	73	362	0.73	495.89	412
Dhamrai	275	1521	1.15	1322.61	1731
Pachowal	148	775	1.15	673.91	882
Sadana	286	1616	3.2	505.00	1839
Maha Rajpur	77	391	1.6	244.38	445
Pandori Bainsan	369	1940	4.73	410.15	2207
Lange	36	179	0.51	350.98	204
Chechian Chhaurian	189	1078	5.65	190.80	1227

Villages	No. of Household	Total Population	Total area (Sq.km)	Population density (Person/sq.km)	Population 2021*
Lahri Viran	57	312	1.17	266.67	355
Mano Nangal	64	351	0.69	508.70	399
Talabpur	845	4659	9.64	483.30	5301
Pakhowal	213	1187	2.47	480.57	1351
Chhina Bet	311	1724	2.71	636.16	1962
Mallowal	122	668	2.19	305.02	760
Jattuwal	243	1305	1.52	858.55	1485
Gazikot	374	1972	6.04	326.49	2244
Chandar Bhan	162	842	2.07	406.76	958

3.12.4 Sex Ratio

The sex ratio i.e. the number of females per 1000 males is in range of 571-1106 with lowest in Bhagoman and highest in Lange. The Sex ratio i.e. the number of females per 1000 males indirectly reveals certain sociological aspect in relation to female births, infant mortality female children. Details of the same are tabulated in **table 3.32.**

Table 3.32: Details of Sex Ratio in Study Area

Villages	Male Population	Female Population	Total Population	Sex Ratio (Female to 1000 Male)
Paniar	2356	2181	4537	926
Jahangirpur	157	144	301	917
Maddowal	417	392	809	940
Bhabra	316	278	594	880
Sahowal	1082	989	2071	914
Anandpur	197	162	359	822
Ali Chak	605	574	1179	949
Rasulpur Gagrotian	432	401	833	928
Haripur	297	286	583	963
Lohgarh	359	322	681	897
Gandhian	1386	1310	2696	945
Mirjanpur	173	158	331	913
Kolian	336	296	632	881
Bhola	376	363	739	965
Dala	274	267	541	974
Matwan	451	412	863	914

Villages	Male Population	Female Population	Total Population	Sex Ratio (Female to 1000 Male)
Kharal	511	519	1030	1016
Baryar	1827	1693	3520	927
Khojepur	850	782	1632	920
Raowal	399	364	763	912
Narad	506	483	989	955
Hoshiarpur	25	21	46	840
Bhagoman	7	4	11	571
Sirkian	231	191	422	827
Kot Bhalla	330	303	633	918
Bhagwanpur	709	686	1395	968
Bhatoya	1238	1085	2323	876
Bara	136	140	276	1029
Shahpur	288	246	534	854
Singowal	393	381	774	969
Dina Nagar	12524	11452	23976	914
Ismailpur	188	193	381	1027
Taruwal	93	92	185	989
Malian	532	464	996	872
Niamta	299	265	564	886
Theh Mundian	7	5	12	714
Khuda Dadpur	217	192	409	885
Pahra	1668	1521	3189	912
Ghurala	1617	1490	3107	921
Ghot Pokhar	1830	1746	3576	954
Bhattian	1022	946	1968	926
Warah	119	119	238	1000
Ram Nagar	938	833	1771	888
Gurdaspur	39705	35844	75549	903
Hardo Bathwala	2741	2500	5241	912
Barnala	596	523	1119	878
Abul Khair	1167	1062	2229	910
Hem Rajpur	1032	949	1981	920
Keshopur	273	262	535	960
Gidar Windi	351	322	673	917

Villages	Male Population	Female Population	Total Population	Sex Ratio (Female to 1000 Male)
Majithi	543	499	1042	919
Wahla	69	67	136	971
Behrampur	2770	2662	5432	961
Raipur	922	835	1757	906
Niwan Dhakala	248	244	492	984
Pindi Rangran	842	823	1665	977
Bahmani	986	907	1893	920
Munnanwali	561	520	1081	927
Udhipur	540	476	1016	881
Bala Pindi	632	578	1210	915
Ballawar	544	519	1063	954
Bahdo Chak	310	273	583	881
Khiyala	797	729	1526	915
Saidipur	788	841	1629	1067
Tango Shah	581	533	1114	917
Jhakhar Pindi	352	320	672	909
Awankha	5141	4581	9722	891
Parmanand	1616	1576	3192	975
Namala	464	487	951	1050
Deeda	883	846	1729	958
Jangal	42	44	86	1048
Ghesal	564	508	1072	901
Chechian	183	179	362	978
Dhamrai	782	739	1521	945
Pachowal	379	396	775	1045
Sadana	834	782	1616	938
Maha Rajpur	197	194	391	985
Pandori Bainsan	979	961	1940	982
Lange	85	94	179	1106
Chechian Chhaurian	544	534	1078	982
Lahri Viran	176	136	312	773
Mano Nangal	191	160	351	838
Talabpur	2373	2286	4659	963
Pakhowal	609	578	1187	949

Villages	Male Population	Female Population	Total Population	Sex Ratio (Female to 1000 Male)
Chhina Bet	904	820	1724	907
Mallowal	336	332	668	988
Jattuwal	707	598	1305	846
Gazikot	1003	969	1972	966
Chandar Bhan	433	409	842	945

3.12.5 Literacy Rate

The literacy level of the study area is summarized in **Table 3.33** and graphically presented in **Figure 3.22.**

Table 3.33 Details of Literacy Rate in Study Area

Villages	Literacy (%)		
	Male	Female	Total
Paniar	77.0	67.8	72.6
Jahangirpur	78.3	65.3	72.1
Maddowal	77.5	71.9	74.8
Bhabra	77.8	68.3	73.4
Sahowal	77.3	68.4	73.0
Anandpur	82.7	71.0	77.4
Ali Chak	72.7	64.5	68.7
Rasulpur Gagrotian	79.6	68.6	74.3
Haripur	81.5	74.1	77.9
Lohgarh	78.8	68.0	73.7
Gandhian	74.3	62.4	68.5
Mirjanpur	83.8	70.3	77.3
Kolian	72.9	64.5	69.0
Bhola	77.9	74.9	76.5
Dala	80.7	70.8	75.8
Matwan	75.8	68.2	72.2
Kharal	80.8	73.2	77.0
Baryar	76.3	63.6	70.2
Khojepur	84.4	71.4	78.1
Raowal	71.9	57.4	65.0
Narad	77.7	70.0	73.9
Hoshiarpur	84.0	76.2	80.4
Bhagoman	85.7	100.0	90.9

Villages	Literacy (%)		
	Male	Female	Total
Sirkian	78.8	69.1	74.4
Kot Bhalla	65.8	51.5	58.9
Bhagwanpur	71.8	61.8	66.9
Bhatoya	72.3	60.0	66.6
Bara	82.4	67.1	74.6
Shahpur	75.0	61.8	68.9
Singowal	86.5	84.0	85.3
Dina Nagar	83.1	76.8	80.1
Ismailpur	77.7	68.4	73.0
Taruwal	77.4	77.2	77.3
Malian	76.3	69.8	73.3
Niamta	83.9	78.5	81.4
Theh Mundian	14.3	20.0	16.7
Khuda Dadpur	80.6	66.7	74.1
Pahra	71.2	62.1	66.8
Ghurala	82.2	76.4	79.4
Ghot Pokhar	77.9	72.9	75.4
Bhattian	73.1	61.7	67.6
Warah	73.1	68.1	70.6
Ram Nagar	71.9	60.3	66.4
Gurdaspur	83.3	79.5	81.5
Hardo Bathwala	69.6	62.5	66.2
Barnala	77.7	68.1	73.2
Abul Khair	75.0	67.8	71.6
Hem Rajpur	76.7	68.1	72.6
Keshopur	81.0	68.3	74.8
Gidar Windi	70.4	60.6	65.7
Majithi	84.2	74.5	79.6
Wahla	65.2	62.7	64.0
Behrampur	78.9	71.5	75.3
Raipur	79.0	70.9	75.1
Niwan Dhakala	83.1	68.9	76.0
Pindi Rangran	76.6	67.9	72.3
Bahmani	72.4	62.2	67.5
Munnanwali	76.5	65.4	71.1

Villages	Literacy (%)		
	Male	Female	Total
Udhipur	72.0	67.4	69.9
Bala Pindi	81.6	71.8	76.9
Ballawar	78.3	68.8	73.7
Bahdo Chak	75.5	70.7	73.2
Khiyala	70.0	58.2	64.4
Saidipur	75.9	66.5	71.0
Tango Shah	77.5	70.2	74.0
Jhakhar Pindi	74.7	69.7	72.3
Awankha	75.5	66.0	71.0
Parmanand	83.0	72.8	78.0
Namala	76.7	67.4	71.9
Deeda	75.2	65.6	70.5
Jangal	78.6	86.4	82.6
Ghesal	77.3	66.9	72.4
Chechian	79.2	68.2	73.8
Dhamrai	74.0	66.0	70.2
Pachowal	78.6	72.7	75.6
Sadana	66.8	59.7	63.4
Maha Rajpur	81.7	73.7	77.7
Pandori Bainsan	76.5	70.0	73.3
Lange	63.5	57.4	60.3
Chechian Chhaurian	74.6	65.0	69.9
Lahri Viran	63.1	51.5	58.0
Mano Nangal	71.7	60.0	66.4
Talabpur	78.1	69.2	73.7
Pakhowal	78.2	70.9	74.6
Chhina Bet	76.5	69.5	73.2
Mallowal	71.7	66.3	69.0
Jattuwal	77.4	63.2	70.9
Gazikot	75.5	68.0	71.8
Chandar Bhan	77.4	69.7	73.6

Figure 3.22: Graph of Literacy Rate

Among all the villages of study area Bhagoman is having high literacy rate i.e. 90.9% in which 85.7% are Male & 100.0% are Female literacy rate. Theh Mundian village accounts the lowest rate of 16.7% in which 14.3% are Male and 20.0% are Female literacy rate. In most of village not much difference between female literacy rate and male literacy rate in the study region. The Literacy rate is above 50% in almost all the villages and Female Literacy is one of the most essential indicators of social change and the quality of a village's human capital.

3.12.6 Economic Aspects

Economic aspects of the study area include the economic structure of the people of the surrounding area. It can be predicted that economic structure of the study area will be improved with time, because it consists large industrial estate and hence there are more employment opportunities.
According to working status, whole population of the study area is divided into,

- Marginal workers
- Non workers
- Main workers

Census department has defined 10 categories of workers in Main workers. It consists of cultivators, agricultural, labourer those engged in livestock, forestry, fishing, mining and quarrying, manufacturing, processing and repairs in household industries and other services. Workers engaged in the work for a period less than 6 months during the reference year falls under marginal workers. Workers engaged in unpaid household duties e.g. students, retired person, dependents etc. falls under non-workers. Detail of occupational structure is shown in Table 3.34.

Table 3.34 Details of Occupational Structure

Zone of Study	Total Workers		
	Non-Workers (%)	Main Workers (%)	Marginal Workers (%)

Zone of Study	Total Workers		
	Non-Workers (%)	Main Workers (%)	Marginal Workers (%)
Paniar	67.64	21.36	11.00
Jahangirpur	59.14	33.22	7.64
Maddowal	65.88	16.56	17.55
Bhabra	68.86	30.13	1.01
Sahowal	61.61	22.11	16.27
Anandpur	72.70	11.14	16.16
Ali Chak	68.53	17.39	14.08
Rasulpur Gagrotian	65.67	31.09	3.24
Haripur	65.87	22.47	11.66
Lohgarh	65.20	31.57	3.23
Gandhian	67.95	30.86	1.19
Mirjanpur	64.95	34.44	0.60
Kolian	58.07	29.27	12.66
Bhola	68.88	28.15	2.98
Dala	66.73	29.21	4.07
Matwan	68.95	30.82	0.23
Kharal	71.26	25.53	3.20
Baryar	66.25	22.22	11.53
Khojepur	68.32	24.20	7.48
Raowal	72.21	14.68	13.11
Narad	65.62	33.27	1.11
Hoshiarpur	76.09	21.74	2.17
Bhagoman	72.73	27.27	0.00
Sirkian	68.25	13.27	18.48
Kot Bhalla	69.98	26.70	3.32
Bhagwanpur	68.53	29.03	2.44
Bhatoya	59.15	29.36	11.49
Bara	71.01	25.36	3.62
Shahpur	69.85	29.78	0.37
Singowal	73.77	20.67	5.56
Dina Nagar	68.08	28.37	3.55
Ismailpur	72.70	13.39	13.91
Taruwal	72.97	8.11	18.92
Malian	62.45	29.02	8.53

Zone of Study	Total Workers		
	Non-Workers (%)	Main Workers (%)	Marginal Workers (%)
Niamta	70.21	26.24	3.55
Theh Mundian	33.33	16.67	50.00
Khuda Dadpur	75.31	19.56	5.13
Pahra	71.53	25.12	3.36
Ghurala	65.43	31.54	3.03
Ghot Pokhar	76.23	20.33	3.44
Bhattian	70.17	22.15	7.67
Warah	74.79	24.79	0.42
Ram Nagar	67.08	28.80	4.12
Gurdaspur	65.31	30.08	4.61
Hardo Bathwala	70.06	26.71	3.22
Barnala	67.83	29.76	2.41
Abul Khair	70.75	26.24	3.01
Hem Rajpur	67.24	27.06	5.70
Keshopur	65.23	31.40	3.36
Gidar Windi	72.96	26.60	0.45
Majithi	76.87	11.71	11.42
Wahla	71.32	22.79	5.88
Behrampur	71.15	25.42	3.42
Raipur	67.39	27.09	5.52
Niwan Dhakala	83.94	14.63	1.42
Pindi Rangran	71.71	18.44	9.85
Bahmani	60.75	22.19	17.06
Munnanwali	61.15	27.66	11.19
Udhipur	63.09	22.05	14.86
Bala Pindi	62.89	32.31	4.79
Ballawar	69.99	23.24	6.77
Bahdo Chak	68.61	30.87	0.51
Khiyala	74.84	10.68	14.48
Saidipur	76.86	14.30	8.84
Tango Shah	73.61	24.33	2.06
Jhakhar Pindi	71.28	16.37	12.35
Awankha	67.73	23.81	8.46
Parmanand	64.60	24.72	10.68

Zone of Study	Total Workers		
	Non-Workers (%)	Main Workers (%)	Marginal Workers (%)
Namala	71.92	25.45	2.63
Deeda	71.49	24.93	3.59
Jangal	75.58	24.42	0.00
Ghesal	71.74	23.97	4.29
Chechian	65.19	33.15	1.66
Dhamrai	71.40	22.35	6.25
Pachowal	69.16	29.42	1.42
Sadana	69.68	29.15	1.18
Maha Rajpur	72.63	26.09	1.28
Pandori Bainsan	72.11	18.09	9.79
Lange	64.80	23.46	11.73
Chechian Chhaurian	67.90	18.00	14.10
Lahri Viran	66.99	9.94	23.08
Mano Nangal	65.24	33.62	1.14
Talabpur	73.45	21.57	4.98
Pakhowal	72.87	24.52	2.61
Chhina Bet	70.59	8.06	21.35
Mallowal	80.09	16.17	3.74
Jattuwal	72.87	24.52	2.61
Gazikot	70.94	20.69	8.37
Chandar Bhan	71.02	28.50	0.48

Mirjanpur Village is having significant employment i.e. 34.44% as main workers, while the lowest employment as main workers is in Chhina Bet Village i.e. 8.06%. Almost all the villages are having more than 50% people as non-workers. Peoples in the study area are largely engaged in agricultural activities and the youth majorly opt for employment in service sector and to find the opportunities they move away from their traditional occupation.

Figure 3.23 Occupational Structure of Study Area

3.12.7 Amenities

Govt. Elementary School, Bhola

Discussion with Respondents during the survey

Water Storage Tank, Ghulla

Electricity Supply & Solar Street Light, Rasulpur Gagrotian

EDUCATIONAL INSTITUTES IN THE STUDY AREA

Govt. Primary School	Private Primary School	Govt. Middle School	Private Middle School	Govt. Secondary School	Private Secondary School	Govt. Senior Secondary School	Private Senior Secondary School
76	20	30	9	13	8	6	2

In study area village availing Govt. Primary, Private Primary School, and Govt. Secondary School facility are available in study area. For higher studies students are required to commute to the nearby larger cities.

HEALTH CARE FACILITIES IN THE STUDY AREA

Community Health Centre	Primary Health Centre	Primary Health Sub Centre	Veterinary Hospital
0	7	3	7

In the villages of the study area are less facilitated with Primary Health Centre, Primary Health Sub Centre and Veterinary Hospital etc.

DRINKING WATER FACILITIES IN THE STUDY AREA

Tap Water Treated	Tap Water Untreated	Covered Well	Uncovered Well	Hand Pump	Tube Wells/ Borehole	River/Canal	Tank/Pond / Lake
40	34	1	5	77	69	6	2

Various types of drinking water facilities were availed in the study area e.g. Tap water and Hand pump etc.

DRAINAGE STATUS IN THE STUDY AREA

Closed Drainage	Open Drainage	No Drainage	Open Pucca Drainage Covered with Tiles Slabs	Open Pucca Drainage Uncovered	Open Kuccha Drainage
2	2	2	7	61	56

Drainage and sanitation facilities were not adequate in the study area. Mostly Open drainage, and open pukka drainage observed in the village.

COMMUNICATION FACILITIES IN THE STUDY AREA

Post Office	Sub Post Office	Telephone	Public Call Office /Mobile (PCO)	Mobile Phone Coverage	Internet Cafes / Common Service Centre (CSC)
6	12	74	60	85	4

Post Office, Sub-post Office, Telephone (Landline), PCO, Mobile Phone Coverage, Internet Cafes/Common Service Centre were availed in villages for communication purpose.

TRANSPORTATION FACILITIES IN THE STUDY AREA

Public Bus Service	Railway Station	Auto/ Modified Autos	Taxi	Vans	Tractors	Sea/River Ferry Services
12	4	28	35	36	76	0

A well planned and efficient network of transport is an essential component for a developing country. In the absence of efficient network of transport, a State's economy would suffer from major grid lock in terms of overall growth potential of that area. In village public bus facility was availed and other facilities were railway station, auto, vans and tractors etc.

ROAD FACILITIES IN THE STUDY AREA

Black Topped (pucca) Road	Gravel (kuchha) Roads	Water Bounded Macadam	All Weather Road	Navigable Waterways (River/Canal)	Footpath
80	65	16	78	1	85

Roads are the basic means of communication for the development of any economy. All type of roads was present in the study area.

BANK FACILITIES IN THE STUDY AREA

Commercial Bank	Cooperative Bank	Agricultural Credit Societies	Self - Help Group (SHG)
5	2	12	6

Banking facility was found in village. Self-help group activities were performed by the women groups.

POWER FACILITY IN THE STUDY AREA

Power Supply For Domestic Use	Power Supply For Agriculture Use	Power Supply For Commercial Use	Power Supply For All Users
85	85	37	73

All the villages are facilitated with power facility in the form of domestic, commercial and for agricultural uses.

Source: District Census Handbook 2011, Gujarat.

3.12.8 Interpretation of Socio Economic Data

All the respondents across all socio-economic groups, age, gender and locations have expressed their views about the location. According to them, all villages are having basic infrastructural facilities but some villages need to be improved in some areas like, sanitation, road, etc. For sanitation, village panchayats can use Swachh Bharat Mission scheme. It will improve quality of life by increasing their employment opportunities and also by bringing about a positive change, like; employment, developmental activities, indirect employment, etc., while some are not having any idea about the upcoming project and its impacts. Most of the villages are having educational institutes up to secondary and higher secondary schools. Students needs to commute to the main hub in nearby vicinity for further studies. The study area consisting majority of the area as an agricultural land and primary profession of the people in the study area is agricultural farming. Almost all the villages have

more than 50 % people as non-workers. People's willingness and ability to be employed in the production activities need to be given importance. The respondents have suggested measures which need to be taken up for welfare of the people. The Company needs to undertake various activities in education, infrastructure development, and health and environment area as a part of Corporate Social Responsibility (CSR) and Corporate Environment Responsibility (CER).

3.13 Summary

Ambient Air Quality Monitoring

Sr. No.	Criteria Pollutants	Unit	Maximum Value	Minimum Value	Prescribed Standard
1.	PM_{10}	$\mu g/m^3$	75.1	63.3	100
2.	$PM_{2.5}$	$\mu g/m^3$	45.1	37.7	60
3.	SO_2	$\mu g/m^3$	7.7	4.9	80
4.	NO_2	$\mu g/m^3$	13.6	10.0	80
5.	CO	mg/m^3	<1.0	<1.0	2.0

All the results of ambient air quality parameters have been found within the limit as per NAAQS standards. Based on comparison study of results for tested parameters with NAAQS, it is interpreted that current ambient air quality of studied locations is well within the NAAQS limits and it can be considered satisfactory based on AQI index calculated. This interpretation is considered based on the results found for particular locations during the specific study period. The project will be developed on the private land and the nearest habitat to the project lies about 1 km project from the project. Due to the usage of the solid fuel in the boiler, there might be the chances of the incremental change in the current ambient air quality.

Noise Monitoring

Sr. No.	Parameter	Unit	Maximum Value	Minimum Value
1.	Ld (Day)	dB(A)	61.4	48.6
2.	Ln(Night)	dB(A)	56.4	43.2

Out of total 8 nos. of locations for noise monitoring 3 nos. of locations are monitored in the existing industry and 5 nos. of locations are monitored in surrounding villages within 3-4 km radius from the project site. Noise level in all the locations are within the standard norms prescribed by MoEF&CC. Noise level measured at villages is mainly due to vehicular movements of local people located within and nearby the villages. The nearby village surrounding to the project site is about 1 km away from the project site and results of the same are found within the prescribed norms during the baseline survey. Due to the project activities, there might be chances of incremental value in the noise levels due to increase in vehicular movement & plant activities. The interpretation can be considered based on the baseline survey conducted during the study period.

Soil Quality and Characteristics

Sr. No.	Parameter	Unit	Maximum Value	Minimum Value
1.	pH	-	8.37	6.92
2.	Electrical Conductivity	dS/m	0.20	0.12
3.	Exchangeable Sodium	meq/100gm	8.20	3.65
4.	Exchangeable Potassium	meq/100gm	38.87	17.13
5.	Total Nitrogen	%	89.60	68.97

	percentage			

Based on soil analysis data it is concluded that soil at the project site is neutral in reaction. The soils are high in nitrogen status, medium in phosphorus and medium in available potassium status. Soil of Barren Land and Grass Land is also having medium concentration of Nitrogen and high availability of Potassium, these soils can also be brought in agricultural purpose after the addition of Phosphorous. The levels of total Fe, Cu, Cr, B and Zn are within the limits as per Dutch Pollutant Standard for Soil. Soil at the project site should be periodically monitored for EC, pH and ESP besides OC, available P and K. In the proposed project, there will be utilization of the treated wastewater generated from the process in the agricultural farming of Sugar Cane within the plant premises only. Due to usage of treated wastewater as irrigation water and excessive usage of manure will result to increase the organic carbon content, nitrogen & phosphorous and there is also chance of acidification in soil.

Ground water

Parameters	**Unit**	**Minimum**	**Maximum**
pH	--	6.35	7.56
TSS	mg/l	14	25
TDS	mg/l	275	502
Total Hardness	mg/l	198	378
Total Alkalinity	mg/l	182	361
Chlorides	mg/l	6	48
Sulphate	mg/l	17.9	99
Iron	mg/l	0.75	1.91

Based on comparison study of test results and summary report with drinking water norms as per IS: 10500 :2012, it is interpreted that all the results for ground water samples are beyond the desirable limit range but they are within the permissible limit except iron in Bhola, Ghulla, Nano Nagal & Paniar. Ground water samples collected from the villages Bhola, Ghulla, Nano Nagal & Paniar should not be used for drinking purpose and other ground water sources can be utilized in drinking purpose. It is suggested that, it is better that these water sources should be used for drinking purpose after proper treatment i.e. filtration, R.O. treatment. This water can be used for all domestic purposes as well as irrigation purposes.

Surface Water

Parameters	**Unit**	**Minimum**	**Maximum**
pH	--	6.84	7.21
TDS	mg/l	110	248
TSS	mg/l	8	12
Total Hardness	mg/l	88	160
Dissolved Oxygen	mg/l	5.4	5.8
COD	mg/l	10	21
BOD	mg/l	3	6
Total Nitrogen	mg/l	0.5	0.6
Iron	mg/l	0.09	0.81

Based on test result data comparison study with CPCB standard, it is interpreted that surface water quality of Upper Bari Doab Canal meet with the criteria B to E and Dala Lake meet with the criteria D & E. According to the classification, water sourced from Upper Bari Doab Canal can be used for outdoor bathing, drinking water source with conventional treatment followed by disinfection, Propagation of wild life, fisheries & Irrigation, industrial, cooling, controlled waste disposal, while the water sourced from Dala Lake can be used for Propagation of wild life, fisheries & Irrigation, industrial, cooling, controlled waste disposal. Bathing, washing and other activities were observed in most of lakes/ponds located in study area. Results

of COD and BOD also indicate towards the organic contamination in surface water body due to Bathing, washing and other activities. DO level for all the locations are >4.0 mg/L. DO level >4.0 mg/L is considered suitable for the survival of aquatic life and <4.0 mg/L is not considered suitable for aquatic life survival. The wastewater from the proposed project is planned to utilize for irrigation purpose in own sugar cane farms within the plant premises and hence, there will be least possibility for surface water contamination due to the proposed project.
Ecology and Biodiversity
The proposed project comes under the private land and the study area is majorly covered with agricultural land and range land. The soils of the district are alluvial and fertile. It is divided into three zones, i.e. sub mountainous, kandi and plain. The major crops cultivated are Rice, Maize, Sesamum, Sugarcane, Wheat & Rapeseed and Mustard. Fruit crops are Mangos, Litchi, Kinnow, Guava, Orange & Malta, Amla, Pear, Plum, Peach, Lemon, Ber, etc. and vegetables are Potato, Onion, Winter Vegetables and Summer Vegetables. Among the enumerated flora in the study area, none of them were assigned any threat category by Red data book of Indian Plants. None of the sighted floral species can be assigned endemic species category of the study area. Common faunal species has been noted during the primary survey. During the survey, it is observed that there is presence of a bird sanctuary within the study area and it is having vast range of bird species, which are listed in the IUCN Red data book. As per IUCN Red List there are 23 nos. of Avifauna likely to be found at the Bird Sanctury located within the study area, out of which 3 nos. of avifaunal species listed as vulnerable species as per IUCN Red list and remaining are listed as least concern species. Among the reptiles, Indian Cobra (Naja naja), and Common rat snake (Ptyas Mucosus) were provided protection as per Schedule-II of Wild life protection act, (1972). Among mammals; Common Mongoose (Herpestes edwardsi), is a schedule –II animals. Conservation plan for such protected species should be submitted to concerned forest depart of the region
Socio economic
All the respondents across all socio-economic groups, age, gender and locations have expressed their views about the location. According to them, all villages are having basic infrastructural facilities but some villages need to be improved in some areas like, sanitation, road, etc. For sanitation, village panchayats can use Swachh Bharat Mission scheme. It will improve quality of life by increasing their employment opportunities and also by bringing about a positive change, like; employment, developmental activities, indirect employment, etc., while some are not having any idea about the upcoming project and its impacts. Most of the villages are having educational institutes up to secondary and higher secondary schools. Students needs to commute to the main hub in nearby vicinity for further studies. The study area consisting majority of the area as an agricultural land and primary profession of the people in the study area is agricultural farming. Almost all the villages have more than 50 % people as non-workers. People's willingness and ability to be employed in the production activities need to be given importance. The respondents have suggested measures which need to be taken up for welfare of the people. The Company needs to undertake various activities in education, infrastructure development, and health and environment area as a part of Corporate Social Responsibility (CSR) and Corporate Environment Responsibility (CER).

CHAPTER 4
ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.0 GENERAL

The chapter aims at controlling pollution at the source level to the extent possible with the available and affordable technology followed by treatment measures before they are discharged. The proposed project would create impact on the environment in two distinct phases:

- During the construction phase which may be regarded as temporary or short term; and
- During the operation phase which would have long term effects.

The construction and operational phase of the proposed project comprises various activities each of which will have an impact on some or other environmental parameters. Various impacts during the construction and operation phase on the environmental parameters have been studied and mitigation measures for the same are discussed briefly below and elaborated in the subsequent sections.

4.1 IMPACT IDENTIFICATION DURING CONSTRUCTION PHASE

This phase involves the activities like erection of civil units, new equipment and machinery etc. Different components of environment are likely to be effected by the activities. The probable impacts during construction phase on various sectors of environment (such as air, water, soil, biotic, socio-economic environment etc.) have been identified and listed in **Table - 4.1.**

Table 4.1: Impact Identification Matrix (During Construction Phase)

Activities	Environmental Attributes										
	Air	Water	Soil	Noise	LU / LC	Hydro geology	Geology	SHW	Risk Hazardous	Ecology & Biodiversity	Socio Economic
Site demolition and leveling	✔	-	✔	✔	-	-	-	-	✔	-	-
Transportation of construction material and operation of machineries	✔	-	✔	✔	-	-	-	-	✔	✔	–
Storage and handling of construction material	✔	-	✔	✔	-	-	-	-	✔	-	-
Civil construction Activities	✔	✔	✔	✔	–	-	-	✔	✔	✔	✔
Disposal of construction debris	–	-	-	-	-	-	-	✔	-	-	-
Wastewater-sewage disposal	✔	✔	✔	-	-	-	-	✔	-	-	-
Greenbelt development	✔	✔	✔	✔	✔	–	-	-	-	✔	✔
Employment generation	-	✔	-	-	-	-	-	✔	-	-	✔

Table 4.2: Severity Criteria for Magnitude of Impacts

S. No	Category	Description of category	Impact	
			Adverse	Beneficial
1.	No impact	--	0	0
2.	No appreciable impact	Short term reversible	-1	1
3.	Significant impact	Long term reversible	-2	2
4.	Major impact	Irreversible but of lesser extent	-3	3
5.	High impact	Irreversible but of medium extent	-4	4
6.	Permanent impact	Severe irreversible impact	-5	5

Probability			Impact				
			Very low 1	Low 2	Medium 3	High 4	Very High 5
	Very High	5	5	10	15	20	25
	High	4	4	8	12	16	20
	Medium	3	3	6	9	12	15
	Low	2	2	4	6	8	10
	Very Low	1	1	2	3	4	5

Figure 4.1: Impact Quantification Chart

Table 4.3: Cumulative Score range for Beneficial and Adverse impacts

S. No.	Cumulative Score	Meaning
1.	+ ve / - ve	Beneficial impact / adverse impact.
2.	0 - 150	No appreciable Beneficial impact / adverse impact.
3.	151 - 300	Appreciable but reversible adverse impact-mitigation measures are needed.
4.	301 - 450	Significant adverse impacts: most of the impacts are reversible. Mitigation measures are crucial.
5.	451 - 600	Major adverse impacts; most of the impacts are reversible. Alternative site selection to be considered.
6.	> 600	Permanent irreversible impact; alternatives to the project need to be explored.

Table 4.4: Environmental Impact Assessment Matrix without Mitigation Measures (Construction Phase)

Activities	Environmental Attributes											Total
	Air	Water	Soil	Noise	LU/LC	Hydro geology	Geology	SHW	Risk Hazardous	Ecology and Biodiversity	Socio Economic	
Site demolition and leveling	-16	-	-4	-12	-	-	-	-	-6	-	-	**-38**
Transportation of construction material and operation of machineries	-9	-	-2	-6	-	-	-	-	-9	-4	-	**-30**
Storage and handling of construction material	-4	-	-2	-4	-	-	-	-	-6	-	-	**-16**
Civil construction Activities	-12	-4	-2	-16	-	-	-	-6	-12	-4	-6	**-62**
Disposal of construction debris	-	-	-	-	-	-	-	-6	-	-	-	**-6**
Wastewater-sewage disposal	-4	-6	-4	-	-	-	-	-4	-	-	-	**-18**
Greenbelt development	6	-2	6	4	2	-	-	-	-	4	4	**24**
Employment generation	-	-6	-	-	-	-	-	-4	-	-	9	**-1**
Total	**-39**	**-18**	**-8**	**-34**	**2**	**0**	**0**	**-20**	**-33**	**-4**	**7**	**-147**

Highest cumulative score (-39) received in Air pollution. Highest total (-62) received for Civil Construction Activities. Total Cumulative Score for various Environmental Parameters without mitigation measures is (-147) which is not appreciable adverse impact score during construction Phase.

4.2 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES DURING CONSTRUCTION PHASE

4.2.1 Air Environment

Table 4.5: Impact on Air Environment and Mitigation Measures during Construction Phase

Project Activity	Impact	Mitigation Measures
• Site demolition and leveling	• Dust generation may increase the PM level in the ambient air, prolong exposure may impair respiratory disorder.	• Water sprinkling will be done while demolition and leveling of site. • Excavated soil and construction debris will be sprinkled with water and kept moist. • Barricading wall shall be provided at periphery of site boundary. • Dust Mask will be provided to the construction workers in dust prone area. • The impact will be for short duration and confined locally to the construction site
• Transportation of construction material and	• Fugitive Dust Emissions due to vehicular movement may deteriorate the quality of Air.	• Water sprinklers will be used to reduce fugitive dust emissions. • The approach roads will be made paved or

Project Activity	Impact	Mitigation Measures
operation of machineries	• Exhaust emissions from vehicles like bulldozers, trucks etc. and equipment deployed during the construction phase is also likely to result in marginal increase in the levels of SO_2, NO_x and PM which leads to respiratory disorders.	tarred. • Trucks used for transportation of construction materials shall be covered with tarpaulin sheet to avoid dust dispersion at site. • Only PUC vehicle shall be used for the transportation of materials and equipment. • Periodic serviced and maintenance of machineries will be done.
• Storage and handling of construction material	• Spillage and fugitive emissions of construction materials will lead to inhalation of dust/gases/fumes which may cause adverse health impact. • Stomatal index may be minimized due to dust deposit on leaf which reduces crop yield and deteriorate crop quality	• Construction materials will be covered with tarpaulin sheets throughout the construction phase to avoid dust generation. • Safety goggles and dust mask will be provided to the workers.
• Civil construction activities	• Increase of dust and airborne particulates may deteriorate the quality of the air. • Civil construction activities may lead to health problems.	• Regular water sprinkling will be done to control dust emission. • Barricading will be done at the construction activity site • Personnel Protective Equipment (PPEs) will be provided to the construction workers. Hence, there will be no significant impacts on their health due to the dust particle.
• Wastewater-sewage disposal	• Odour generation due to sewage disposal may create nuisance to the workers and nearby community.	• Proper sanitation facilities will be provided to construction workers. • Sewage generated will be treated & disposed through septic tank/soak pit.
• Greenbelt development	• Positive impact due to greenbelt development as it will act as natural barrier for dust and noise emission. • The impact will be confined within the project boundary and is expected to be negligible outside the plant boundaries.	• The unit will develop greenbelt of 1,37,391 m^2 (35% of total plot area) in and around plant premises. • Regular maintenance will be carried out for proper growth.

4.2.2 Water Environment

Table 4.6: Impact on water Environment and Mitigation Measures during Construction Phase

Project Activity	Impact	Mitigation Measures
• Civil construction activities	• Decrease in ground water level due to water consumption in construction activities like concrete batching, grouting, dust suppression etc.	• Rainwater harvesting system will be implemented as per plan and will be reuse to reduce fresh water requirement. • Workers will be trained for optimizing water consumption and reusing water wherever possible.
• Wastewater-sewage disposal	• Untreated sewage if disposed openly may create nuisance in the surrounding areas • Wastewater generated during construction activities if discharged on ground, then it can reach the ground water table by leaching and affect the ground water quality.	• Proper sanitation facilities shall be provided to construction workers. • Sedimentation pits will be provided at appropriate location to trap the silt laden runoff water and prevent excessive silt from going outside • Sewage will be disposed through septic tank during the construction phase.
• Greenbelt development • Employment generation	• Water resource depletion due to water consumption by employed workers and for Greenbelt development	• Water consumption will be from own water reservoir / facility of water tankers will be provided if needed. • Recharge of ground water will be done by proper rainwater harvesting plan • Wastage of water will be strictly avoided. Awareness for water conservation will be provided to the workers.

4.2.3 Soil Environment

Table 4.7: Impact on Soil Environment and Mitigation Measures during Construction Phase

Project Activity	Impact	Mitigation Measures
• Site demolition and leveling	• Improper storage of excavated earth material may result into runoff and thus resulting in loss of top soil.	• Excavated earth shall be stored at designated area and covered with plastic/tarpaulin sheets and reused for landscape development along the corridor.
• Transportation of construction material and operation of machineries	• Soil may get contaminated from the spillage of chemicals such as fuels, oils, and other construction chemicals. This normally happens when these materials are transported in open or loosely capped containers.	• Proper spill management plan will be prepared and followed for oily residues such as transformer oil and lubricants in the case of accidental or unexpected release. Transformer oil will be supplied in drums from an imported source. • Oily residues and fuel and any contaminated soil residues will be

Project Activity	Impact	Mitigation Measures
		captured at source and refueling and maintenance will take place in dedicated areas away from surface water resources. Contaminated residues and waste oily residues will be disposed at a site agreed with the local authority.
• Storage and handling of construction material	• Soil contamination due to improper handling and storage of construction material. • Oil spillage can affect nutritive composition of the soils.	• The construction material & diesel / oil to be used for various construction activities will be stored in designated storage yards to reduce the spills into unwarranted areas. • Good practices of storage and material handling will be carried out. • Spillage control will be carried out by disposing the affected soil at dedicated place.
• Civil construction activities	• Construction activities, such as grading and filling, drastically reduce soil quality on construction sites. • The excavated earth material if stacked loosely may result into runoff resulting in loss of topsoil.	• Soil management plan will implemented during construction phase • Excavated earth will be stored in stockpiles and covered with plastic / tarpaulin sheets or stored in closed room and reused for landscape development along the corridor.
• Wastewater-sewage disposal	• Unmanaged sewage can contribute to contamination of soil.	• The wastewater generation during the construction period will be from the sanitary units provided for the constructional workers. • This wastewater will be treated in septic tanks and discharged into soak pits.
• Greenbelt development	• Positive impact as improvement in soil texture due to binding of top soil materials and root structure.	• The greenbelt development will control the soil erosion due to wind and runoff water. • Regular maintenance of greenbelt will be ensured.

4.2.4 Noise Environment

Table 4.8: Impact on Noise Environment and Mitigation Measures during Construction Phase

Project Activity	Impact	Mitigation Measures
• Site demolition and leveling • Transportation of construction material	• High noise from demolition activity and operation of machinery like Crawler Excavators, Wheel Loaders, and Crawler Loaders etc. and Noise generation from vehicles movement, D.G sets and construction equipment	• Demolition activity will be temporary during the daytime only. Hence, will not have any significant impact. • Machinery used for construction will adhere to International standards. These standards itself take care of noise pollution control / vibration control.

Project Activity	Impact	Mitigation Measures
and operation of machineries • Storage and handling of construction material • Civil construction activities	like dozers, scrapers, concrete mixers, cranes, pumps, compressors, pneumatic tools, saws, vibrators etc. may lead to hearing problem and other health related issues etc. • Biological environment i.e. Birds, reptiles are sensitive to high noise level. Continuous exposure of high noise level may leads to hearing issues.	• Lubrication will be carried-out periodically for rotation machinery. • Use of well - maintained construction equipment as well as vehicles used for transportation. • Noise barriers will be provided near high noise generating areas. • Provision of quiet areas where workers can find relief during breaks • Vibration control damped tools will be used and the number of hours that a worker uses them must be limited. • No engines to be running while waiting within the site for a certain length of time. • D.G. set shall be provided with acoustic enclosures and shall be used only in case of power failure / emergency. • Provision of PPEs like earmuffs / earplug to avoid adverse effects of noise on occupational health and hearing capacity of workers as well as planning of working hours and shift of workers.
• Greenbelt development	• Plant parts such as stems, leaves, branches, wood, etc. absorb sound. Rough bark and thick, fleshy leaves are particularly effective at absorbing sound with their dynamic surface area for absorbing sound.	• The unit will develop greenbelt of 1,37,391 m^2 in and around plant premises. • Adequate water and manure will be providedfor plant growth.

4.2.5 Land Use/ Land Cover

Table 4.9: Impact on Land Use/ Land Cover and Mitigation Measures during Construction Phase

Project Activity	Impact	Mitigation Measures
• Greenbelt development	• No major impact as proposed project will be developed within land acquired by Gurdaspur Sugar mills. • Green belt development will lead to permanent change in land cover pattern at the site as a direct impact. • Green belt will enhance the aesthetic value and beautify the landscapes.	• Greenbelt area will be developed which will result in beneficial impacts on land cover of the project area.

4.2.6 Hydrogeology

Table 4.10: Impact on Hydrogeology and Mitigation Measures during Construction Phase

Project Activity	Impact	Mitigation Measures
• Greenbelt Development	• Decrease in ground water level due to ground water consumption.	• Rainwater harvesting will be carried out for water conservation and recharge of ground water.

4.2.7 Geology

Table 4.11: Impact on Geology and Mitigation Measures during Construction Phase

Project Activity	Impact	Mitigation Measures
No major impact is envisaged on the geology of the area due to construction activities.		

4.2.8 Hazardous / Solid Waste

Table 4.12: Impact of Hazardous/Solid Waste and Mitigation Measures during Construction Phase

Project Activity	Impact	Mitigation Measures
• Civil construction activities	• The excavated earth material if stacked loosely may result into runoff resulting in loss of top soil.	• No major excavation will be carried out. • Excavated earth shall be stored in stockpiles and covered with plastic / tarpaulin sheets or stored in closed room and reused for landscape development along the corridor.
• Disposal of Solid waste	• Construction waste like asphalt, ordinary concrete, reinforced concrete, bricks, wood, glass, iron, electric pipes, concrete pipes, plastic pipes etc. will be generated which may cause adverse health impact, if not disposed properly. • Fuel leakage / spillage used for construction equipment or vehicles may cause land contamination.	• Construction waste will be segregated and disposed off adequately. • The construction wastes will be utilized for leveling work etc. • Fuel leakage / spillage will be mitigated by providing properly lined storage area. • Care will also be taken that stagnant pools are not formed at the site during the construction phase. • Separate bins will be provided for storing Garbage / wastes and will be disposed off adequately.
• Waste water - sewage disposal	• The solid wastes generated from the domestic activities of construction workforce and sewage generation may cause land contamination if disposed on land.	• Sewage generated will be disposed properly through soak pit to avoid any adverse impacts on land. • Proper sanitation and drinking water facilities shall be provided for construction workers.
• Employment generation		

4.2.9 Risk and Hazard

Table 4.13: Impact of Risk and Hazards and Mitigation Measures during Construction Phase

Project Activity	Impact	Mitigation Measures
• Site demolition and leveling	• Falling from height, through openings and fragile materials, Contact with live overheads, falling debris, etc. may cause serious injuries	• Fall prevention devices (e.g. temporary work platforms and guard railing), work positioning systems (for example, industrial rope access systems), or fall arrest systems such as catch platforms shall be used. • Pipes and live cables must be de-energized or labeled clearly and instructed workers accordingly. • Demolition work should begin at the top of the structure and proceed downwards • Personnel Protective Equipment (PPEs) will be provided to the construction workers.
• Transportation of construction material and operation of machineries • Storage and handling of construction material • Civil Construction Activities	• Vehicle collision due to failure may lead to loss of life and property. • Failure of machineries during construction activities may cause bodily injuries and accidents. • Fire and explosion in storage area may cause loss of life and property. • Fall from height, falling object, cut/crush injury, due to construction activities may cause serious injuries.	• All the activities will be carried out under the supervision and control of the competent person. • The vehicles will be maintained in good repairs and checked thoroughly at least once a week. • The vehicles will be maintained in good repairs and checked thoroughly at least once a week by the competent person appointed by the management. • Construction machineries and equipments will be well maintained and properly guarded. • Firefighting arrangement will be made available at construction site. • Personal Protected equipment such as helmet, goggles, fall arrest earplug, etc., will be provided.

4.2.10 Ecology and Biodiversity

Table 4.14: Impact on Ecology and Biodiversity and Mitigation Measures during Construction Phase

Project Activity	Impact	Mitigation Measures
• Transportation of construction material and operation of machineries • Civil construction activities	• Transportation of construction material by the trucks/dumper will affect the movement of animals and birds. • Fugitive emission from vehicle movement will form a layer in leaves thus reducing the gaseous exchange	• Transportation of products and raw material shall be carried out during daytime only. • Only PUC vehicle shall be used for the transportation of materials and equipment. • During the site visit, it was observed that there is no forest land, or ecologically sensitive area near the project site. Hence, impact on the same is not envisaged. • Noise control measures like enclosure, silencer will be installed to reduce noise generating from operation of construction

	process. This ultimately affects the growth of plants. • Operation of machineries and civil construction activity will lead to noise pollution near surround areas.	machineries. • The proposed activities do not envisage destruction of habitat and feeding or breeding area of faunal species. Further, development of plantation will provide habitat, food and breeding areas for small animals and insects. Thus, a positive impact is envisaged. • No rare or endangered species of fauna are reported to exist in the area. Thus, no impacts on rare / endangered species are envisaged due to normal operations.
• Green belt Development	• Greenbelt development may cause positive impacts on the flora by enhancing gaseous exchange. • Generation of habitats for avifauna i.e. positive impact.	• Regular watering and maintenance of the greenbelt to sustained plant growth.

4.2.11 Socio-Economic

Table 4.15: Impact on Socio-Economic and Mitigation Measures during Construction Phase

Project Activity	Impact	Mitigation Measures
• Transportation of construction material and operation of machineries • Civil construction Activities • Employment Generation • Greenbelt development	• Transportation, movement/ operation of machineries and civil construction activities will generate noise and air pollution, which will impair the health of the nearby community. It may also increase the traffic due to transportation. • The construction phase will generate employment opportunity in skilled as well as unskilled categories. Although the workforce requirement will be temporary in nature, it will be met from the local populace hence there will be positive impact. • Greenbelt will enhance the aesthetic value and beautify the landscapes	• Proper measure will be adopted to reduce various pollution generated by Transportation, movement/ operation of machineries and civil construction activities • It will be ensured that contractor provides all necessary amenities like sanitary, drinking water facility, first aid etc. to the workers. • Local businessmen will get opportunity to supply construction materials. • Demands generated from the employees working at site for basic facilities will increase the local business activity of the area. During the construction phase, approximate 100-125 Nos. of workers will be required. • Regular maintenance and watering of greenbelt will be done.

Table 4.16: Environmental Impact Assessment Matrix with Mitigation Measures (Construction Phase)

Activities	Environmental Attributes											
	Air	Water	Soil	Noise	LU/LC	Hydro geology	Geology	SHW	Risk Hazardous	Ecology and Biodiversity	Socio Economic	Total
Site demolition and leveling	-6	-	-2	-8	-	-	-	-	-2	-	-	**-18**
Transportation of construction material and operation of machineries	-8	-	-1	-4	-	-	-	-	-4	-2	-	**-19**
Storage and handling of construction material	-2	-	-1	-2	-	-	-	-	-2	-	-	**-7**
Civil Construction Activities	-6	-2	-1	-6	-	-	-	-2	-4	-2	-2	**-25**
Disposal of Solid Waste	-	-	-	-	-	-	-	-2	-	-	-	**-2**
Wastewater-sewage Disposal	-2	-2	-2	-	-	-	-	-2	-	-	-	**-8**
Greenbelt Development	8	-	6	6	4	-	-	-	-	8	4	**36**
Employment Generation	-	-4	-	-	-	-	-	-2	-	-	12	**6**
Total	**-16**	**-8**	**-1**	**-14**	**4**	**0**	**0**	**-8**	**-12**	**4**	**14**	**-37**

Total cumulative score for various environmental parameters with mitigation measures is -37 which is not appreciable adverse impact during construction phase.

4.3 IMPACT IDENTIFICATION DURING OPERATION PHASE

Probable impacts on various sectors of environment during operation phase are given in Table - 4.17.

Table 4.17: Impact Identification Matrix (Operation Phase)

Activities	Environmental Attributes										
	Air	Water	Soil	Noise	LU/LC	Hydro geology	Geology	SHW	Risk Hazardous	Ecology and Biodiversity	Socio Economic
Transportation (Raw materials & products)	✔	-	-	✔	-	-	-	-	✔	✔	✔
Raw material and product Handling and Storage	✔	-	✔	-	-	-	-	–	✔	-	-
Product Manufacturing	✔	✔	-	✔	-	-	-	✔	✔	-	-
Operation of utilities	✔	-	✔	✔	-	-	-	✔	✔	✔	✔
ETP Operation	✔	✔	✔	-	-	✔	-	✔	–	✔	-
Recruitment	-	✔	-	-	-	-	-	-	-	-	✔
Greenbelt development	✔	✔	✔	✔	✔	✔	-	-	-	✔	✔

Table 4.18: Environmental impact matrix without mitigation measures (During Operation Phase)

Activities	Environmental Attributes											
	Air	Water	Soil	Noise	LU / LC	Hydro geology	Geology	SHW	Risk Hazardous	Ecology & Biodiversity	Socio Economic	Total
Transportation (Materials Supply & product)	-9	-	-	-6	-	-	-	-	-6	-6	-4	**-31**
Raw material and product Handling and Storage	-9	-	-6	-	-	-	-	-	-9	-	-	**-24**
Product Manufacturing	-6	-6	-	-12	-	-	-	-4	-6	-	-	**-34**
Operation of utilities	-12	-	-4	-9	-	-	-	-4	-9	-6	-6	**-50**
ETP Operation	-4	-16	-6	-	-	-6	-	-6	-	-4	-	**-42**
Recruitment	-	-4	-	-	-	-	-	-	-	-	+6	**+2**
Greenbelt development	+6	-6	+6	+4	+2	-4	-	-	-	+4	+4	**+16**
Total	**-34**	**-32**	**-10**	**-23**	**2**	**-10**	**0**	**-14**	**-30**	**-12**	**0**	**-163**

Highest cumulative score (-34) received in Air pollution. Highest total (-50) received for Operation of utilities. Total Cumulative Score for various Environmental Parameters without mitigation measures is (-163) which is appreciable adverse impact score but reversible adverse impact-mitigation measures are needed during operation phase.

4.4 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES DURING OPERATION PHASE

4.4.1 Air Environment

4.4.1.1 Air Quality Index

The Minister for Environment, Forests and Climate Change Shri Prakash Javadekar launched The National Air Quality Index (AQI) in New Delhi on 17 September 2014 under the Swachh Bharat Abhiyan. It is outlined as 'One Number- One Colour-One Description' for the common man to judge the air quality within his vicinity. The index constitutes part of the Government's mission to introduce the culture of cleanliness.

Air Quality Index (AQI) is one such tool for effective dissemination of air quality information to people. As such an Expert Group comprising medical professionals, air quality experts, academia, advocacy groups, and SPCBs was constituted and a technical study was awarded to IIT Kanpur. IIT Kanpur and the Expert Group recommended an AQI scheme in 2014.

There are six AQI categories, namely Good, Satisfactory, Moderately polluted, Poor, Very Poor, and Severe. The proposed AQI will consider eight pollutants (PM10, PM2.5, NO2, SO2, CO, O3, NH3, and Pb) for which short-term (up to 24-hourly averaging period) National Ambient Air Quality Standards are prescribed. Based on the measured ambient concentrations, corresponding standards and likely health impact, a sub-index is calculated for each of these pollutants. The worst sub-index reflects overall AQI.

AQI to be calculated by using the pollutant concentration data, the following table, and the following equation (linear interpolation):

$$I_p = \frac{I_{Hi} - I_{Lo}}{BP_{HI} - BP_{Lo}}(C_p - BP_{Lo}) + I_{Lo}.$$

Where,
Ip = the index for pollutant p
Cp = the rounded concentration of pollutant p
BPHi = the breakpoint that is greater than or equal to Cp
BPLo = the breakpoint that is less than or equal to Cp
BPHi = the breakpoint that is greater than or equal to Cp
IHi = the AQI value corresponding to BPHi
ILo = the AQI value corresponding to BPLo
AQI is divided into six categories.

Air Quality index (AQI) values	Levels of health concern	Description	Color
0 – 50	Good	Minimal Impact	Dark Green
51 - 100	Satisfactory	Minor breathing discomfort to sensitive people	Light Green
101 – 150	Moderate	Breathing discomfort to the people with Lung, heart disease, children and other adults.	Lemon Yellow
151- 200	Poor	Breathing discomfort to people on prolonged exposure	Yellow
201 – 300	Very Poor	Respiratory illness to the people on prolonged exposure	Red
301 - 500	Severe	Respiratory effects even on healthy people.	Brown

Source: Central Pollution control board series CUPS/8z/2014-15

S. No.	Locations	SUB INDEX					AQI
		PM_{10}	$PM_{2.5}$	SO_2	NO_x	CO	
1.	Project Site	69.8	41.9	6.5	12.4	--	**70**
2.	Sahowal	67.7	40.7	6.3	12.1	--	**68**
3.	Saidipur	67.3	40.5	6.6	12.6	--	**68**
4.	Talwandi	68.0	40.5	6.4	12.2	--	**68**
5.	Bhola	68.3	40.7	6.2	12.2	--	**68**
6.	Paniar	68.8	41.1	6.3	11.8	--	**69**
7.	Mokha	69.3	41.5	6.3	12.2	--	**69**
8.	Bhangwan	68.9	41.2	6.2	12.0	--	**69**

- AQI of 8 locations is recorded satisfactory in study area. The AQI for all 5 parameters has been calculated for running 8-h averages. It can be seen that for pollutants air quality is good / satisfactory.
- From the above representative table of air quality index for 10 Km radius of project site, responsible parameter for pollution is PM_{10} Maximum AQI and responsible parameter for pollution are recorded in project area are PM_{10} and $PM_{2.5}$ with satisfactory pollution.

4.4.1.3 Air Quality Modelling

The flue gas stacks are considered as a point source to predict the impact on ambient air quality during the operational phase. The prediction has been done by using AERMOD View Gaussian Plume Dispersion model.

Air Environment

A number of sources from the proposed project which can cause potential impacts on Air environment during operation phase are discussed as below:

Operational Phase

1. The flue gas emission through stack attached to Steam boilers (145 TPH & 45 TPH).

Methodology

The methodology for Air Quality Modeling using AERMOD View model is given in Figure 4.2.

Figure 4.2 Methodology for Air Quality Modeling

Meteorological Parameters

Surface meteorological data at the project site was collected for Dec 2021 – Feb 2022. The hourly meteorological data considered during this period were:

- Wind Speed & Direction;
- Ambient atmospheric temperature;
- Cloud cover;
- Relative humidity.

Following parameters were considered for dispersion modeling – Point source

- Quantity of fuel;
- The Emission rate of pollutants;
- Stack & Vent:

- Internal diameter at top; and height from ground level;
- Exit gas velocity;
- Exit gas temperature.

Source of Emission

- Flue gas emission of PM, SO_2, & NOx, from the stack attached to 145 TPH Capacity of steam boiler and 45 TPH Capacity of steam boiler.
- There is no process gas emission.

The stack & vent details along with APCM and emission rate of pollutants are given in Table 4.19.

Table 4.19: Estimation Emission Rate from Proposed Flue Gas Stacks

Stack Details										Emission		
Sr. No.	**Stack Attached to**	**Capacity**	**Height (m)**	**Diameter (m)**	**Gas Exit Velocity (m/s)**	**Gas Exit Temperature °K**	**Fuel**	**APCM**	**Fuel Consumption**	**PM Emitted (g/s)**	**SO_2 Emitted (g/s)**	**NOx Emitted (g/s)**
1.	Steam boiler	145 TPH	65	3.5	7.66	398	Bagasse	Electrostatic Precipitator	55.33 TPH	1.15	0.06	-
2.	Steam boiler	45 TPH	83	3.8	8.50	398	Concentrated spent wash and Bagasse	Electrostatic Precipitator	Concentrated spent wash – 16.71 TPH along with Bagasse – 8.34 TPH	4.33	0.94	2.70

Assumptions:

The dispersion modeling assumptions considered are as follows:

- The flue gas stack emission rate for PM and SO_2 was calculated based on the Ash and Sulphur content specification of Bagasse & Concentrated spent wash and the NOx was calculated based on flue gas emission standards.
- The terrain of the study area was considered as flat.
- The mathematical equations used for the dispersion modeling assumes that the earth surface acts as a perfect reflector of plume and physic-chemical processes such as dry and wet deposition and chemical transformation of pollutants are negligible.

Isopleths & Results

The maximum of 24 hourly highest GLC's of PM, SO_2, and NOx, due to flue gas emission (Point source) is summarized in **Table 4.20.**

Table 4.20: Summary of Point Source Modeling

Pollutant	Maximum of 24 hourly highest Concentration (µg/m^3)	Distance (m)	Direction
PM_{10}	1.81	500	S
SO_2	0.30	500	S
NO_X	0.79	500	S

The 1st highest 24-h concentration values of incremental GLC & Isopleths for PM, SO_2, and NOx are given below.

Isopleth for PM from flue gas stack

Isopleth for SO_2 from flue gas stack

PROJECT TITLE:

M/s. The Gurdaspur Cooperative Sugar Mills Ltd.
SO2 Isopleth

PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL — ug/m^3

Max: 0.30 [ug/m^3] at (543416.62, 3550149.56)

0.09 | 0.10 | 0.20 | 0.30 | 0.30

COMMENTS:	SOURCES: **2**	COMPANY NAME: **M/s. The Gurdaspur Cooperative Sugar Mills Ltd.**
	RECEPTORS: **360**	MODELER: **Eco Chem Sales and Services, Surat**
	OUTPUT TYPE: **Concentration**	SCALE: 1:129,744 — 0 — 5 km
	MAX: **0.30 ug/m^3**	DATE: **25-Mar-22**

Isopleth for NOx from flue gas stack

PROJECT TITLE:

M/s. The Gurdaspur Cooperative Sugar Mills Ltd.
NOX Isopleth

PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL ug/m^3

Max: 0.79 [ug/m^3] at (543416.62, 3550149.56)

0.20 0.40 0.50 0.70 0.79

COMMENTS:	SOURCES:	COMPANY NAME:
	1	M/s. The Gurdaspur Cooperative Sugar Mills Ltd.
	RECEPTORS: 360	MODELER: Eco Chem Sales and Services, Surat
	OUTPUT TYPE: Concentration	SCALE: 1:129,744 — 0 5 km
	MAX: 0.79 ug/m^3	DATE: 25-Mar-22

Prediction of Incremental GLC of Pollutants on Air Environment
Results

The incremental increase in GLC of PM, SO_2, and NOx due to flue gas emission (Point source) presented in **Table 4.21.**

Table 4.21: 24 hourly highest incremental increase in GLC

S.No.	AAQ Monitoring Location (Distance in Km/ Direction)	Pollutant	98th Percentile Baseline Concentration (µg/m³)	Incremental GLC (µg/m³)	Total Predictive GLC (µg/m³)	NAAQS Concentration Limit (µg/m³)
1.	Project site --	PM_{10}	74.9	1.81	76.71	100
		SO_2	7.3	0.30	7.6	80
		NO_X	13.4	0.79	14.19	80
2.	Sahowal (2.18 km / SE)	PM_{10}	72.9	0.65	73.55	100
		SO_2	7.0	0.12	7.12	80
		NO_X	13.1	0.32	13.42	80
3.	Saidipur (8.90 km / N)	PM_{10}	72.6	0.06	72.66	100
		SO_2	7.5	0.01	7.51	80
		NO_X	13.6	0.03	13.63	80
4.	Talwandi (6.91 km / NNE)	PM_{10}	73.2	0.07	73.27	100
		SO_2	7.2	0.01	7.21	80
		NO_X	13.2	0.04	13.24	80
5.	Bhola (3.41 km / W)	PM_{10}	73.4	0.16	73.56	100
		SO_2	7.1	0.03	7.13	80
		NO_X	13.2	0.08	13.28	80
6.	Paniar (1.24 km / WSW)	PM_{10}	73.9	0.78	74.68	100
		SO_2	7.1	0.13	7.23	80
		NO_X	12.8	0.36	13.16	80
7.	Mokha (3.70 km / S)	PM_{10}	74.5	0.43	74.93	100
		SO_2	7.1	0.08	7.18	80
		NO_X	13.2	0.20	13.4	80
8.	Bhangwan (5.57 km / S)	PM_{10}	74.1	0.39	74.49	100
		SO_2	7.0	0.07	7.07	80
		NO_X	13.0	0.18	13.18	80

Conclusion

- The Total predictive GLC of PM10 concentration is observed in the range of 72.66 – 76.71 µg/m³, which is well within the standard limit.
- The Total predictive GLC of SO_2 concentration is observed in the range of 7.07 – 7.6 µg/m³, which is well within the standard limit.
- The Total predictive GLC of NOx concentration is observed in the range of 13.16 – 14.19 µg/m³, which is well within the standard limit.

Table 4.22: Impact on Air Environment and Mitigation Measures

Project Activity	Impact	Mitigation Measures
• Transportation (Raw Material & product)	• During movement of vehicles, fine dust settled on the roads get airborne and remains suspended for a long time. Repetitive movement of vehicles throughout the day leads to substantial fugitive emissions. It can have pronounced effect on people's health and well-being.	• Trucks used for transportation of raw material and products will be closed/ covered with tarpaulin sheet to avoid dust dispersion at site. • Although all the roads in the plant are paved roads, during the movement of trucks, fugitive emissions will be minimized by water sprinkling on roads and regular vehicular maintenance. • Only PUC vehicle will be used for the transportation.
• Raw material and product Handling and Storage	• Dust generation from conveyors of bagasse, press mud, sugar grader, sugar drier, boiler ash generation and handling may cause bagassosis and other respiratory diseases. • PM, SO_2, NO_X, minor VOCs from storage of raw material and products may affect air quality.	• Dust generation from conveyors of bagasse, press mud, sugar grader, sugar drier, boiler ash generation and handling will be suitably covered with hood or enclosures to control fugitive emissions • Fugitive emissions from raw material storage yards, loading and unloading operations will be controlled by water sprinkling system, whenever necessary.
• Product manufacturing • Operation of utilities	• Generation of SO_2, NOx and SPM etc. from 145 TPH steam boilers of sugar, Cogen unit, and 45 TPH Slop Fired Boiler of distillery unit and D.G Sets may affect the health of people in the vicinity. • Other Air emissions like VOC from distillation columns, CO_2, and ethanol from fermentation process. • Health effects include irritation to the eyes, nose and throat, and upper respiratory infections.	• Electrostatic precipitator along with 65 meters stack height for sugar and cogen unit and 83 meters stack height for distillery unit will be installed to reduce pollution within permissible limit. • 6.5 meters stack height above enclosure will be provided to D. G. Set, it will be operated in case of power failure only. • Regular work place monitoring will be carried out • The final gaseous emissions would be well within the permissible limits as prescribed by PPCB / CPCB / MoEFCC. • Usage of respiratory protective equipment by all employees will be ensured. • From air modelling study, it has been proved that the air emission from the proposed project will not be increased significantly after providing adequate APCs.
• ETP Operation	• Effluent generation from process contains odorous compound. It may create nuisance to worker.	• Proper housekeeping will be maintained near ETP/STP area.

• Greenbelt development	• Positive impact of Green belt as it plays an important role in cleaning the atmosphere by ab-sorbing certain toxic air pollutants from its surroundings.	• The company will develop greenbelt in and around plant premises and along the periphery of the proposed site. • It shall greatly serve as an efficient barrier for prevention of air pollution and odour outside the plant premises. • While making choice of plant species for green belts, weightage was given to the natural factor of bio-climate.

4.4.2 Water Environment

Table 4.23: Impact on Water Environment and Mitigation Measures

Project Activity	Impact	Mitigation Measures
• Product Manufacturing • ETP Operation	• Spillage or leakage of any raw material or product may have accidental impact on nearby water body if drained directly into the sewer line. • Distillery generates huge amount of effluent. If effluent is not treated properly before disposal, it will pollute land and ground water quality and thereby will change the existing characteristics of soil and water. • The major quantity of liquid waste that will be generated in the normal day to day operations at the proposed project includes process, sewage, washing, etc. This wastewater has a potential to pollute river water if disposed untreated.	• Provision of well-designed internal drainage system with adequate slope connected to ETP. • Total industrial Waste Water Generation will be 2391 KLD, out of which 1320 KLD process water, 218 KLD RO Reject and 44 KLD Floor/equipment washing will be treated in ETP/MEE. 565 KLD from boiler/cooling tower blowdown will be treated in RO. MEE Condensate, 347 KLD RO Permeate, and 59 KLD Boiler Condensate will be recycled. Treated effluent from ETP/MEE will be used for irrigation in farm lands of the unit. Thus, there will be a zero liquid discharge. • Sewage quantity of 45 KLD will be generated and it shall be treated in STP of 50 KLD capacity. Treated water will be used in gardening within plant premises. • The unit will provide garland drain around the storage tank of raw materials and also provided central drain line connected to the collection pit to avoid contact of any accidental spillages with the domestic and storm water drain. • Guard ponds shall be provided around molasses & spent wash storage area • Spent wash lagoon will be constructed as per CPCB guidelines • Online monitoring system will be provided
• Recruitment • Greenbelt development	• Ground Water depletion due to consumption of water for employees and green belt development	• Proper rainwater harvesting plan will be implemented for conservation of water. • Wastage of water will be strictly avoided. • Awareness programs for conservation of water will be developed for the employees.

4.4.3 Soil Environment

Table 4.24: Impact on Soil Environment and Mitigation Measures

Project Activity	Impact	Mitigation Measures
• Raw material and product Handling and Storage • Operation of utilities • ETP Operation	• The soil contamination due to leakage/ spillage from Boiler Operation (Fuel Burning), Ash storage Yard, Fermentation, Juice Storage, Juice Concentration Section, Vacuum Pan, Crystallizer, Centrifuge, Molasses storage tank, Distillation etc. • Leachate from the process wastewater collection tank may contaminate the soil. • 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.	• Solid / hazardous waste generated from the process will be properly handled with adequate solid / hazardous waste management facilities. • The unit has proposed best available technology concerning wastewater generation management facility. Hence, the issue of contamination of soil due to wastewater is also not envisaged. • Dedicated storage area will be provided with lining to avoid leakage. Closed collection container, storage and transportation of all hazardous wastes within the plant and outside. • Care shall be taken to avoid spillage / leakage of fuel. Proper spill control measures will be implemented. • Proposed distillery plant will be zero liquid discharge unit. No spent wash shall be disposed on land. Moreover, spent wash will be concentrated and used as fuel in boiler. All solid waste and hazardous waste from the proposed distillery unit will be properly collected, stored and disposed. • Regular road sweeping will be done for recovery of dust from the spilled areas within the plant boundary. • Regular monitoring will be done as per monitoring plan mentioned in chapter 6.
• Greenbelt development	• The greenbelt will significantly help to protect the soil from erosion and contamination.	• The company will develop green belt in and around plant premises and along the periphery of the proposed site.

4.4.4 Noise Environment

Table 4.25: Impact on Noise Environment and Mitigation Measures

Project Activity	Impact	Mitigation Measures
• Transportation (Raw Materials & product) • Product Manufacturing • Operation of utilities	• Transportation of materials/ products contributes to increase in noise levels both inside the plant premises as well as outside. • **Major noise generation from Sugar and Cogeneration unit:** Mill house, boiling house, sugar house, bagasse & ash	• Transportation activity will be carried out during daytime only. • Well-maintained vehicles will be used for transportation of raw materials and products. • Lubrication of moving/ rotating part or component of machineries will be done on regular basis. • Vibrating pads & acoustic enclosure will be

	handballing, power house, steam turbines and, transportation etc. • **Major noise generation from Distillery unit:** Fans, blowers and compressors, steam turbines etc. • Noise generation from the above unit may lead to health issues associated with high noise level such as, , hearing impairment, ischemic heart disease, hypertension, decreases in working efficiency, Lack of concentration etc. • Continuous exposure in high noise may cause permanent Deafness.	provided to high noise generating equipment to control noise level within norms. • The operator's cabins (control rooms) will be properly (acoustically) insulated with special doors with observation windows. • Noise anticipated from the proposed project shall be confined only within the plant boundary and more precisely within the source area. • All the equipment / machineries operated in the proposed project will be designed/operated in such a way that the noise level in work place shall not exceed 75 dB (A) as per the requirement of Noise Pollution (Regulation and Control) Rules, 2000. • Hearing conservation program will be implemented to detect early hearing loss • Provision of PPEs like earmuffs / earplug to avoid adverse effects of noise on occupational health and hearing capacity of workers as well as planning of working hours and shift of workers. • D. G. Set shall be provided with acoustic enclosures and shall be used only in case of power failure/emergency.
• Greenbelt development	• Greenbelt will greatly serve as an efficient barrier for prevention of noise propagation outside the plant premises. It can either deflect, refract or may absorb sound to reduce its intensity.	• Green belt of 1,37,391 m^2 will be developed in and around the plant premises and along the periphery. • Regular maintenance of Greenbelt area will be carried out.

4.4.5 Land Use/ Land Cover

Project Activity	Impact	Mitigation Measures
• Green Belt Development	• Green belt will enhance the aesthetic value and beautify the landscapes.	• Green belt of 1,37,391 m^2 will be developed in and around the plant premises and along the periphery. • Regular maintenance of Greenbelt area will be carried out.

4.4.6 Hydrogeology

Project Activity	Impact	Mitigation Measures
• ETP Operation	• Infiltration of untreated effluent can contaminate the ground water.	• Care shall be undertaken to avoid spillage / leakage of effluent / sewage. Proper spill control plan will be implemented.

Project Activity	Impact	Mitigation Measures
• ETP Operation	• Infiltration of untreated effluent can contaminate the ground water.	• Care shall be undertaken to avoid spillage / leakage of effluent / sewage. Proper spill control plan will be implemented.
• Green Belt Development	• Tree roots improve drainage because each root acts as an underground water channel to help water penetrate the soil.	• Selection of trees shall be as per guidelines prescribed by CPCB / MoEFCC.

4.4.7 Geology

Project Activity	Impact	Mitigation Measures
• No major impact is envisaged on the geology of the area during operational phase.		

4.4.8 Hazardous/Solid Waste

Table 4.26: Impact and Mitigation Measures on Hazardous/Solid Waste

Project Activity	Impact	Mitigation Measures
• Product Manufacturing • Operation of utilities • ETP Operation	• Press mud & yeast sludge will be generated during product manufacturing which may cause ill effect to human health when in direct contact. • Frequent and prolonged contact with used oil may cause dermatitis and other skin disorders • Exposure to Bagasse ash from Sugar & Cogen Unit & Incineration Boiler ash may cause acute and chronic respiratory health hazard • ETP Sludge if disposed off inadequately will create odour nuisance in nearby area.	• All the solid / hazardous waste generated will be stored in Hazardous waste storage facility having impervious layer. • Good practice for collection and storage of Press mud & yeast sludge will be followed. • Press mud & yeast sludge ill be used for greenbelt development within premises • Collection and recycling of used oil will be carried out as per SOP. • Used oil will be used as lubricant in plant machineries. • Ash generated from Bagasse & Incineration Boiler will be collected through a closed system and sold to brick manufacturer/ mixed with pressmud and used as manure. • ETP Sludge will be collected and stored separately and used for greenbelt development. • PPEs will be provided to the workers. Hence, there will be no significant impacts on their health.

4.4.9 Risk and Hazard

Table 4.27: Impact and Mitigation Measures on Risk and Hazards

Project Activity	Impact	Mitigation Measures
• Transportation (Raw Materials & product)	• Chances of accident may increase due to transportation activity.	• Trained driver having valid licence will be employed for transportation of raw material & products. • Speed limit within plant will be prescribed.

Project Activity	Impact	Mitigation Measures
		• Well-maintained vehicles will be deployed. • Vehicle Safety pre-checks will be carried out before use. • In the proposed project, wide road will be provided for smooth movement of the goods carrying vehicles.
• Raw material and product Handling and Storage	• Fire/explosion in bagasse storage area. • Bagasse dust inhalation may lead to bagassosis • Spillage/ leakage, discharge of chemicals during handling and storage may cause severe accident like fire/ explosion, serious burn injury etc.	• Regulation inspection of bagasse storage area will be carried out. • Isolation from ignition sources will be ensured. • Training to the worker involved in bagasse handling. • Fire fighting system will be provided in the area. • Dust mask shall be provided to the workers and periodic health check-up will be carried out. • Loading and unloading activities will be carried out under supervision of competent person.
• Product Manufacturing	• Accident in workplace area involving Milling, Pan boiling, Centrifugation, production unit, distillation unit etc. may lead to slips, trips, falls, electric shock, noise, vibration etc. • Exposure to chemicals due to spillage/leakage may cause burn injury, skin irritation etc.	• Product Manufacturing will be carried out under the supervision of trained, experience and qualified person. • SOPs will be followed. • Material Safety Data Sheet (MSDS) of all raw materials and products will be readily available to all. The training for awareness of MSDS will be provided. • First aid kits will be made available at every department. • PPEs like gloves, helmet , safety shoes, safety goggles etc. will be provided to the workers
• Operation of utilities	• Chances of fatal incident, severe injury and loss of property due to explosion of boiler • High noise and vibration from operation of boilers and turbines. • Emission of flue gases from boilers may cause health hazard.	• External and internal visual inspections, leakage and pressure tests will be conducted • Proper enclosure and maintenance of boilers and turbines will be ensured • Pre-employment and Periodic Audiometry test will be carried out. • Proper APCMs and adequate stack height will be provided. • Fire extinguishers and fire hydrant systems will be provided at designated places. • PPEs will be provided to the workers. Hence, there will be no significant impacts on their health. • Credential risk assessment and DMP will be prepared for proposed project. • Persons working at the site will be given

Project Activity	Impact	Mitigation Measures
		appropriate training, equipment and necessary information to ensure their safety for handling of hazardous waste and operation of machineries.

4.4.10 Ecological and Biodiversity

Table 4.28: Impact and Mitigation Measures on Ecology and Biodiversity

Project Activity	Impact	Mitigation Measures
• Transportation (Raw Materials & product)	• The attributes that are identified to describe ecology are animals, birds, fish, field crops, threatened species, natural vegetation etc • Settling of fugitive dust on leaves reduces the gaseous exchange process. This affects the growth of plants.	• All the faunal species reported from the core zone are very common and well adapted to the urban environment so no faunal species will be disturbed or affected significantly. However, safety will be ensured while transportation of goods. • Proposed project will be carried out within the premises of the land in possession of the company the and also not forms a part of any unique habitat, hence there is will be no major impacts.
• ETP Operation	• Due to discharge of untreated wastewater into water body, there shall be impact on aquatic ecology of surrounding area.	• The proposed plant will be zero liquid discharge unit. Hence, there will be no discharge of effluent in aquatic ecology.
• Operation of utilities	• Flue gas emission will lead to increase in air pollution and there will be impact on terrestrial ecology of surrounding area. • Noise generation from utility area may influences the way animals migrate, can cause • The study area does not fall within any Notified Forest, National Park, and Sanctuaries; hence there is no any adverse impact on the same.	• The emission from the proposed project will not be significant to cause any damage to the habitual area as all necessary and efficient modern air pollution control technologies are already planned to prevent impacts on air environment and on the ecology of the nearby area • As per the survey close to the proposed site and in the vicinity, no endangered species or wildlife is reported at project site. As mentioned earlier, the proposed project would not dispose sewage, effluent or solid waste in the existing environment. In addition to the wastes, noise generation from project operation would also be minor. Hence there will not be any major adverse impact on ecology
• Greenbelt development	• Greenbelt development cause positive impacts on the flora by enhancement of green spaces and also create habitats for avifauna	• Green belt of 1,37,391 m^2 will be developed in and around the plant premises and along the periphery. • Regular maintenance of Greenbelt area will be carried out.

4.4.11 Socio-Economic

Table 4.29: Impact and Mitigation Measures on Socio-Economic

Project Activity	Impact	Mitigation Measures
• Transportation (Raw Materials & product)	• Transportation for raw material and product may create additional traffic and cause inconvenience to the local people.	• Traffic study has been carried out for the proposed project scenario. The LOS value from the proposed project will be i.e. "C" "Good" for the National highway falling in the study area. Therefore, the additional load on the carrying capacity of the concern road is not likely to have any significant adverse effect.
• Operation of utilities.	• Emission of gaseous pollutant like PM_{10}, SO_2 & NOx may affect the health of the people living in surrounding of the project site and employees.	• The emission from the proposed project would not be significant to cause any damage to the people as all necessary and efficient modern air pollution control technologies are already planned to prevent impacts on people of the nearby area. The final gaseous emissions will be well within the permissible limits prescribed by PPCB / CPCB / MoEFCC.
• Recruitment	• During operation phase, manpower will be required and this requirement will be meet from local area. Hence, positive impact will be on socio economic environment. • The project will also help in generation of significant indirect employment.	• The requirements of skilled / unskilled manpower during operation will be met from nearby villages. • Total 332 numbers of direct and indirect employees will be generated for proposed project. • The budget for CER is approx. Rs. 665.24 lakhs i.e. 1% of project cost should be allotted for development of locals and surrounding villages. This will be a positive socio - economic development for the region and general upliftment of standard of living in the region. • 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.
• Greenbelt development	• Positive impact of green belt as it will be act as dust barrier, noise barrier and increase soil fertility. • It will enhance the aesthetic value and beautify the landscapes.	• The company will develop greenbelt of 1,37,391 sq. m in and around plant premises and along the periphery of the site.

Table 4.30: Environmental Impact Assessment Matrix with Mitigation Measures (Operation Phase)

Activities	Environmental Attributes											
	Air	Water	Soil	Noise	LU / LC	Hydro geology	Geology	SHW	Risk Hazardous	Ecology and Biodiversity	Socio Economic	Total
Transportation (Materials Supply & product)	-4	-	-	-4	-	-	-	-	-4	-2	-2	**-16**
Raw material and product Handling and Storage	-2	-	-2	-	-	-	-	-	-4	-	-	**-8**
Product Manufacturing	-2	-4	-	-6	-	-	-	-2	-2	-	-	**-16**
Operation of utilities	-4	-2	-2	-4	-	-	-	-2	-4	-1	-2	**-21**
ETP Operation	-1	-2	-2	-	-	-2	-	-2	-	-1	-	**-10**
Recruitment	-	-2	-	-	-	-	-	-	-	-	-	**-2**
Greenbelt development	+6	-4	+6	+4	2	-2	-	-	-	+4	+6	**+22**
Total	**-7**	**-14**	**0**	**-10**	**2**	**-4**	**0**	**-6**	**-14**	**0**	**+2**	**-51**

Highest total score (+22) received for green belt development as it supports directly and indirectly for mitigating various pollution. Total cumulative score for various environmental parameters with mitigation measure is -51; which is not appreciable adverse impacts during operation phase.

4.5 SUMMARY

The proposed project has no major adverse impact on surrounding environment. During the movement of trucks, fugitive emissions will be minimized by water sprinkling on roads and regular vehicular maintenance. Trucks used for transportation will be closed / covered with tarpaulin sheet to avoid dust dispersion at site. Only PUC vehicle will be used for the transportation. The emission from the proposed project will not be significant to cause any damage to the people as all necessary and efficient modern air pollution control technologies are already planned to prevent impacts on worker and people of the nearby area. The final gaseous emissions will be well within the permissible limits prescribed by PPCB/CPCB/MoEFCC. Unit will provide separate entry and exit for the smooth traffic movement. The electricity will be supplied by Punjab State Power Cooperation Limited; hence D.G. set will be used only in case of power failure. Water shall be sourced from reservoir. Rainwater harvesting plan shall be implemented; hence no major impact will be envisaged on surface or ground water resources. Effluent will be treated in proposed well designed treatment facility with Zero liquid discharge scheme. Proper sanitation facilities will be provided within the premises to prevent contamination of water due to runoff. Solid / hazardous waste generated from the process and ETP will be properly handled with adequate solid / hazardous waste management facilities. All the solid / hazardous waste generated will be packed in HDPE bags and stored in Hazardous waste storage facility having impervious layer. The collection, storage and disposal of solid / hazardous waste shall be carried out as per Hazardous and other wastes (Management and Trans boundary Movement) Rules, 2016. The adequate greenbelt will be developed in and around the plant shall greatly serve as an efficient barrier for prevention of air outside the plant premises.

CHAPTER 5
ANALYSIS OF ALTERNATIVES (TECHNOLOGY AND SITE)

5.0 GENERAL

This chapter gives us information on alternative site and technology to be used for the proposed project. No alternative site selection study has been conducted as:

- The land for the proposed project is already in the possession of Gurdaspur Sugar Mills Pvt. Ltd.
- The project is very well connected to National Highway no. 54 and Northern Railways
- Easy availability of infrastructure facilities.
- There is no Notified National Park or Wild Life Sanctuary, no ecologically sensitive areas within 10 km radius of the project site.
- Area where proposed site is to be located has no history of natural calamities like floods, cloud burst etc.
- Proximity to raw material suppliers.
- The cane potential and irrigation facilities in the command area are adequate and will ensure sustained cane availability for the proposed project with the extensive experience of farmers in sugar cane cultivation
- The season & off season fuel requirements for the conventional boiler can be easily met by own bagasse.
- The human resource required for the proposed project will be easily available. Also, the same will be met from surrounding areas.

5.1 ALTERNATIVE FOR TECHNOLOGY AND OTHER PARAMETER

During EIA study, some alternatives for technology and other parameters were considered and are discussed below:

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

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.

Technology	Description
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).
Multi-pressure vacuum distillation	• Degasifying cum analyzer column – Operation under vacuum

system for production of Rectified Spirit / ENA consists of following distillation columns namely	• Pre-rectification column – Operation under vacuum • Rectification cum Exhaust Column - Operated under pressure • Recovery column - Operated under atmospheric • Extractive distillation column – Operated under vacuum • Simmering column – Operated under atmospheric
Choice of technology	**Multi Pressure Vacuum Distillation** Following are the advantages of pressure vacuum distillation: • Since the columns operate under different pressures, the vapours from one column could provide the energy required for driving the other column. As the system operates to some extent like a multiple effect evaporator system, good steam economy is achieved. • Since the analyzer column operates under vacuum, the formation of by-products such as acetal may be minimized there by improvement in quality of alcohol. • Pre-rectification column ensure removal of sulfur compounds/mercaptans and also reduces load of lower boiling volatile compounds passing on to Rectifier cum exhaust column. • The chances of scaling due to invert solubility of certain precipitating inorganic salts are minimized in vacuum distillation. • Vacuum distillation requires low steam consumption with reboiler

Distillery Spent Wash Treatment

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 project. Brief of various technologies are given below:

Figure 5.1: Alternative technologies for spent wash treatment

Multi Effect Evaporator (MEE)	• Well established technology for concentration up to 60 % 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 (60%) or spent wash powder is fired in a specially designed boiler with in house generated bagasse. 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.
Bio-composting	• Spent wash will be composted with press mud and microbial culture in windrows system. Separate aeration machine will be used for proper turning and aeration. Curing period will be 30 days. • 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.
Biodigester	• About 70 to 80 % distilleries in the country have adopted bio-methanation of distillery spent wash as the primary treatment method. It is one of the well-established technologies for distillery effluent treatment with excellent returns in terms of valuable biogas generation.
Reverse osmosis	• Reverse osmosis is a membrane based separation technique. • A membrane is a selective barrier that permits the separation of certain species in a fluid by a combination of sieving & sorption mechanisms. • The feed stream is physically split into permeate (or filtrate) comprising molecules that pass through the membrane and reject (or retentive or concentrate) that is composed of the molecules retained by the membrane.
Choice of treatment technology Spent wash generated during the process of distillation will be evaporated in Multi effect evaporator followed by Incineration boiler. In order to effect economy on the steam consumption, the concentration is proposed to be done in a multiple effect evaporation system	

Table 5.1 Alternative for other Parameters

S.No.	Particular	Alternative Option 1	Alternative Option 2	Remarks
1.	Employment	Local employment	Outsource employment	Local employment is preferred. **Benefits:** • Provides employment to local people along with financial benefit. • No residential building/housing is required
2.	Labour transportation	Public transport	Private transport	Private transport is preferred. **Benefits:** • Local labours will be deployed so they will either reach plant by bicycle or by foot or by own vehicle.
3.	Raw material	Public	Private	Material will be transported through

	and product transportation	transport	transport	trucks on the contract basis. **Benefits:** • It will give indirect employment to the local people.
4.	Fuel	Bagasse	Coal, Furnace oil	Bagasse will be preferred **Benefit:** • Bagasse has a calorific value of about 3500 kcal/kg. If utilized as fuel, this can replace about 10 MT of coal or about 5 MT of oil. Less pollution compared to Coal. • Ease of availability of bagasse from own sugar Plant.

5.2 SUMMARY

No alternative site study has been carried out as proposed project will be developed in area already in possession of Gurdaspur Sugar Mills. The project site is located where all necessary infrastructure facilities will be easily available. A part from this, no ecologically sensitive, no notified national park, wild life sanctuary, biosphere reserve, no reserved and protected forests are present within the study area. Also, some alternatives for technology were considered for the proposed project.

CHAPTER 6

ENVIRONMENTAL MONITORING PROGRAM

6.0 GENERAL

Environmental monitoring is the measurement of environmental parameters at regular intervals over an extended period of time. Monitoring allows the assessment of environmental and biological changes in an ecosystem. All the project activities shall be monitored to ensure that appropriate environmental mitigation activities are being implemented and to identify areas where Environmental Management Plan compliance is not satisfactory. Hence, Environmental quality monitoring of critical parameter is very essential in the routine activity schedule of project operation. An Environmental Monitoring Programme shall be scheduled for the following major objectives:

- To verify the result of the impact assessment study in particular with regards to new developments.
- To follow the trend of parameters which have been identified as critical.
- To check or assess the efficiency of controlling measures.
- To ensure that new parameters, other than those identified in the impact assessment study, do not become critical through the commissioning of new project.
- To monitor effectiveness of control measures.
- Regular monitoring of environmental parameters to find out any deterioration in environmental quality.

6.1 ENVIRONMENT MONITORING PLAN

6.1.1 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 sugar and distillery unit, 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 Parameters and Frequency during construction phase

Sr. No.	Particular	Parameter for Monitoring	Frequency of Monitoring
1.	**Air Quality**	Random checks of equipment's logs/ manuals	Weekly during site clearance & construction activities
		Vehicle logs	Weekly during site clearance & construction activities
		Gaseous emissions (PM, SO_2, CO, NO_X, VOCs)	Monthly emission monitoring
		The ambient air quality will conform to the standards for PM_{10}, $PM_{2.5}$, SO_2 and NO_X	As per CPCB/ SPCB requirement or on monthly basis whichever is earlier
2.	**Noise Quality**	Equipment logs, noise reading	Weekly during construction
		Working hour records	Daily records
		Maintenance of record of vehicles	Daily records
		Spot Noise recording	As per CPCB/SPCB requirement or on monthly basis whichever is

			earlier
3.	**Wastewater Quality**	No discharge hoses shall be in vicinity of watercourse	Monthly during construction activities
4.	**Soil Quality**	Effective cover in place	Weekly during construction activities
5.	**Drainage & effluent Management**	Visual inspection of drainage and record thereof	Weekly during construction activities
6.	**Waste Management**	Comprehensive Waste Management plan should be in place and available for inspection onsite.	Fortnightly check during construction activities
7.	**Non-routine events & accidental releases**	Mock drills and records of the same	Monthly during construction activities
8.	**Health of workers**	General fitness tests, lung function test	Monthly check ups
9.	**Loss of flora and fauna**	Numbers and species of flora and fauna within plant premises	During site clearance Phase

6.1.2 Post Project Environmental Monitoring Program

Environmental Monitoring Parameters and Frequency

After the commissioning of the project, monitoring parameters and frequency for operation phase shall be as follows:

Table 6.2: Environmental Monitoring Parameters and Frequency

S. No.		Particular		Parameter for Monitoring	Frequency of Monitoring
1.		**Air Quality**			
	i.	Ambient Air Quality Monitoring	Two samples in downwind direction at 500 m and 1000 m respectively. One sample in upwind direction at 500 m	$PM_{2.5}$, PM_{10}, SO_2, NO_x, VOCs	Monthly
	ii.	Flue gas Stack Monitoring (Boilers, D.G.Sets)		PM, SO_2, NO_x, CO	Monthly
2.		**Water Quality** (Ground and Surface)		As per IS 10500:2012	Six monthly
3.		**Wastewater Quality** (ETP & STP)		As per CPCB conditions	Monthly
4.		**Noise Quality**			
	a.	Ambient Noise 1. Near Main Gate 2. Near Cogen Plant 3. Near ETP/STP 4. Outside of production Plants		Leq. Levels for Day and Night Time	Monthly
	b.	Sensitive receptors in the vicinity			

S. No.		Particular	Parameter for Monitoring	Frequency of Monitoring
5.		**Soil Quality**	Routine Physical and chemical parameters, Organic matter, Moisture content, Chloride ions, Phosphorous, Nitrates, Sulfates and Cations (Al, Fe, Mg, Na, Ca, K) – Min. 4 Nos.	Six monthly
6.		**Work Zone monitoring**	VOC	Monthly
7.		**Solid/Hazardous waste generation**	Records of quantity of generation, handling, storage and transportation (disposal) of solid and hazardous waste will be maintained.	
8.		**Occupational Health Checkup**	Pre-employment and periodical health checkup for eye test, lung test, hearing capacity, skin test, step test *etc*. of every employee at least once in six months.	
9.		**Greenbelt Development**	Number of plantation (Units), Number of Survived Plants/ Trees, Number of Poor plant/ Trees	Once in a year
10.		**Environmental Statement Form V**	As per MoEFCC guideline	Once in a year
11.		**Consents and Authorization**	Consent to operate under applicable acts	Renewing 90 days before expiry of validity
12.		**Compliance of EC conditions**	Submission of 6 monthly compliance reports	June and December

Monitoring of the above parameters will be carried out to assess the performance of pollution control equipment installed to achieve the statutory norms. In case emissions/pollutant found to exceed the norms, 'on duty' personnel will check the relevant parameters and take appropriate corrective actions. A record of corrective and preventive action will be maintained as per requirement.

6.2 ENVIRONMENTAL MONITORING METHODOLOGIES

Monitoring of environmental components shall be done as per the guidelines provided by MoEFCC / CPCB / SPCB. The following methods are recommended/standard method approved/recommended by MoEFCC/CPCB.

Table 6.3: Method of Environmental Sampling and Analysis

S. No.	Attributes	Method	
		Sampling / Preservation	**Analysis**
1.	Ambient Air Quality	As per IS: 5182, ASTM and Instruments Manual	As per IS: 5182 and ASTM
2.	Water and Waste Water I. Ground Water III. Treated effluent	Standard Methods for Examination of Water and Wastewater Analysis, 22nd edition APHA, 2012	IS: 3025 and Standard Methods for Examination of Water and Wastewater Analysis, 22nd edition APHA, 2012
3.	Noise	Instrument: Noise level meter	EPA
4.	Soil Quality	IS: 2720 and Laboratory Standard Methods	IS: 2720 and Laboratory Standard Methods

Other environment related monitoring required is given in Table 6.4.

Table 6.4: Other environment related monitoring activities required

Sr. No.	Monitoring particulars	Frequency
1.	Keep track of the green belt to monitor the survival rate of plantation and to confirm that the growth is adequate and on expected lines	Once a month
2.	Monitor and review of safety performance of the plant with specific reference to incidents/accidents, which have impact on the environment like spillages, which can result in air pollution, water pollution, soil contamination.	Once a month
3.	Monitor the drainage system in the plant to prevent entry of storm water to the ETP and vice versa	Once a Quarter
4.	Monitor drains carrying storm water or wastewater for ensuring timely cleaning.	Once a Quarter
5.	Noise generating equipment monitored for increase in noise levels to initiate corrective action.	Once a month
6.	Monitor hazardous waste storage sites to ensure good housekeeping to avoid cross contamination.	Once a month
7.	Monitor raw material consumption, water consumption, wastewater generation per unit mass/volume of product to ensure that they remain within expected norms and to take action for further reduction.	Daily
8.	Monitor training imparted to the workforce to ensure that the workmen are adequately trained in matters which have relevance to the impact on environmental attributes like handling of hazardous waste.	Once a month
9.	Review by top management on the environment monitoring compliance every month to avoid slippages and to take corrective and preventive action.	Once a month

6.3 DOCUMENTATION AND RECORDS

The environmental department in respect of operation of pollution control facility will maintain following records:

- Monthly and annual progress reports: Immediately upon the completion of monitoring as per the planned schedule, report shall be prepared and necessary documents shall be forwarded to the concerned person.
- Instruction manual for operation and maintenance of pollution control equipment
- Instruction manual for monitoring of water and gaseous parameter and hazardous waste management
- Records of medical check-up of employees
- Regularly all documents and records shall be reviewed for necessary improvement of the monitoring plan/mitigation measures/environmental technologies as well as for necessary actions of Environmental Management Cell.

6.4 INFRASTRUCTURAL REQUIREMENT

Gurdaspur sugar mills will establish laboratory with adequate manpower and all basic facilities for self-monitoring of pollutants generated in plant. The laboratory will be equipped with instruments and chemicals required for monitoring of general parameters of wastewater to fulfill the reuse criteria within plant premises. The laboratory shall be fully fledged for the analysis of pH, COD, BOD, SS, TDS parameters in waste water.

6.4.1 Reporting System

The in-charge of environment, health and safety department will co-ordinate with monitoring agency and analysis report with interpretation will be submitted regularly to the statutory authority after obtaining approval from higher management. Any non-conformity identify should be brought in notice of higher management. Environmental and safety policy will be also communicated to each employee work within plant premises.

6.5 BUDGETARY PROVISION FOR ENVIRONMENT MONITORING PROGRAM

On regular basis, environment management cell shall inspect the necessity and availability of the materials, technologies, services, maintenance works and make appropriate budget for the purpose. Regular record review for change in financial requirement of environment management shall be done and appropriate budgetary provisions shall be made. With other budget, budget for environment management shall be prepared and revised regularly up on requirement. The budget shall include provisions of:

- Environmental Monitoring Program
- Operation and Maintenance of Environmental Technologies/Equipment
- Laboratory works for Environmental management activities
- Emergency Purchase of necessary material, equipment, tools, services, etc.

Table 6.5: Budgetary Provision for Environment Monitoring Program

S. No.	Description	Amount in Lakhs/ Annum
1.	Air Quality Monitoring	9.00
2.	Water Quality Monitoring	6.00
3.	Noise Monitoring	0.50
4.	Soil quality Monitoring	0.50
	Total	**16.00**

6.6 SUMMARY

The environmental monitoring plan enables environmental management system with early sign of need for additional action and modification of ongoing actions for environment management, improvement and conservation. The environmental monitoring locations will be decided considering the environmental impacts likely to occur due to the operation of proposed project as the main aim of the monitoring program is to track, timely and regularly, the change in environmental conditions and to take timely action for protection of surrounding environment. Environmental sampling and monitoring will be done as per the guidelines provided by MoEFCC/CPCB/PPCB. Laboratory will be set up with manpower and facilities for self-monitoring of pollutants generated in the industry. Along with other budgets, budget for environmental management will be prepared and revised regularly as per requirement. Cost of the Environment Monitoring will be approx. Rs. 16.00 Lakhs/Annum.

CHAPTER 7

ADDITIONAL STUDIES

7.0 GENERAL

An additional study including Public Consultation, Risk Assessment (RA), Disaster Management Plan, Occupational, Health and Safety has been carried out for the proposed expansion project. The study has been incorporated in the EIA report to support the Environmental Management Plan.

7.1 PUBLIC CONSULTATION

The applicability of the S. O. 1533 for the proposed project was explored by considering different possibilities and provisions described in the said notification. Considering the products and project location of the proposed expansion, it is noticed that the proposed falls under the item no. 5(g), 5g(a),1(d) & 5(j) as Category-'A' according to EIA Notification, SO 1533 amended on 14th September 2006. Public hearing is applicable as proposed project will be carried out as per standard procedure. Issues raised in public hearing along with project proponent comments will be incorporate in final EIA report.

7.2 RISK ASSESSMENT

The Gurdaspur Cooperative Sugar Mills Ltd. is proposing development of a new 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant at V.P.O Paniar, Dist. Gurdaspur, Punjab- 143531. The Gurdaspur co-operative sugar mills is a unit of Punjab State Federation of Co-operative Sugar Mills. The project involves hazardous chemicals which are of flammable, toxic and corrosive in nature.

7.2.1 Scope and Methodology of Study

- Hazard Identification
- Hazard Identification and Risk Assessment (HIRA)
- Risk Analysis (QRA)
- Identification of Emergencies (level 1, 2 & 3) & Safety Mitigation Measures
- Disaster Management Plan (Onsite and Offsite Emergency Management Plan)
- Occupational Health and Safety Management System
- Compliance of ToR

Hazard Identification

This step involves identification of hazardous chemicals on the basis of its state, mode of storage and storage quantity for various toxic, flammable and explosive chemicals. Storage details of all the chemicals are provided *Ch.2* of EIA Report. Physio-Chemicals properties of the chemicals are provided in below table.

A systematic identification of the chemicals and their quantities of storages has been studied, to determine threshold quantities as notified by MSIHC Rules 1989 and amended till date.

a) Toxic Chemicals:

Chemicals having the following values of acute toxicity and which owing to their physical and chemical properties are capable of producing major accident hazards

S.No.	Toxicity	Oral toxicity LD50(mg/kg)	Dermal toxicity LD50 (mg/kg)	Inhalation toxicity LC50 (mg/l)
1.	Extremely toxic	>5	<40	<0.5
2.	Highly toxic	>5-50	>40-200	<0.5-2.0
3.	Toxic	>50-200	>200-1000	>2-10

b) Flammable Chemicals:

The flammability is determined by tests or by calculation in accordance with methods adopted by International Standards Organization ISO Number10156 of 1990 or by Bureau of Indian Standards ISI Number 1446 of 1985. The flammable criteria is detailed in table 7.1.

Table 7.1: Flammable Criteria

S. No.	Flammable Criteria	Range
1.	Extremely flammable liquids	flash point lower than or equal to 23°C and boiling point less than 35°C
2.	Very highly flammable liquids	flash point lower than or equal to 23°C and initial boiling point higher than 35°C
3.	Highly flammable liquids	flash point lower than or equal to 60°C but higher than 23°C
4.	Flammable liquids	flash point higher than 60°C but lower than 90°C

There are some chemicals which are in flammable in nature provided in *Error! Reference source not ound.* ***7.2.***

c) Explosives:

Explosives means a solid or liquid or pyrotechnic substance (or a mixture of substances) or an article.

- Which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings;
- Which is designed to produce an effect by heat, light, sound, gas or smoke or a combination of these as a result of non-detonative self-sustaining exothermic chemical reaction

7.2.2 Physico-chemical properties of Chemicals

Table 7.2: Details of Physico-chemical properties of Chemicals

S. No.	Name of the Material	Cas No.	State	Formula	BP ^0C	MP ^0C	Flash Point (°C)	LEL %	UEL %	IDLH (ppm)	LD50	LC50	Possible type of hazards
1.	Ethyl Alcohol	64-17-5	Liquid	C_2H_5OH	78	-114	13	3.3	19	3300	7060 mg/kg (Oral, rat)	20000 ppm/10H (Inhalation, rat)	Flammable
2.	Lime	1305-62-0	Liquid	$Ca(OH)_2$	NA	580	NA	NA	NA	10 mg/m	7300 mg/kg (Oral, rat)	NA	Irritant
3.	Urea	57-13-6	Solid	CH_4N_2O	NA	132.7	NA	NA	NA	NA	8471 mg/kg (Oral, rat)	NA	Irritant
4.	Phosphoric Acid	7664-38-2	Liquid	H_3PO_4	158	21	NA	NA	NA	1000 mg/m^3	2600 mg/kg (Oral, rat)	850 mg/m^3 (Inhalation, rat)	Corrosive
5.	Hydrochloride Acid	7647-01-0	Liquid	HCl	83	-66	NA	NA	NA	50	>90 mL/kg (Oral, rat)	3124 ppm (Inhalation, rat)	Corrosive & Irritant
6.	Caustic Soda	1310-73-2	Solid	NaOH	1390	318	Not applicable	NA	NA	10 mg/m3	4090 mg/kg (Oral, rat)	2300 mg/m^3 (Inhalation, rat)	Corrosive
7.	Sulphuric Acid	7664-93-9	Liquid	H_2SO_4	290	10	NA	NA	NA	15 mg/m^3	2140 mg/kg (Oral, rat)	10 mg/m^3/2hr. (Inhalation, rat)	Corrosive
8.	Nitric Acid	7697-37-2	Liquid	HNO_3	83	-42	NA	NA	NA	25	NA	NA	Corrosive Oxidizer Poison Inhalation Hazard
9.	Sodium	7681-57-4	Solid	$Na_2 O_5S_2$	NA	150	NA	NA	NA	NA	1310	NA	Corrosive

	Metabisulphate										mg/kg (oral, Rat)		
10.	Sodium Hypochlorite	7681-52-9	Liquid	NaClO	Decomposes	0	NA	NA	NA	NA	5800 mg/kg (oral, mouse)	NA	Corrosive
11.	Fusel oil	8013-75-0	Liquid	$C_5H_{12}O$	60	NA	26	NA	NA	NA	4172 mg/kg (oral, mouse)	16.6 mg/l/4h (Inhalation, rat)	Flammable Corrosive

7.2.3 Details of Chemicals Storage in Tanks

Table 7.3: Chemical Storage details

Sr. No.	Name of Hazardous Chemical	Physical state	Storage Capacity	Type of Storage Tank	Aboveground/ Underground
1.	Ethyl Alcohol	Liquid	4 * 1500 kL	MS	Above Ground
2.	Lime	Liquid	2 X 30 kL	MS	Above Ground
3.	Fusel oil	Liquid	10 kL	MS	Above Ground

Chemical considered for Quantitative risk assessment is given in Table 7.4.

Table 7.4: Hazardous Properties of Chemicals considered for 2D Modeling

Chemical Name	Capacity	Nature of Hazard	FP (°C)	LD50 (mg/kg)	IDLH (PPM)	Chemical Hazard according to NFPA				LEL %	UEL %
						Health, Nh	Fire, Nf	Reactivity, Nr	Special		
Ethyl Alcohol	4 * 1500 kL	Flammable	13	7060 mg/kg (Oral, rat)	3300	2	3	0	N/A	3.3	19

7.2.4 Identification based on Manufacture, Storage and Import of Hazardous Chemical Rules, 1989

In order to determine applicability of MSIHC rules, and amendment thereof to the notified threshold quantities, analysis of products and quantities of storage in the plant has been carried out.

Group	Material	Max. Storage Capacity (Mt.)	*Threshold Qty. (Mt.) For application of Rule	
			Rules 5,7-9 Rule and 13-15	Rule 10-12
5.3- Very Highly Flammable Liquids	Ethyl Alcohol	> threshold*	1500	10000

The inventory of Ethyl Alcohol qualifies the site as MAH (Major Accident Hazard installation)

7.2.5 Identification involving relative rating technique through Fire Explosion and Toxicity Index

Fire Explosion & Toxicity Indexing (FETI) is a rapid ranking method for identifying the degree of hazard. The basic objectives that characterize Fire Explosion and Toxicity Index are,

- Identification of equipment within the plant that would contribute to the initiation or escalation of accidents.
- Quantification and classification of the expected damage potential of fire
- Explosion n and toxicity index in relative terms. Determination of area of exposure.

In preliminary hazard analysis, alcohol is 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 hazard in these areas. Before hazards index is applied, the installation in question is sub divided into logical, independent elements or units. The unit is logically characterized by the nature of the process that takes place in it.

Fire explosion and Toxicity Index is a product of Material Factor and Hazard Factor. Material factor represents the flammability and reactivity of the chemicals. The hazards factor itself is a product of general process and special process hazard. Respective Material Factor (MF), General Hazard Factors (GHF), Special Process Hazard factors (SPH) are computed using standard procedure of awarding penalties based on storage, handling and reaction parameters. Material factor is a measure of intrinsic rate of potential energy release from fire and explosion produced by combustion or other chemical reaction. General factor is a measure of intrinsic rate of potential energy release from fire and explosion produced by combustion or other chemical reaction.

General Process Hazard The plant activities, which contribute to a significant enhancement of potential for Fire and Explosion, have been identified. The measured values of penalties have been added to obtain the value of General Process Hazard as given in DOW's Fire & Explosion Index Hazard classification guide.

Special Process Hazard The Special Process Hazard includes the factor that contributes the probability and occurrence of accident. They are:

- Process temperature

- Low pressure
- Operation in or near flammable range
- Operation pressure
- Low temperature
- Quantity of Flammable and toxic material
- Corrosion and erosion
- Leakage, Joints

FEI (Fire Explosion Index) = MF x (1 + GPH) x (1 + SPH)

Classification of Hazards into Categories

By comparing the indices Fire and/or Toxicity to the criteria in the following table the unit in the question classified in one of the three categories established for this purpose.

Dows Fire and Explosion Index Hazard Classification, Degree of Hazard for F&EI.

F & EI Range	Degree of Hazard
01-60	Light
61-96	Moderate
97-127	Intermediate
128-158	Heavy
159 and more	Severe

Based on the above, the degree of potential hazard based on DOW's classification for alcohol is given below.

Section	Material Factor	General Process Hazard	Special Process Hazard	Fire & Explosion Index	Category of Potential Hazard
Ethanol storage	16	2.35	3.35	126	Intermediate

Toxicity Index

Toxicity index is primarily based on the index figures for health hazards established by the NFPA in codes NFPA 704, NFPA 4 n and NFPA 325 m. NFPA Index figures of toxicity factor for Health Hazard index Nh are given below:

NFPA Index Toxicity Factor	NFPA Index Toxicity Factor
0	0
1	50
2	125
3	250
4	325

NFPA Health hazard index of ethanol is 2, which give toxicity factor of 125. In addition, the toxicity factor has to be corrected for the Maximum Allowable Concentration (MAC) values of the toxic substance by adding a penalty Ts. Ts values are arranged according to the following Criteria.

Toxicity index is evaluated using the following Equation

$$\text{Toxicity Index} = \frac{Th+Ts\ (1+GPH+SPH)}{100}$$

By comparing the indices of FEI and Toxicity index, the unit under consideration is classified into one of the following three categories,

Classification of Toxicity Index

Category	Toxicity Index
Light	<6
Moderate	6-10
Severe	>10

Fire Explosion and Toxicity Index for Storage Facility

Fire explosion and Toxicity Index values obtained for ethanol are given below:

Fire Explosion and Toxicity Index for Storage Facility

Section	Material Factor	Fire & Explosion Index	Toxicity Index
Ethanol storage	16	126	4.6

Degree of Hazard based on Fire explosion and Toxicity indices computed for the storage units is categorized as below:

Degree of Hazard

Section	Fire Explosion	Toxicity
Ethanol storage	Intermediate	Light

Minimum Preventive and Protective Measures for Fire and Explosion

Based on the categorization of Degree of Hazard, the following minimum preventive and protective measures are recommended.

Features	FE&I Rating				
	Light	Moderate	Intermediate	Heavy	Severe
Fire Proofing	2	2	3	4	4
Water Spray					
1. Directional	2	3	3	4	4
2. Area	2	3	3	4	4
3. Curtain	1	2	2	2	4
Special instrumentation					
1.Temperature	2	3	3	4	4
2. Pressure	2	3	3	4	4
3. flow control	2	3	4	4	4
Dust, blowdown, spill control	1	2	3	3	4
Internal examination	2	3	3	4	4
Combustible gas monitors					

1. Signal alarm	1	2	3	3	4
Remote operation	1	2	2	3	4
Dyking	4	4	4	4	4
Blast and Barrier wall separation	1	2	3	4	4
1= Optional 2=Suggested 3=Recommended 4= Required					

Layout map showing Storage Facilities

The storage facilities for the raw material and finished goods have been shown in the layout map as shown in ***figure 7.1.***

Figure 7.1 Plant Layout

7.3 Qualitative Risk Assessment

Many a times risk involved in various processes / process equipments cannot be addressed completely by consequence analysis. As a conservative approach, these risks have been considered separately under this topic. The approach is to identify hazards associated in operation of equipments as well as in processes, assessing its impacts, ranking the risk posed by it and finally to propose remedial actions/mitigation measures such that the risk is minimized to tolerable level. The Risk Matrix presented below should be referred in evaluating this assessment.

In Qualitative Risk Assessment, risk has been analyzed using methodology called HIRA-Hazards Identification & Risk Assessment. In HIRA, major manual activities carried out by plant personnel as well as contract labors have been considered.

HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA)

Qualitative Risk Assessment has been carried out by HIRA methodology for the following areas:

- Hazard involving during Pre-Construction/Construction Phase
- Cogeneration Plant;
- Sugar Plant;
- Distillery/Ethanol Plant;

In Qualitative Risk Assessment, risk has been analyzed using methodology called HIRA-Hazards Identification & Risk Assessment. In HIRA, major manual activities carried out by plant personnel as well as contract labors have been considered and evaluation is carried out based on Risk Matric and Risk Acceptability Criteria as provided in ***Table 7.5*** and ***Table 7.6***.

Table 7.5 Risk Matrix for Qualitative Risk Assessment

LIKEHOOD/ PROBABILITY		SEVERITY				
		Catastrophic (Death/ System Loss)	Major/ Critical (Serious injury/ Illness)	Moderate (Less Serious Injury/ Illness)	Minor/ Marginal (Minor Injury/ Illness)	Insignificant/Negligible (No injury /illness)
		5	4	3	2	1
Almost Certain	E	H	H	H	M	M
Likely	D	H	H	M	M	L
Possible	C	H	M	M	M	L
Unlikely	B	M	M	M	L	L
Impossible	A	M	M	L	L	L

Table 7.6: Risk Acceptability Criteria

Risk Range	Risk Acceptability Criteria	Remarks
H	Unacceptable/ High	Management's Decision/Action Plan Required. Potential off-site Impact.
M	Medium	Generally Minor Impact. Acceptable with Management's Review. Specific monitoring or SOP to be followed.
L	Low	Acceptable without Review. Manage through Routine Procedure.

Table 7.7: HIRA Worksheet for Pre-Construction/Construction & Erection

S. No.	Process Or Activity	Associated Hazards	Health & Safety Impact (Risk)	Initial Risk			Control / Mitigation Measures	Residual Risk		
				Severity	Likelihood	Risk		Severity	Likelihood	Risk
A. Site Demolition										
1.	**Demolition of existing plant and machineries**	• Falling from height, through openings and fragile materials, Contact with live overheads, falling debris, etc.	• Physical Injury • Electric shock, • Equipment damage	**4**	**D**	**H**	• Fall prevention devices (e.g. temporary work platforms and guard railing), work positioning systems (for example, industrial rope access systems), or fall arrest systems such as catch platforms shall be used. • Pipes and live cables must be de-energized or labeled clearly and instructed workers accordingly. • Demolition work should begin at the top of the structure and proceed downwards • Personnel Protective Equipment (PPEs) will be provided to the construction workers.	**2**	**B**	**L**
B. Construction & Erection Phase										
1.	Site Clearance, top soil removal, excavation and paving of site	• Dust generation & increase in SPM in ambient air • Entrapping of body part, cloths	• Respiratory diseases • Physical Injury • Property Loss • Fatality	**4**	**C**	**M**	• Construction activities performed under supervision of competent person. • Water sprinkling system. • Guards on moving/rotating parts of the construction machineries/	**2**	**B**	**L**

S. No.	Process Or Activity	Associated Hazards	Health & Safety Impact (Risk)	Initial Risk			Control / Mitigation Measures	Residual Risk		
				Severity	Likelihood	Risk		Severity	Likelihood	Risk
		in moving/ rotating construction machineries • Fall from height; fall through openings, collapse of scaffold, structure *etc*. • Fall of objects due to breaking of pulley or chains of material handling equipments.					equipments. • Work Permit System • Examine ropes, hooks for defects before putting into service. • Display of carrying capacity/load of Hoist and Pulley • Standards Work Procedure will be followed • Trained persons will be allowed to operate construction machineries • Use of PPE's like safety harness, helmet, safety shoes, gloves and goggles as required for the activity task			
2.	Other construction activities like welding, cutting, use of hand tools and power tools etc.	• Dust and fumes generation • Heat radiation • Noise and vibration	• Eye & skin irritation, • Burn injury • Physical Injury • Bone damage and white finger disease.	4	C	M	• Adequate ventilation near welding, cutting area. • Welding Partition screen will be used during operation • Periodical inspection and maintenance of tools/equipment's. • Use of well-maintained and use of right tool for the right job	2	B	L

S. No.	Process Or Activity	Associated Hazards	Health & Safety Impact (Risk)	Initial Risk			Control / Mitigation Measures	Residual Risk		
				Severity	Likelihood	Risk		Severity	Likelihood	Risk
							• Use of PPE's like face shield, helmet, safety shoes, goggles, anti-vibrating gloves as required for the activity task			
3.	Installation of machinery	• Structure collapse • Fall of objects from installation machinery	• Property loss • Physical Injury • Fatality	4	C	M	• The appropriate platform will be designed as per the load bearing calculation • Only authorized personnel will operate the machines • Area will be barricaded	2	B	L

Conclusion:

After providing mitigation measure in activities the risk probability will change from almost certain to possible as well as initial high risk will change to low residual risk.

Table 7.8: HIRA Worksheet for Cogeneration Plant

S. No.	Process Or Activity	Associated Hazards	Health & Safety Impact (Risk)	Initial Risk			Mitigation Measures	Residual Risk		
				Severity	Likelihood	Risk		Severity	Likelihood	Risk
1. Bagasse Handling										
1.	Bagasse Storage	Fire in bagasse storage yard	• Burn injury • Property damage	3	C	M	• Regular inspection • Isolation from ignition sources	2	B	L
2.	Bagasse Handling Equipment	Physical Injury during operating conveyor, lifting equipment etc.	• Cut injury, entrapment of body parts and cloths of the workers.	3	C	M	• Operators/Workers to be trained for Safe Work Practices. • Equipments will be provided with proper guarding and will be maintained in sound condition	1	B	L
3.	Handling of Bagasse	Respiratory Problem	• Bagassosis (pulmonary disorder brought about by the inhalation of dried bagasse dust)	4	D	H	• Training to worker involved in bagasse handling • Dust mask shall be provided. • Periodic Health Check-up of workers	2	B	L
4.	Bagasse Trucks	Vehicle collision and overturning	• Injury to workers, damage to property, loss of material	2	C	M	• Speed limit in plant premises will be specified, trained driver will be employed and specifying entry & exist route etc.	1	B	L
2. Steam Boiler Operation										
1.	Working near Boiler	High Noise	• Noise induced hearing loss	4	D	H	• Proper enclosure and maintenance • Pre-employment and Periodic Audiometry test. • PPEs like earmuff, ear plug etc.	2	C	M

S. No.	Process Or Activity	Associated Hazards	Health & Safety Impact (Risk)	Initial Risk			Mitigation Measures	Residual Risk		
				Severity	Likelihood	Risk		Severity	Likelihood	Risk
2.	Combustion Chamber of Boiler	Explosion due to increase in internal temperature and pressure	• Property damage, • fatality	5	C	H	• Regular inspection, maintenance • DCS system for operational safety	3	B	M
3.	Hot Water & Hot Steam Pipeline	Hot Water & Steam Leakage, Hot surface, Burst due to over pressure and over temp	• Burns injury, • Heat stress • Physical Injury	3	C	M	• Inspection and maintenance of hot steam pipeline • Proper insulation of steam pipeline. • Standardised Pressure relief valve.	1	B	L
3.	**Generator And Turbine Operation**	High noise level from Turbine	• Noise induced hearing loss	4	D	H	• Proper enclosure and maintenance • Pre-employment and Periodic Audiometry test. • PPEs like earmuff, ear plug etc.	2	C	M
		Spillage of lubricating oil of coupling shaft of generator	• Fire in lubricating oil	3	C	M	• Regular Housekeeping. • Class B Fire extinguisher • Spillage control plan	2	B	L
		Equipment damage	• Damage to generator due to lack of lubrication in	3	B	M	• Regular inspection, maintenance	1	B	L

S. No.	Process Or Activity	Associated Hazards	Health & Safety Impact (Risk)	Initial Risk			Mitigation Measures	Residual Risk		
				Severity	Likelihood	Risk		Severity	Likelihood	Risk
			coupling shaft							
4. Switch Yard										
1.	**Transformer line**	Fire in switch yard area, short circuit in transmission line	• Electric shock and electric burn to the operator in contact.	**3**	**C**	**M**	• Routine work, maintenance or inspection of electrical panels in switch yard. • Trained operator shall be employed	**2**	**B**	**L**

Conclusion:

After providing mitigation measure in activities the risk probability will change from almost certain to possible as well as initial high risk will change to low residual risk.

Table 7.9: HIRA Worksheet for Sugar Plant

S. No.	Process Or Activity	Associated Hazards	Health & Safety Impact (Risk)	Initial Risk			Mitigation Measures	Residual Risk		
				Severity	Likelihood	Risk		Severity	Likelihood	Risk
Transportation of raw material										
1.	Transportation of Sugar Cane, Calcium	• Vehicle collision, overturning of vehicle	Physical injury, Burn injury	**3**	**C**	**M**	• Trained driver having valid Licence will be employed, • First aid, portable fire extinguisher	**2**	**B**	**L**

S. No.	Process Or Activity	Associated Hazards	Health & Safety Impact (Risk)	Initial Risk			Mitigation Measures	Residual Risk		
				Severity	Likelihood	Risk		Severity	Likelihood	Risk
	salt/chemicals/ additives etc.	• Fire in flammable materials					etc. shall be provided in the vehicle.			
Manufacturing Process										
1.	Cane unloading & loading at weighed bridge slot	• Fall of cane due to breaking of pulley or chains of material handling equipments • Overturning of lifting equipment	Physical injury, Damage to nearby amenities	**3**	**C**	**M**	• Operators/Workers to be trained for Safe Work Practices. • Periodic inspection and maintenance of lifting machines	**1**	**B**	**L**
2.	Conveying, cutting and crushing	• Fall of object from Conveyor system. • Entrapping of body part, cloths in crusher/cutter • Flying object from crusher/Chopper	Physical injury, Eye damage, Fatality	**4**	**C**	**M**	• Guards on conveyor belt and crushing/Chopper machines. • Operators/Workers to be trained for Safe Work Practices • PPEs like safety helmet, shoes, goggles etc. will be provided	**2**	**B**	**L**
3.	Operation of Juice extraction system	• Spillage/ leakage of hot water from milling section • Entrapment of body parts/cloths in	Burn injury due to contact with hot water, Disabling injury	**3**	**C**	**M**	• Spillages shall be collected through proper collection system and delivered to waste water treatment plant • Mill water conservation system shall be employed through closed loop	**1**	**B**	**L**

S. No.	Process Or Activity	Associated Hazards	Health & Safety Impact (Risk)	Initial Risk			Mitigation Measures	Residual Risk		
				Severity	Likelihood	Risk		Severity	Likelihood	Risk
		between rolling mill					water circulation system with cooling tower • Proper guarding will be provided to the milling machines			
4.	Operation of Juice processing system	• Spillage/leakage of dosing chemicals & sugar syrup • High temperature due to steam leakage	Slipping due to accumulation of chemicals/syrup can cause serious physical injury Heat stress due to exposure to hot steam	3	C	M	• Continuous inspection of equipment and periodic maintenance • Good housekeeping will be maintained • Adequate ventilation will be ensured in MEE, vacuum pan boiling area • PPEs will be provided to the workers.	1	B	L
5.	Sugar handling	• Dust explosion in sugar storage silos due to ignition of fine dust particles of sugar	Irritation to nose and throat, damage to structures, equipment, and personnel from violent overpressure or shockwave effects	4	C	M	• Proper venting system will be provided to avoid accumulation. • Good housekeeping measures will be followed • Hot work permit will be followed for repair and maintenance job	2	B	L

Conclusion:

After providing mitigation measure in activities the risk probability will change from almost certain to possible as well as initial high risk will change to low residual risk.

Table 7.10: HIRA Worksheet for Distillery/Ethanol Plant

S. No.	Process Or Activity	Associated Hazards	Health & Safety Impact (Risk)	Initial Risk			Mitigation Measures	Residual Risk		
				Severity	Likelihood	Risk		Severity	Likelihood	Risk
Storage and handling of Raw Material										
1.	Storage and Handling of molasses	Foul Odour	Headache/nausea	**2**	**C**	**M**	• Control odour at source by providing high rise vents • Close system for storage and handling	**1**	**B**	**L**
2.	Storage and Handling of grain	Fire in grain storage yarn	Burn injury, property damage	**3**	**C**	**M**	• MOC will be as per IS 5503-2 • Periodic checking for air leak will be carried out.	**2**	**B**	**L**
Manufacturing Process										
3.	Fermentation process	• CO_2 Emission • Bursting of fermentation vessel • Spent wash generated	Higher levels of carbon dioxide can result in more serious and immediate effects including coma, asphyxia, convulsions, unconsciousness etc.	**3**	**C**	**M**	• CO_2 will be scrubber with water and adequate venting will be provided • CO_2 detector will be installed at dedicated location • Pressure and temperature indicators will be provided • Fermentation process will carried out in closed loop • Inspection & regular monitoring • Spent wash will be concentrated and used as	**2**	**B**	**L**

S. No.	Process Or Activity	Associated Hazards	Health & Safety Impact (Risk)	Initial Risk			Mitigation Measures	Residual Risk		
				Severity	Likelihood	Risk		Severity	Likelihood	Risk
			Property damage, High COD/BOD in spent wash leads to foul odour and severe water pollution				fuel for boiler operation			
4.	Working near Distillation column	• Fire/explosion due increase in temperature and pressure in column • High temperature near reboiler	• Physical injury to the nearby operator • Property damage • Heat stress	3	C	M	• DCS system will be installed • Pressure relief valve will be installed on column • Emergency shut-off valve on stream line • Proper insulation of column and pipelines • Trained operator will be employed	1	B	L
5.	Storage of Alcohol	• Fire/explosion due to ignition of alcohol • Inhalation, ingestion	Burn injury, Fatality, Property damage, Exposure to over 1000 ppm may cause a headache, drowsiness and	4	C	M	• Work permit system will be followed for hot work. • Flameproof electric fittings/ Earthing is installed in the storage area of flammable chemicals • Use of spark proof tools during maintenance in the area. • Use of CO_2, dry chemical or alcohol resistant foam for extinguishing of fire.	2	B	L

S. No.	Process Or Activity	Associated Hazards	Health & Safety Impact (Risk)	Initial Risk			Mitigation Measures	Residual Risk		
				Severity	Likelihood	Risk		Severity	Likelihood	Risk
			lassitude, loss of appetite, and inability to concentrate. Throat Irritation. Ingestion causes depression of the central nervous system, nausea, vomiting, and diarrhea Liquid or vapor may cause eye and skin irritation				• Provision of smoke/leak detectors and sensors in the storage area. • Proper ventilation (natural or forced) will be provided to avoid flammable cloud formation. • Provision of safe & sound material dyke wall and spill control SOP. • Appropriate PPEs like safety goggles, SCBA, gloves, gumboot, etc. will be used.			

Conclusion: After providing mitigation measure in activities the risk probability will change from almost certain to possible as well as initial high risk will change to low residual risk.

7.4 Quantitative Risk Assessment

Quantitative Risk Assessment (QRA) is a structured approach to identifying and understanding the hazards and risks associated with Storage and Handling of flammable/ toxic chemicals. The assessment starts by taking into account an inventory of hazardous chemicals stored, likelihood of leakage/ spillage associated with it and selecting the worst case scenario for consequence estimation. Finally, suggesting the measures to minimize or mitigate risks to meet appropriate acceptability criteria. The planning for emergency evacuation shall be borne in mind whilst interpreting the results.

Consequence analysis

A consequence analysis is used to determine the consequences of the hazard release from a facility (including flammable, explosion and toxic). In a plant handling hazardous chemicals, the main hazard arises due to storage and handling of hazardous chemicals as mentioned above. If these chemicals are released into the atmosphere, it may cause damage due to resulting fires or vapor clouds. Blast overpressures depend upon the reactivity class of material between two explosive limits

1) About the software

The consequence analysis (2D modeling) for the modeled scenarios has been done using DNV's software PHAST (Process Hazard Analysis Software Tool) 6.7.

Input data for software (modeling)

For consequence analysis, input data considered given in ***table 7.11.***

Table 7.11: Input Data

Input data	Consideration
Volume inventory	Quantity of material
Scenario	Leak, Catastrophic Rupture (CR) & Toxic Dose
Leak size	2 & 10 mm & CR for storage tank
Storage conditions	Atmospheric Temperature and pressure
Tank details	Height & Diameter
Dyke details	Dyke height, Dyke area
Weather condition	Wind speed, Pasquill stability, Atmospheric temperature, Relative humidity

2) Damage Criteria

In consequence analysis studies, in principal three types of exposure to hazardous effects are distinguished:

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

The chosen damage criteria are given and explained as per the Guidelines for QRA – PHAST Software, version 6.7 (DNV) & Yellow Book (Consequence Modeling), Purple Book (Risk Assessment) for QRA released by Centre for Chemical Process Safety (CCPS).

Planning

During planning classification of events, consequence of Fire, Consequence of Overpressure, Consequence of Toxic release, and Pasquill stability classes area has been considered**.**

3) Weather Conditions

Following Weather conditions are selected as per collected baseline meteorological data during the study period. These weather conditions are used for consequence analysis.

Table 7.12: Weather Condition selected for Consequence analysis

Time	Remarks	Weather Condition		
		Temperature	Wind speed m/s	Stability Class
Day Time	Prevalent during the day, most times of the year	22	1.5	D
Night Time	Prevalent during the night, most times of the year	16	1.5	F
Monsoon Period	Prevalent during the monsoon months	31	5.0	D

4) SELECTION OF MAXIMUM CREDIBLE LOSS SCENARIOS (MCLS')

Following points are considered while selecting the release scenarios:

- Flash point for flammable chemicals
- IDLH of Toxic chemicals
- Operating Temperature and Pressure of the material
- Total inventory of the material

On the basis of the information provided in table 10 and as discussed over failures scenarios given in publications like World Bank Technical Paper 55 and TNO Purple Book and the experience of the consultant, MCLs' which may take place are presented in table below:

Leak Failure Frequency/ Rates

A leak or rupture of the tank / pipe, releasing some or all of its contents, can be caused by brittle failure of the tank walls, welds or connected pipework due to use of inadequate materials, combined with loading such as wind, earthquake or impact. The failure rates are the deciding factor for selecting the MCAS'. The failure rates for selected MCAS' are given in table 7.13.

Table 7.13: Failure Frequencies for Storage Tanks

ITEM FAILURE RATES		
Type of Release	Non Flammable Contents (per vessel year)	Flammable Contents (per vessel year)
Catastrophic	8×10^{-6}	1.6×10^{-5}
Large	5×10^{-5}	1×10^{-4}
Small	5×10^{-4}	1×10^{-3}

Reference: *International Association of HSE-UK Failure Rate and Event Data for use within Risk Assessments (06/11/17)*

Simulation of Release and Development of Contours

As the MCLS' were developed for the selected set of chemicals, the next step is to carry out the consequence analysis. The consequence analysis results along with their contours are presented in this section.

Figure 7.2: Late Pool Fire effect distance Contour due to 50 mm leak of Ethanol storage tank at weather condition 1.5/F

Figure 7.3: Late ignition effect distance Contour due to 50 mm leak of Ethanol storage tank at weather condition 1.5/F

Figure 7.4: Flash Fire effect distance Contour due to catastrophic rupture of Ethanol storage at weather condition 1.5/D

Figure 7.5: Late Pool Fire effect distance Contour due to catastrophic rupture of Ethanol storage at weather condition 1.5/D

Figure 7.6: Late ignition effect distance Contour due to catastrophic rupture of Ethanol storage at weather condition 1.5/D

Table 7.14: Effective Distance due to Release of Ethanol

Chemical (Storage Tank)	Failure Scenario	Consequence	Met Data	Effective Distance in meter to Radiation Level			Effective Distance in meter to Radiation Level		Overpressure Distances in Meters		
				4 kW/m^2	12.5 kW/m^2	37.5 kW/m^2	0.5 LFL	LFL	0.02 bar	0.13 bar	0.2 bar
Ethanol	10 mm Leak	Late pool, Flash Fire	1.5/F	27.41	17.66	9.35	2.53	2.53	-	-	-
			1.5D	26.99	17.38	9.30	2.67	2.66	-	-	-
			5/D	27.44	19.58	9.65	3.30	3.14	-	-	-
	50 mm Leak	Late pool, Flash Fire, late ignition	1.5/F	**115.37**	74.03	40.55	32.37	20.98	**95.24**	46.89	43.07
			1.5D	113.62	72.72	39.44	27.91	16.35	49.64	27.68	25.94
			5/D	111.31	75.70	43.24	14.73	5.07	19.97	12.58	12.00
	Catastrophic Rupture	Late pool, Flash Fire, late ignition	1.5/F	856.85	570.64	376.30	342.88	190.77	619.29	369.33	355.90
			1.5D	**856.86**	569.63	373.56	**405.08**	240.96	**646.10**	418.11	407.17
			5/D	852.25	587.60	411.86	199.58	80.35	296.61	153.97	146.29

7.4.5 Results of Consequence Analysis

Summary of effect distance (in meter) for worst case scenario of hazardous chemical considered for consequence analysis are given below:

Chemical/ Scenario	Effect Distance in Meters at specific Weather condition		
	At Radiation Level 4 kW/m^2	At Overpressure 0.02 bar	At IDLH Concentration (in ppm)
Ethyl Alcohol	856.86 (1.5/D)	646.10 (1.5/D)	-

- It can be seen from the above summarized table that the risk of late pool fire in worst case scenario is in release of Ethanol *i.e.* 856.86 m in 1.5/D weather condition for 4 kW/m^2 radiation level.

7.4.6 Safety Measures for storage and handling of hazardous chemicals

7.4.6.1 Safety Measure for Storage and Handling of Acids:

- Material of Construction for SA tank will be carbon steel, which is a proven MOC.
- A 1/8" (3 mm) corrosion allowance will be considered to protect tank shell, bottom plate of carbon steel against corrosive effect.
- Storage tanks will be supported by reinforced concrete footings so that leakage, if any, can be spotted immediately.
- Storage tanks will be surrounded by a dike, which is 125% times the capacity of the tank.
- Tank will be equipped with an open vent for normal breathing to prevent dangerous pressure build-up due to hydrogen.
- Suitable slop in dyke will be provided to divert Sulphuric Acid flow towards neutralization tank, in case of major leaks from failure of storage tanks, bottom and side walls of dyke will be having acid resistant bricks lining.
- Eye wash / Safety Shower will be provided at storage facility and unloading area. This will be used for washing purpose if affected with acid spray.
- Sign boards instructing neither to spray water on the spillages nor to use it for neutralization of Sulphuric Acid will be displayed.
- Well laid Standard Operating Procedures (SOP) for unloading acid, transfer of Acids from storage to plant and emergency control procedures will be developed.

7.4.6.2 Safety Measures for storage & handling of flammable chemicals absolute alcohol, denatured alcohol etc.:

- Flameproof electric fittings/ Earthing will be installed in the storage area.
- Use of spark proof tools during maintenance in the area.
- Provision of dyke wall and ensuring it dry all time following spill control SOP
- Quickly and gently blot or brush away excess or spilled toluene or soak with inert material
- Provision of smoke detectors in the storage area.
- Safety sign board indicating heat radiation hazard in 10m radius of area
- Self-breathing air apparatus is available to avoid CO_2 & CO generation During Fire.
- Use of CO_2, dry chemical or alcohol resistant foam for extinguishing of fire.
- Proper ventilation of storage area where benzene/flammable chemicals are stored
- Use of PPEs like organic mask, goggles and gloves

- Availability of SCBA set in the area
- Remove exposed person to fresh air and approach doctor for medical help

7.4.6.3 Mitigation Measures for safe storage of bagasse:

Following mitigation measures to eliminate the fire hazard are in place and some additional measures are suggested as below:

- It should be ensured while routing high tension voltage lines that bagasse storage below & near high voltage (H.T.) transmission lines should be avoided.
- Avoid routing of electric supply cables & cable trenches near to bagasse storage and if unavoidable locate these as far away from stored bagasse or bagasse heaps.
- Always keep other raw materials & useful material far away from storage of bagasse area
- Creating awareness among workers about sudden bagasse fire and emergency action plan will avoid risks of heavy fire. In this way a valuable fuel & life of human being working near bagasse can be saved.
- Posting of proper supervision staff with necessary communication facility.
- Hot work, like welding, gas cutting should not be carried out near Bagasse storage or only after issue of proper work permit and making necessary arrangements.
- Daily record of Bagasse storage data will be maintained and proper review of storage conditions will be taken by higher authority.
- Training of all the involved staff in firefighting in normal & emergency operating system.
- Proper Planning & Maintenance of the fire hydrant system around the bagasse storage yard and not depending exclusively on fire tender for fire-fighting.
- Goggle and mask should be provided for workers in bagasse yard to prevent ill effect on eyes and inhalation of fine Bagasse dust on the workers in the area

7.4.6.4 Mitigation Measures for safe storage of bagasse:

- Store in good quality ventilated and leak-proof tanks (mild steel, stainless steel, polyethylene, PVC) at ambient temperatures, out of moisture.
- Continuous mixing of molasses should be done.
- If there is increase in temperature beyond 300C 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.

7.4.6.5 Process Safety

During Manufacturing:

- CO_2 detectors/sensors with alarms will be installed at Process Area.
- Forced draft hood will be installed.
- Heat detectors/Smoke detectors/Temperature and pressure controlling indicators and PSV will be provided, Fire Detectors with alarms will be provided at each process area.
- Safe operation of Equipments/Instruments.
- Scrubber hood/Line will be installed at each process reactors/Area.
- Process operations will be through DCS.
- Emergency shut-off procedure will be established.

7.4.6.6 Runaway Reactions Safety

Causes:

- Delay in reaction initiation
- Reaction mixture instability
- Gas phase explosions
- Runaway reaction or thermal explosion in the condensed phase

Engineering Safety Measures

- DCS controlled operations
- High temperature, high pressure and auto cutoff input reaction chemicals
- During runaway reaction, downstream of safety vent in the reactor will have a catch tank to collect releasing material (liquid, gas and/or vapor)
- Provision of adequate pressure relief valve
- Equipments, vessels properly earthed/grounded
- Closed loop system with high alarm
- High pressure and high temperature interlock to cut off steam
- Gas phase composition below LFL by lowering the fuel vapor pressure

7.5 General Safety Measures

Based on the risk assessment analysis following precautionary mitigation measures will be followed for the project during pre-construction, excavation, construction, erection and commissioning

- **Fall Protection:** The Contractor is required to provide fall protection to employees who are working at heights equal to or greater than 1.8 m. fall protection can be in the form of perimeter protection such as guardrails and toe rails, harness, personal protective equipment (PPE), a safety monitoring system, or a fall protection plan. Activities that require personal fall protection systems include steel erection bolting, riveting, fitting-up and plumbing-up, work over water and some deep excavation work. Safety nets to be provided.
- **Foot Protection**: If machines or operations present the potential for foot injury, the contractor will provide foot protection with safe design and construction for the work to be performed. Workers and visitors shall not be allowed on a construction site without safety boots. The foot protection will be provided for workers working with concrete or cement. Gum boot shall be provided to avoid contact with cement/RCC mixtures and mortar.
- **Head Protection:** The Contractor will provide workers with appropriate head protection. Safety helmet use to be ensured. When the worker is carrying load on the head a suitable head protection to be provided.
- **Noise Protection:** Workers shall wear hearing protection devices (ear plugs, ear muffs, canal caps), whenever the diesel operated engines, D.G set or other noisy machines are operating in the area. The operation of these machines during night after 10 PM shall be strictly avoided. The workers shall be informed the hazards and long term effect of working in noisy area.(e.g. loss reduction in hearing over a period of 5 to 10 years)
- **Eye Protection:** When operations present potential eye injury from physical or chemical elements, the Contractor will select, provide appropriate eye protection. Eye protection is required while working on RCC dismantling, steel fabrication, welding, rough plastering and painting work. Any work which involves looking upside also requires the protection e.g. electrical cabling on walls and ceiling. The various eye protecting devices like safety glasses and goggles, face shields and welding helmets to be provided to workers.

- **Hand protection**: Suitable hand gloves shall be provided for working with cement or mortar. A suitable anti-allergic cream or protecting gel shall be applied on the hands for persons who develop allergy with cement or lime.
- Hazard Identification Studies like HAC/HAZOP, HAZAN, Fault tree analysis, Event tree analysis, Checklist Audit etc. will be carried out (if required) for safe operation of plant.

Safety audit (i.e. Third Party Safety Audit as per IS: 14489) and its compliance will be carried out as per the Rules

I. Engineering control:

- Drains and vents will be provided on chemical pipe line to pump suction.
- Checking schedule/maintenance schedule for Pump, Control valves, Air Instrument system and Instrument will be prepared
- Testing, inspection and certification will be carried out for all pressure vessels, lifting tackles and storage tanks as per Factories Act.
- Calibration will be carried out to maintain the flow indicator.
- Mechanical sealed pumps will be used to avoid and reduce leakages and fugitive emissions.
- Double mechanical seals will be provided for agitators
- Work Place monitoring will be carried out.
- Removal of combustible scrap and debris (wood, clearing/grubbing material) from the site daily and to store it at designated place.
- Dyke wall will be provided for each tank.
- Spill prevention control will be provided to limit the risk of hazardous material release into environment.
- Secondary control will be provided for material transfer in the form of leakage collection tray.
- Alarm system will be provided for deviation of temperature, Pressure and level in storage tanks.
- Cooling arrangement will be provided for storage tank in case of fire/Heat.
- Double earthing system/Earthing grid will be provided for tanks, piping and road tankers.
- Proper labeling will be provided for all equipment and materials.
- Safety system like Emergency Shut Down (ESD‘) switches will be provided for proper functioning.
- Sprinkler system, gas/fire detectors and Remote operated valves (ROV) will be provided as safety system.
- Lightening protection systems will be provided to cover tank farm.
- Wind socks at various locations to know the direction of wind in case of a leak or fire.
- MSDS will be provided for all the hazardous materials at handling areas.
- Proper ventilation will be provided to keep area well ventilated to avoid accumulation of gas/ vapors and to keep it below PEL/ TWL values.
- Every floor, working place and passageway will be free from protruding nails, splinters, holes or loose boards.
- Working surfaces will be dry to prevent slips and falls.
- Occupational health center will be developed to cater any emergency.
- Competent and authorized contractors will be deployed for transport of hazardous material and to follow the Motor vehicles act strictly for hazardous material transportation.

II. Working at Height

- Examine ropes, hooks for defects before putting into service. Use chains or cables to suspend tackle over tonners.
- Each man handling the falls should know how to tie the rope knots properly and safely.
- Make sure that supports to which hoists are attached are strong enough to withstand the loads to which they will be subject.
- Do not tie knots to retain cables run through chains and hooks.
- Use cable clamps or wedge sockets, manila rope is not to be used for slings on material contaminated with acid.
- Care should be exercised in selecting equipment to snug tag lines. Be sure it is strong enough to withstand the load.
- Hoisting equipment operators should keep their eyes on the man giving signals. Do not allow cables to stack up on the side of the drum. In giving signals to Crane Operator, keep attention on the load.
- As a matter of safety, all this equipment should be inspected very year and each year a different colour code is to be used to show and exhibit that the equipment has been checked.
- Hoist ropes must not be used if more than thr.ee outside adjacent wires are broken within a length of one lay or if outer wires are worn 2/3 of their original diameter, or if marked corrosion appears.
- Truck cranes must be properly blocked and be on firm footing before lifting a heavy load with a low room.
- Employees must stand clean off the swing of the crane and keep out from under suspended loads.

III. Electrical Safety

- A licensed electrician will be deployed to complete all temporary wiring and electrical installations required for construction activities.
- Approved Rubber mat will be provided below the MCC panels and near electrical junction.
- Electric proof hand gloves will be available to avoid electrical shock.
- Fuses and circuit breakers (ELCB's) are used to protect motherboards, conductors and equipment to avoid short circuiting and electric shock. MCB's and fuses are also to use to protect the electrical equipment from over current and over voltage.
- Extension cords for equipment or as part of a temporary wiring system shall not be damaged or compromised in any way and insulation must be of the highest grade.
- The joints of electrical wires avoided or an extension cord can be used if needed
- Anytime electrical equipment will be deactivated for repair, or circuits will be shut off, the equipment have locked out and tagged at the point where it can be energized.
- Proper earthling is ensured for all equipment and electrical panels.
- Temporary lights are not be suspended by their cords.
- The employer will provide the necessary safety equipment, supplies and monitoring equipment to their personnel.
- To follow Lock Out/Tag Out (LOTO) system.

IV. Safety Work Permit System

❖ **Safety Permit will be taken for job in case of:**

- Work on line opening involving hazardous chemicals
- Work involving entry in to tank, vessel or work on pipe line.
- Work involving hot jobs like gas cutting, welding, burning, lighting etc. required to be done in battery limit / hazardous are of the plant.
- When it is required to carry out hot work on or adjacent (within 7 mt. Radius) to tank / vessel containing inflammable liquid / gas / solid, rubber lines equipment's and piping.
- Work involving electric shock or hazards from starting up of equipment.
- When work is to be done in the plant at Hydrogen seal water piping.
- When the work is to be done on roof of buildings.
- Working at height above 2 mt. Where working arrangements like ladders, stairs, platforms, railing etc. are not available.
- Work involving excavation and digging jobs in plant / factory premises.

❖ **Cold Work Permit will be taken for job in case of:**

- Work below 2 mts height.
- Work where no any inflammable material available within 7 mts Radius.
- Work on pipeline – where hazardous material or height work is not to be carried out.
- Excavation and digging job inside plant / factory premises.
- Any maintenance job which is not follows in Safety permit criteria.

❖ **Jobs will be extended beyond office hours or non-working days:**

- Permit must be revalidated by and permitted with the consent of DGM / HOD.
- Responsible person of concern department should present till validity of extension of permit.
- Shift in-charge (permit issuer) will personally take care of the situation and take necessary safety precautions like using PPE, Isolation, Decontamination, Draining, Venting, depressurization etc.
- In case of emergency breakdown job - outside working hours (apart from 'G' shift timings) - Shift Incharge (issuer) and Permittee will take care of whole the job by due concern with Safety Department by following all the SOPs and Safety Guidelines.

V. General Safety for Employees and Visitors

- Use of Personal Protective Appliances / Equipments depending upon the nature of the job.
- Nobody will move in the plant without wearing Safety Helmet, Safety goggles and Safety Shoes.
- Employees / workers must remain at their duty points & should leave their areas only with the Permission of their Supervisory officers. Loitering is strictly prohibited.
- Use of weapons, Radio, Transistor, Photography equipments, intoxicants narcotics carrying of Cigarettes / Bidies, Match Box, Lighter or Mobile phone will be prohibited.
- Do not leave respective Places/Unit/Section will till the shift reliever reports in the Plant. Never take and hand over charge at the Material Gate/ TKO/ Punching Machines as this leaves the plant unattended. All those not on specific duty in plants or machines must be obtain prior permission of the Shift Incharge / Sectional Incharge / Head of the Dept. before entering the Operation area.

- In the event of emergency like Fire, Explosive, Toxic Gas release Forceful intrusion, terrorism, corrosion or Nature Disaster (like Flood, Earthquake, Cyclone etc.), emergency siren will be operated from the concerned control room. Persons other than those who are assigned the jobs should evacuate the area immediately, moving away in the perpendicular direction of the wind from such sources of hazards. The direction of the wind should be immediately judged by looking at the windsocks installed at various locations in the plant or by flying dust, small pieces of paper or handkerchief.
- No clothing or other inflammable material shall be dried out on steam line, any other hot equipment, or on electrical supply cable / line or near moving machinery etc.
- The engines of all vehicles and stationary equipment such as welding machines, air compressors cranes, bull-dozers, forklift etc. must be stopped when being filled with diesel / flammable liquid.
- Know the location of safety shower, on line air mask, B.A. set, fire extinguishers; layout of fire hydrant system and fire exist doors, First Aid box, Safety cupboards, Fire proximity suit etc.
- In case of Toxic release, fire, Explosion or siren below, Go in perpendicular direction and follow the instructions of plant personnel assemble at plant-wise safe assembly point. DO not panic; Do not Run but move safely.

- **Visitor Card**

➢ Visitor card will be provided to each visitor with gate pass & visitor badge; which will contain the Rules & Information as below:

ID Badges: ID Badges must be worn and visible at all times. They are to be returned to the reception desk/security gate when leaving the premises.

Mobile phone: Mobile phones with a camera function must not be used on these premises. The use of mobile phones is strictly prohibited in designated areas

Electronic devices: Electronic devices may not be connected to the company network without authorization

Smoking is prohibited: Smoking is prohibited on the company premises. The sale and consumption of tobacco products, alcohol and other narcotic substances is forbidden

Personal protective equipment (PPE): PPE must be worn in many areas of our site. For your own safety you must wear the appropriate protective equipment when entering these areas.

Alarm Signal: Obey alarm signals and follow the instructions of the fire safety team. A triggered piezo siren signal indicates a fire system alarm and alerts the fire safety team. However, piezo sirens emitting a continuous tone indicate that you must evacuate the building immediately.

Emergency Call: To report an accident or environmental incident, please call our internal emergency number on XXXX/XXXXXX. Please contact the emergency services; if there is any immediate danger. Emergency personnel will provide further instructions. Manual call points can be used to alert the fire brigade directly in the event of a fire.

Emergency Exit: Please leave the danger zone immediately and warn people at risk. In the event of fire, try to put out the fire with a fire extinguisher, if possible. Escape routes are marked in green on the emergency and evacuation plans displayed inside buildings. In the event of an evacuation, please proceed to the appropriate assembly point.

Assembly Point: Make your way to one of the designated assembly points and await further instructions. Report any missing colleagues to management at the assembly point.

First aid boxes: First aid boxes are provided for treating injuries, and qualified first aiders are on hand during working hours.

VI. SOP's:

- Separate work permit system for hot work, cold work, electrical isolation, confine space entry, etc.
- Emergency preparedness document covering all the details to handle any emergency.
- SOP for procedure for start-up, shut-down and emergency shutdown of the plant

VII. Training:

- To conduct periodic training on fire drills by conducting monthly exercise
- To conduct Mock drill (Emergency Response Drill) on yearly basis by keeping liaison with local administration and to continue liaison with available firefighting facilities in the area.
- To train the workers on use of Personal Protective Equipment
- To train the drivers on transportation of hazardous goods

Transportation:

- Drivers should have valid driving license.
- Display emergency information panel on the tanker containing correct technical name of the chemicals, UN number, Hazchem. Code, class label and name & telephone number of the emergency services. It should be clean and legible.
- The driver should carry the transport emergency card (Trem card); of the product which is loaded in the tanker/truck. Driver should have knowledge about MSDS, important of temperature, pressure, level, explosive limit and equipment.
- The vehicle should be equipped with a First-aid Box and personal protective equipment as prescribed in "Trem Card".
- Vehicles should be always parked in a safe place away from ignition source and guarded by the driver or the cleaner so that nobody tampers with vehicle or the product.
- One year from the date of commencement of Central Motor Vehicles (Amendment) Rules 1993, every goods carriage carrying goods of dangerous or hazardous nature to human life, shall be fitted with technograph (an instrument to record the lapse of running time of the motor vehicle; time speed maintained, acceleration, declaration, etc.) conforming to the specification of the Bureau of Indian Standards.
- Six months from the date of commencement of these Rules 1993, every goods carriage carrying hazardous goods shall be fitted with a Spark Arrester.
- While handling sharp material or steel plates, wear Leather Gloves. For handling corrosive liquids and acids wear Gumboots, Rubber/PVC Gloves and Safety Goggles and for handling hot material use heat resistant Gloves.

- Experienced labourers should work on slat heaps to prevent accidents due to sliding.
- Inspect the tanker for contamination with acid / alkali / water or any other material to prevent product quality deterioration / side reaction.
- All the electrical accessories of the truck and the engine should be shut off when the tanker is for unloading / filling and put wooden chock.
- Face shield shall be issued from concerned area for the Drivers/Cleaner carrying Liquid Material.

VIII. Traffic

Traffic risk assessment will be carried out for vehicle movement in the plant premises. Outcome of the same is as below:

- A dedicated gate will be provided only for Jeeps entry and exit
- Speed limits boards (20 km/hr.) will be provided to control speed
- Roads will be RCC type and suitable for heavy vehicle movement
- Convex mirrors will be installed for easy identification of opposite vehicle movement
- Bumpers will be installed for speed control
- Main roads will be wide and opposite vehicle movement is clearly visible
- Car movement will be limited only from main gate to parking area. Cars will not be allowed in plant premises
- Traffic movement will be controlled by providing additional security guards at various locations
- To avoid fire hazard it will be ensured that all vehicles entering in the factory have spark arrestors and also ensured that smoking items and explosives are not being carried inside the factory.
- It will be ensured that no driver enters the plant premises under the influence of Alcohol
- Parking area will be defined and sign boards are provided.
- No entry signs will be defined and provided.
- One way traffic movement routes will be defined and provided.
- Zebra crossings will be marked.
- Pedestrian markings will be provided for personal movement

Following requirements will be ensured for transportation of vehicles carrying hazardous goods:

- Spark Arrestor
- Manner of display of class labels
- Emergency information panels
- Class label
- Valid registration to carry the said goods
- The vehicle will be equipped with necessary first aid, safety equipment, toolbox and antidotes as may be necessary to contain any accident
- The driver must hold a valid driving license, which authorizes him to carry hazardous goods
- All relevant information will be given to the driver in writing in the form of Transport Emergency Card (TREM) and MSDS
- Transport Emergency Card (TREM) must be present in drivers cabin all the time
- Safe routes for transportation of goods will be identified.

IX. Preventive safety

The safety measures in form of the general **Do's** & **Don'ts** for safety in process & other plant area are as below:

Do's

- Check VOC content for flammable and make sure that no flammable vapor contents.
- Keep proper and adequate fire extinguisher near work area.
- Check all motors are disconnected and fuse pulled out before maintenance.
- Work on any equipment must be conducted in presence of supervisor.
- Make sure all process lines are disconnected.
- Ensuring that operators/workers etc. follows the SOPs, Safety procedures & standards, work permit system etc.
- Inspection of Storage Area, Earthling & Bonding system.
- Inspection of all Fire Fighting Facilities /Check Alarms operation.
- Checking the availability of Spill Containment Kit.
- Make sure existing fire extinguishers are fully charged and ready for action.
- Inspections of plant, machinery, tools, equipment, premises, work practices, processes, procedures and general environment must be carried out for the health and safety of plant, people and surrounding.
- On-site and Offsite Emergency Plans shall be reviewed and updated, as per the requirement

Don'ts

- Do not work on equipments/machineries without permission from plant head and maintenance head.
- Do not allow any employment without pre-medical checkup or without checking fitness.
- Use of right PPE.
- Don't allow anyone who hasn't received specific safety and operational training to get indulge in any site activity.
- Don't perform any activity without proper permit.
- Don't perform your own maintenance.
- Don't compromise on Design and Engineering part.
- Don't panic if you are in a risky situation.
- Don't allow Spilled hazardous Chemicals to drain to Sewers/Gutters

X. Boiler Safety

Boiler shall be installed as per the Boiler Rules with all the safety equipments and instruments. Start-up and Shut down procedures shall be formulated and complied with. Boiler operation will be carried out by qualified personnel with boiler proficiency certificate. Boiler inspections will be done as per rules.

Hazards associated with Boiler Room:

- Risk of Explosion
- High Pressure steam
- Combustion Gases
- Chemicals
- Hot Surfaces

Safety aspects:

- Water level
- Safety Valve
- Steam valves/traps
- Flame scanner system
- Burner control system
- Use of protective clothing like face shield along with safety glasses
- Fire safety plans shall include the locations of fire alarms, fire extinguishers, the main electrical breaker, fire main, and exits for each area of the facility
- Lockout/Tagout (LOTO) System

Housekeeping

- Proper housekeeping is an essential part of sound environmental management. It will be rigorously seen that there is no accumulation of wastes, especially combustible wastes inside the plant area. Regular maintenance of greenbelt area will help to reduce to dusting and noise level around the plant.

Fire Fighting Facility

- Use of flameproof type electric torch instead of naked light in places where inflammable liquids, vapours and gases are liable to be present.
- Entry with footwear having iron nails or studs is prohibited the operating area, where inflammable liquids vapours / gases are present.
- Portable electrical apparatus, including portable electric lamps must be of flameproof type in areas where flameproof apparatus is prescribed.
- The use of water for extinguishing electric fire is dangerous. In the event of electric fire, DCP, CO_2 & Clean agent type of extinguisher will be used. Before using isolate the electric supply if possible.
- Firefighting arrangements will be provided as per the guidelines of OISD.

❖ **Fire Load:**

- Fire load calculation, Fire water tank/Reservoir will be provided for at least 100 min capacity.

Fire & Safety Measures will be provided at various locations after commissioning of plant which is following:

- Location of Wind Socks
- Location of Safe Assembly Point
- Mobile Fire System : Fire Tender
- Fire Extinguishers
- Sand Buckets
- Fire Hydrant / Sluice Valve
- Fire Pump House

❖ **Fire Fighting Systems**

Firefighting systems will be installed as per fire load of the plant, which are following:

- Fire Hydrant System
- Fire monitoring system

- Water reservoir
- Fire Tender with foam monitoring system
- Portable firefighting system

7.6 Disaster Management Plan (DMP)

M/s. The Gurdaspur Cooperative Sugar Mills Ltd. will prepare On-site Emergency Plan as per MSIHC Rules & Gujarat Factory Rules, incorporating the risk from proposed project to compile the proposed safety measures and will be linked with District Management Plan.

The Disaster Management Plan (DMP) is a guide, giving detailed organizational responsibilities, actions, reporting requirements and support resources available to ensure effective and timely management of emergencies likely to arise from planned operations. The DMP has been prepared for the Sugar, cogeneration and distillery Plant on the basis of the Risk Assessment and related findings covered in the foregoing topics in this report.

Policy

The Environment, Health and Safety (EHS) policies will be made accessible to all personnel at site and to other stakeholders. The policies must be framed considering statutory compliance, stakeholder involvement, continual improvement, and management by objectives. If required, the explanation for the EHS policies will be provided in simple language which could be easily understood by the personnel

Planning

1. Identification and Prevention of Possible Emergency Situations.
2. Possible emergency situations in the plant can broadly be classified into unintended explosions, fire, electrical short-circuits and resultant fire, vehicle collision, and inundation. Additional emergency situations can be developed on the basis of audit or other procedures prior to commencement of operations.
3. Emergency Prevention

Some of the ways of preventing emergencies are as follows:

- Preparation of a Preventive Maintenance Programme covering periodic maintenance schedules for all the equipment's, instruments and system as a whole as per recommendations provided in the Operation and Maintenance manual supplied by the respective manufacturers. The maintenance schedule may also incorporate additional recommendations based on the hands-on experience of engineers gained from working in similar plants.
- Importantly, it is of great importance to collect and analyze information pertaining to minor incidents and accidents at similar sites, as well as for recording near misses or emergencies that were averted. This information gives an indication of how likely or unlikely it is for the site to face actual emergencies and what should be further done to prevent them from occurring.
- Establishment of an on-going training and evaluation Programme, incorporating the development of capabilities amongst employees about potential emergencies and ways and means of identifying and averting the same. Most emergencies do not occur without some incident or an abnormal situation. Hence, there is always sometime of few seconds to few minutes to arrest an incident of abnormal situation from turning into an emergency. This is the role of the shift in-charge who is generally the incident controller (IC) along with his shift team.

Emergency Response Plan Objectives

Specific objectives of the Emergency Response Plan are listed with regards to the responses desired for successful management of the possible emergency situations. Suggested Objectives would include:

- To define and assess emergencies
- To control and contain incidents.
- To safeguard the employees.
- To minimize damage to the property and/or the environment.
- To inform the employees, the general public residing around the plant and the authority on the hazards/risks assessed.
- To safeguard provided residual risk, if any, and the role to be played by the employees in the event of emergency.
- To inform the state authorities like Police and Fire Departments, Mutual Aid Centres, Medical Centres to come up for help.
- To effectively rescue and to provide treatment of casualties and to count the injured.
- To identify and list fatal accidents, if any.
- To secure the safe rehabilitation of affected areas and to restore normally.
- To provide authoritative information to the news media for the incident.
- To preserve records, equipment's, etc. and to organize investigation into the cause of the emergency and to suggest preventive measures to stop its recurrence.
- To ensure safety of staff and patients and resume work.
- To work out a plan with all provisions to handle emergencies and to provide for emergency.

Classification of Emergency

The Level of Emergency can be classified in three Categories, which is given in ***table 15.***

Table 7.15: Emergency Types

Classification	Description	Causes	Applicability
Onsite			
Level – 1	The leakage or emergency, which is confinable within the plant/area.	Small pipe/valve rupture or similar leakages that do not affect outside premises.	Ethyl Alcohol, Sulphuric acid, Hydrochloride Acid storage etc.
		Release of toxic chemicals for short duration.	
		Small fire in the plant.	
Level – 2	The emergency, which is confinable within the factory premises.	Leakage of toxic chemicals for long duration.	Heavy Leak of Ethyl Alcohol
		Medium scale fire and/or explosion confined to the factory premises.	
Offsite			
Level – 3	The emergency, which is not confinable within the factory premises and	Heavy / Profuse leakage of toxic / flammable gases for a long duration. Explosion of high magnitude	Catastrophic failure of Ethyl Alcohol storage tank

Classification	Description	Causes	Applicability
Onsite			
	general public in the vicinity are likely to be affected.	affecting the adjacent area. Major fire inside the factory premises	

7.6.1 On-Site Emergency Plan

The On-site emergency plan: deals with, measures to prevent and control emergencies within the factory and not affecting outside public or Environment. In proposed site onsite Emergency can be exposed by estimated from Risk assessment. Below code of practice, Objective and Line of action will be planning to control emergency.

Table 7.16: On-Site Emergency Planning

S.No.	Code of Practice	Objective	Line of Action
1.	In Case of Fire at hazardous chemicals Storage area.	To deal with Fire efficiently and quickly at different locations in the storage area and electrical Panel	Any person notices any sign of fire shall start shouting FIRE, FIRE (*Aag, Aag*) to seek assistance and also immediately take steps to give warning by blowing the siren continuously and take steps to extinguish the fire by using fire extinguishers available near the site of fire. After giving information reach the spot remove Man & Machinery and take steps to tackle the fire in accordance with the firefighting instructions. Inform at security office to get Ambulance if required.
2.	In case of Heavy Spillage, Leakage of chemicals. Fire and explosion	To deal with the incidence of chemical spillage or leakage efficiently and Quickly.	Any person who notices any leakage or spillage of chemicals from storage tank, pipe line or from any equipment should try to warn the nearby persons and report to the shift supervisor without any delay. The Person should not go near the spill unless he is wearing a proper PPE and has been fully trained to handle the chemicals leaks.

Emergency management cell as shown in ***Figure 16.***

Figure 7.7: Emergency management cell

Allocation of Resources

Key Personnel are identified for carrying out specific and assigned duties in case of any kind of emergency. All such key personnel shall be available on call even on holidays and off duty as well.

- Commander (Office Manager)
- Deputy Commander (Personnel Officer)
- Site Incident Controller (Shift-in-charge)
- Deputy Incident Controller (Deputy to Shift-in-charge)
- Other key personnel
- Essential Workers

7.6.1.1 Setting up of Emergency Infrastructure

To enable the key persons to implement the DMP, the following infrastructure will be set up:

Assembly Points

In case of emergency, the site needs to be evacuated immediately. On evacuation, the personnel working in the plant will go to pre-assigned assembly points. The charge will be taken by Shift-in-charge, and in his absence, a person deployed by Commander will be in charge of respective assembly points and will supervise Assembly and Head Count. The sign boards indicating the Assembly Point with number having relevant information will be placed at all such point for guidance. Each assembly point will be earmarked for the personnel from specific plant areas for assembly in the event of emergency.

Task Force of Essential Staff

A task force of essential trained staff will be made available to get the work done by Commander. Task Force personnel will be trained to perform various tasks as mentioned above.

Emergency Control Center

A separate room (generally located near Security Office at Main Entry Gate) will be provided to facilitate Emergency Control Center. This room will be equipped with dedicated and direct communication facilities. The Control Center will be situated in this area, which is of minimum risk with immediate availability of security personnel nearby. Moreover, the area will be on the arterial road to allow easy access by a vehicle, if other systems fail or extra communication facilities needed to be set up. The Emergency control center will consist of following items:

- Internal and external telephone including STD facility;
- Telephone directory/ Telephone nos. of mutual aid centers.
- First Aid;
- Muster roll of Workers;
- Identity card register;
- Layout plan of the factory showing the location of hazardous materials, assembly point, and first aid centers etc.;
- Map of surrounding area with Fire Extinguishers location;
- M.S.D.S.;
- Copy of ON SITE OFF SITE PLAN;
- Stationeries like- note book, pen, pencils etc.
- S.B. Apparatus;
- List of Government Agencies /Local press agencies with phone No;
- Sand Buckets & Hydrant Network;
- Adequate numbers of PPE's.

Fire Fighting

❖ **Salvage & fire Fighting Arrangement**

M/s. The Gurdaspur Co-op Sugar Mills Limited Gurdaspur (Pb) will be using some raw materials, chemicals in the plant and in the plants some process is hazardous in nature therefore it is paramount important to use personal protective equipments in the plant as well as in emergency situations

Company will ensure adequate personal protective equipments (PPEs) in the plant which have been classified into respiratory protective equipments and non-respiratory equipments depending on whether they are to be used for protection against toxic substances in the breathing air or they are used for protection of other body parts. The following is the list of safety equipments.

Table 7.17: List of safety equipments

S. No.	Personal protective equipment in the plant	Quantity in No.
1.	Stretcher	3
2.	First aid box	6
3.	Safety Helmets	300
4.	Safety Harness Belts	4
5.	Safety Goggles	25
6.	Rubber Hand Gloves	100
7.	Safety Shoe (foot wear)	250
8.	Air Muffs & air Plugs	50
9.	Face Shields for welding	4
10.	Gas mask	25
11.	PVC Aprons	25
12.	Safety ladder	5

Firefighting Arrangement and facilities

The factory / mill, The Gurdaspur Cooperative Sugar Mills Limited Gurdaspur (Pb) will be using some chemicals/ diesel oil in the plant which are flammable and hazardous in nature and may cause fire which can be extinguished by stopping the source of leakage and cooling down with water of vessels, equipment's and structure to prevent escalation.

The factory will equip fire water pumping system (Hydrant System) as well as fire extinguishers of different capacities installed at all prominent locations of the plant to meet any emergency.

Other categories of fire possible in the installation and their class are as given below along with a guide on the use fire extinguishing apparatus.

Table 7.18: Categories of fire possible their control measures

Name of Substance	Class of Fire	The system required to extinguish
Paper, cloths wood & other Synthetic substance	A	Water , sand , water pressure type fire extinguishes
Solvents , paints & thinner	B	DCP, ABC , Mechanical Foam
Compressed gas , LPG, Propane, gasoline , Acetylene	C	DCP, ABC, Mechanical Foam
Reactive Chemicals like Sodium, Lithium Hydride , Managanese, Aluminum Chloride	D	CO_2, DCP type Fire extinguishers No water is applied
Electrical generated fire	E	CO_2 and DCP type fire extinguishers are used No water is applied

Fire Fighting arrangement within The Factory Premises

M/s. The Gurdaspur Cooperative Sugar Mills Limited (Pb) will provide adequate portable firefighting facilities at the site to meet any emergency in the Mill. Different types of firefighting extinguishers will be installed at different locations of the factory as shown in the following table.

Table 7.19: Location of fire extinguishers in the plant area

S. No.	Location of fire extinguishers	Capacity	Qty in no.
1.	Security Main gate	ABC 5 Kg	5
2.	Main Panel Room	CO_2 4.5 Kg	2
3.	GM Office	ABC 5 Kg	1
4.	Molasses Tank Area	ABC 5 Kg	3
5.	Boiler House	ABC 5 Kg	4
6.	Transformer area	ABC 5 Kg	2
7.	Mill House Turbine	ABC 5 Kg	4
8.	Cane yard office	ABC 2 Kg	1
9.	Chief Engineering Office	ABC 5 Kg	1
10.	Account Office	ABC 5 Kg	1
11.	CCDO Office	ABC 6 Kg	1
12.	Outside godown	ABC 5 Kg	2
13.	Turbine Area	ABC 5 Kg	4
14.	Security Office	ABC 2 Kg	2
15.	Dryer House	ABC 5 Kg	2
16.	Plant Panel	CO_2 4.5 Kg	2

Detail of the Fire Fighting Staff

All the staff at the Mill/ factory will be trained in firefighting and all new employees will be given charge only after undergoing extensive firefighting training. In addition trained staffs will be given refresher-training courses periodically

1. Fire Fighting Staff

Well trained fire fighters are part of the production and security department and the factory have a chain of command of fire fighters and numbers of trained fire fighters will be kept in each shift so that in case of emergency they can tackle the problem. All the security persons will be trained in

firefighting. M/s. The Gurdaspur Cooperative Sugar Mills Limited Gurdaspur (Pb) assigns the following as trained fire fighters:

Table 7.20: Details of fire fighters

S. No.	Name of the fire fighters	Designation	Contact Number
1.	Mr. Rashpal Singh	Security Officer	95017-39867
2.	Mr. Ranjeet Singh	Security Inspector	95017-24795
3.	Mr. Randhir Singh	Security Inspector	97795-35755
4.	Mr. Salwinder Singh	Security Guard	75080-68850
5.	Mr. Jaspal Singh	Security Guard	89681-81133
6.	Mr. P.C Pandey	Electrician	70091-16077
7.	Mr. Sudershan Pal	Fireman (Boiler)	94781-41346
8.	Mr. Nanak Chand	Fireman (Boiler)	95923-36190
9.	Mr. Sunil Kumar	Boiler Attendant	97921-29934

2. Water Tank

1232 KL water Capacity tank and water reservoir will be the water source for continuous supply for water. The company has own tube well at site.

3. Arrangement of power failure

The company has diesel generator set of 320 kVA in the plant for firefighting purpose in case of emergency.

4. Fire water pump

Sufficient water capacity and having 120 HP pump arrangement at fire hydrant system which comprises 33 hydrant points at prominent locations with attachment of hose reels and sufficient fire hoses will be available to fight the fire.

Table 7.21: Location of fire hydrant points in plant area

S. No.	Fire Hydrant Location	Qty. in no.
1.	Entry gate	1
2.	Mill House	2
3.	Bagasse yard	2
4.	Boiling House Entrance	1
5.	Dryer house	1
6.	Godown – 1	1
7.	Godown -2	1
8.	Godown -3	1
9.	Godown -4	1
10.	Molasses Tank Area	1
11.	Power House	1

Other arrangement outside the factory

Beside this company will maintain direct contact with fire brigade of nearby Gurdaspur, Dinanagar, Pathankot, Batala, , the list of fire station is given below

Table 7.22: Location of nearby firefighting arrangement

S. No.	Name & location of the fire station	Fire Fighting arrangement available	Phone no.
1.	Fire Station Gurdaspur G.T Road-143521	Water Tenders Foam Dispensers Fire Trailor Pump	01874-244659
2.	Fire Station Pathankot	Water Tenders Foam Dispensers Fire Trailor Pump	0186-2220101
3.	Fire Station Batala	Water Tenders Foam Dispensers Fire Trailor Pump	91157-96801
4.	Fire Station Dera Baba Nanak	Water Tenders Foam Dispensers Fire Trailor Pump	77102-27101

Plant Assembly Point: - Assembly points will be fixed in the opposite of main gate & another is near dispensary and these points will be properly displayed.

Communication:- For communication following things will be made available in the factory, first of all security will be informed through the nearest telephone numbers on noticing the incident the security shall inform to the Incharge of the plant, the area and the nearest phone number to contact the security is given below.

S. No.	Facility	Remark
1.	Telephone facility available	Phone no. 01875-222819, 98145-56256 mobile sets will be made available with all the workers and officers
2.	Electric siren	-
3.	Mobile Phone at the gate with all key persons	Will be made available with security officer 95017-39867

Fire action plan

1. In case of occurrence of fire any person who happens to be near the site of occurrence will alarm an tell “Aag. Aag"/ leakage of the gas/ earthquake etc and rush to the nearby telephone to inform the in charge on receiving the call, call the In-charge advised to chain of command to identify the class of fire and based on the identification they will use the extinguishing media accordingly. The first thing the fire fighter will put out the power supply of that area and people are advised.
    - Don't panic protect yourself
    - Walk briskly do not run
    - Proceed toward safe assembly point at ground floor level and wait further instruction from side emergency controller /incident controller
    - Follow the fire safety existing of the building
    - Do not take any risk , but if you can attack the fire with proper type of the fire extinguisher provided in the plant building and ensure your full safety
2. After seeing the gravity of the situation they will inform other members of his team from the outside for help. After ascertaining the condition and in consultation with Site Emergency controller the siren will be sounded continuously for two minutes Emergency control centre / Site Emergency

controller and site incident controller will be informed by the telephone mobile addition to the security personnel on the duty in shifts have been notified to assist the firefighter in case of emergency

The personnel working in the plant, in case of noticing fire, will immediately raise an alarm and ask the nearest personnel to inform Manager. He may make an attempt to extinguish the fire depending on intensity using a portable fire extinguisher along with other personnel working with him. The severity of fire will be assessed and if it is likely to be severe, will take following steps:

- Call his departmental head/Shift-in-charge to inform about the incident.
- Call fire tenders and mobile trailer pump from nearby fire department.
- Call nearby personnel to move away from the site of incident and go to assembly points.
- Arrange for switching off electricity supply to that specific area of incident.
- Manager shall review the steps taken by Shift-in-charge in his capacity as COMMANDER and will reach "Emergency Control Room".

Steps in Case of Spreading of fire

Commander, after taking charge of the situation, will continuously assess the situation and if it is not being controlled then ensure:

- Ensure evacuation, in orderly fashion and assembly of all persons at the assembly points.
- Arrival of fire tenders and/or Mobile Trailer Pump from outside resources.
- Ensure that any vehicle parked near the fire site is taken away to safe area.

Communication System

- Communication System is a Crucial Factor while handling emergency. Company has quick & effective Communication System through which, any situation, which can lead to emergency, can be informed or known to.
  1. All persons working inside the plant.
  2. Key Personnel outside during normal working hours & during off-duty hours.
  3. Outside emergency services, Statutory and Local Authorities &
  4. Neighbouring facilities and public leaving in vicinity.
- Each and every section, Plant & Department of the Factory will be connected by internal telephones with SMC, Supervisor or IC's. External Phone at Office and Residence and Mobile shall also be made available with Key Personnel and top executive of the factory. The Communication System shall begin with raising the alarm declaring the emergency, Telephone messages and Procedure to communicate the emergency to other persons & General Public.

Treatment of affected persons

Injured / Affected persons will be provided suitable first-aid treatment and sent to the Company's Doctor and/or designated local medical center nearby in town for further treatment depending on injury.

Patients requiring further treatment shall be sent in Ambulances to Hospitals in nearest area.
Patients suffering from minor problems will be discharged and sent home after preliminary treatment by the Doctor.

Post Emergency Activities

Medical check up

Medical checkup of affected persons in the incident, if any, will be carried out, and suitable medical aid shall be provided to set right the problem.

Collection of Records

All possible evidences will be collected along with shift logs and personnel nearby or connected with the incident will be called for narrating the details so as to facilitate finding of the most probable and convincing cause of incident and emergency situation. The proposed procedure will help in suggesting the remedial measures for preventing recurrence.

Inquiry

Detailed inquiry for the incident will be carried out to find out the cause, which will be in the form of fact finding mission and recommendations made to the suitable authority.

Training

Training and retraining of safety and fire personnel: A thorough understanding of safety is essential for the nature of operation at the installation. Safety awareness and safe working habits form the backbone of a strong safety culture. In addition, understanding the disaster or hazard potential existing and issue raised in the emergency plan is essential in order to ensure proper implementation of the plan in case of emergency.

Training programs are one of the most effective tools for dissemination of information and the management lays strong emphasis on the same. Training needs are identified carefully and actions to ensure a high level of training carried out.

The fire fighter crew of the plant, wing of factory personnel who will be trained in fire-fighting and regular fire-fighting refresher course will be arranged in the plant; in addition to this our security people will also be trained in firefighting.

Training and retraining of other employees: Safety and fire training is important to the Managers, supervisors and worker of the plant by various means.

1. The personnel deputed to participate in the training programs on safety organized by the specialist organization from time to time.
2. Lecture on safety, health and related subjects will be delivered by the officers from various departments including safety for officers supervisory and worker development training Program's
3. In plant training programs will be organized for imparting safety, first aid & Firefighting training to the employees.
4. Seminars will be organized which are associated with other safety motivational scheme in order to increase the safety awareness of the employee
5. Safety instruction especially for hazardous operation will be prepared and issued to the concerned employees.
6. 4th march is celebrated as safety day and safety week, safety activities are undertaken in the month are as follows;
   a. Slogan and essay competitions.
   b. Prize distribution function.
   c. Banner displaying and hoisting of safety flag.

d. Safety badges to all the employees.
e. Safety calendar distribution to the entire department.

Public Awareness & Disclosure of Information

As per the rule 41-B of the Factories Act 1948 and Rule 13 of the MSIHC rules, the safety measure to be taken in the event of emergency shall be made know to the public who are likely to be affected. M/S The Gurdaspur Cooperative Sugar Mills Limited Gurdaspur (Pb has taken up community development program under which the company creating awareness on safety matter among the employees training on handling of the material is give.

Table 7.23: Training programmes to be conducted in the plant

S.No	Training Program Activity	Level of Participants	Subject / Matter Covered	Faculty
1.	Safety induction training. All the hazards, their preventive measures are explained.	All new joiners are the participants.	Introduction of the plant, major hazards of the plant, safety measures required to be taken safety rule of the company.	By H.R Manager.
2.	Training program on 1. Accident Prevention. 2. Fire prevention in the mill. 3. Material handling. 4. Health hazards in the industry.	Officer's supervisors, operators and helpers.	1. Accident Prevention. 2. Fire Prevention. 3. Health hazards in the industry. 4. Raw Material Handling. Emergency Planning.	Managers/ Officers Supervisor of the plant.
3.	Need based safety programs	Officers / Supervisors	Hand tools, risk assessment, use of PPE's	Inside Faculty

Review of Emergency Performance

The site/head office management will review the findings of the audit and the non-compliances. It will consider whether the DMP is providing adequate safety assurance to the management, delivering performance as desired, and whether it continues to be in the spirit of Environment, Health and Safety Policies and changing requirements. On the basis of these, the management will record its decisions and consider modifying the DMP, as deemed appropriate.

Details in the On-site Emergency Plan (as per Schedule 11 of MSIHC Rules)

1. Name and address of the person Furnishing the information: Factory Manager

M/s The Gurdaspur Cooperative Sugar Mills Ltd., V.P.O Paniar Village, Dist. Gurdaspur, Punjab-143531.

2. Key personnel of the Organization and Responsibilities assigned to them in case of an emergency

Key personnel of the Organization:

- SMC/IC (Site Main Controller/Incident Controller)
- Deputy Incident Controller (Deputy to Shift-in-charge)
- Other key personnel (Maintenance, Safety Officer, Admin))
- Essential Workers

❖ **Responsibilities of SMC/IC**

- To reach the identified Emergency Control Center as soon as information for incident will be provided and take charge of situation and send his deputy at the place of incident.
- To activate the Emergency Preparedness Plan according to severity of situation.
- To call Safety Officer and Fire Officer with all necessary resources at site of incident.
- To call for outside help from State Fire Department, nearby industries, if required, looking at magnitude of incident.
- Call all key personnel and inform Doctor/Medical Center to be ready for treatment.
- To deploy staff to carry out following functions:
- To liaise with other departments and guide their personnel.
- To supervise Assembly and Evacuation at all points.
- To look after patients who are bed ridden and any casualties and give psychological support.
- To activate Assembly and Evacuation Plan, if required, as per situation by ordering Site Incident Controller.
- To inform and liaison with Chief Operating Officer, Police Department and District Emergency Authority.
- To inform all the employees and relatives of the affected employees.
- To arrange for chronological records of emergency for future reference and supplement the investigation of incident.
- Issue authorized statements to News Media.
- To ensure prompt action for preservation of evidence and arrange for video shooting/ photographs.
- Deputy Commander to carry out the responsibilities of Commander in his absence and assist him in his duties when present.
- Assign Medicare and Emergency Management tasks to all persons of management cadre.

❖ **Responsibilities of Deputy Incident Controller**

- To rush to the site of incident and take immediate charge.
- To ensure that immediate steps as per Emergency Preparedness Plan are taken and direct the worker staff accordingly.
- To inform Commander, Deputy Commander and other key personnel for the situation from time to time.
- To blow the Siren as per situation to declare Emergency.
- To supervise assembly and evacuation as per plan, if required, from the site of incident.
- To take decisions for controlling the emergency and incorporate advice given by Commander after taking charge in Emergency Control Center.
- To ensure that casualties receive adequate attention and medical care.
- To ensure accounting for the personnel present at site of incident and personnel rescued and personnel missing.

- To control traffic movement in the premises.
- To arrange for relief of rescue workers and catering facilities, when emergency is prolonged.
- Deputy Incident Controller shall take charge at site of emergency in the absence of Site Incident Controller.
- When Site Incident Controller shall be present at the site of incident, Deputy Incident Controller shall assist Site Incident Controller or take charge at another location, if emergency exists at more than one place.

❖ **Responsibilities of Essential Workers/ Other Personnel**

- Firefighting using portable extinguishers / hydrants (as feasible) and controlling the spill, if any, till fire department people take the charge.
- To help the fire brigade, if required.
- Emergency engineering work e.g. isolating equipment, shifting materials, urgent repairing or replacement, electrical work etc.
- Provision of emergency power, water, lighting, material etc.
- Direct movement of people, equipment, special vehicle and transport to or from the scene of the incident and provide barricade to area of incident to prevent unauthorized trespassing.
- Search, evacuation, rescue and welfare, first-aid and medical help.
- Manning of assembly points to record the arrival of evacuated personnel.
- Manning of outside shelters and welfare of evacuated persons there.
- Assistance at casualty's reception areas to record details of casualties.
- Assistance at communication center to handle outgoing and incoming calls and to act as messengers, if necessary.
- Control of traffic at the premises

3. Mutual Aid

It will have mutual agreement with nearby industries and District Disaster management Center for specific emergency help requiring during any emergency.

Mutual aid agreement for treatment of injured workers with hospitals will be done.

4. Details of liaison arrangement between the organizations

The Plan of Coordination

The plan of coordination include the responsibilities like preparation of plan and its updating keeping liaison with government authorities, mutual aid agencies and other related organizations etc explained in the subsections.

Liaison with external authorities

The official nominated to liaison/factory manager will meet with the external authorities and the matter in which their cooperation will be sought are below authority wise and other neighbor Factories (under Mutual aid scheme).

a) **District Magistrate:** The Factory Manager will keep in touch with the District magistrate to make him aware about the different accident scenario envisaged in the plan and the physical damage possible from within and outside the factory in may also be provided with any other information required by him for preparing off site emergency plan. District Magistrate may be invited to witness the rehearsal of onsite emergency plan and conducted from time to time. He may also be persuaded to mobilize the service like District Health Services, hospitals, police,

fire department, civil defense etc., whenever required in connection with the onsite emergency plan.

b) **Police Department:** The liaison with the police department official will be maintained by the Factory Manager the police will be kept informed about the type of assistance required from police in case of major emergencies in the plant. The role and statutory duties of police at the time of emergencies are:
1. Traffic Control
2. Assisting rescue and medical team to work without hindrance.
3. Helping to evacuate the personnel.
4. Prevent unauthorized entry in the affected area.

c) **Fire Service:** The liaison with the district fire officer will be maintained by the manager of the factory. He will be made aware about the type f fire possible in the plant, extent of their firefighting facilities available in the plant and the additional help required from them in the event of fire and other emergencies.

d) **District Medical Service:** The Factory Manager will get in touch with the official of the medical service of Morinda, Roopnagar & Mohali and arrange for cooperation for making their services in case of emergency.

e) **Director of Factories:** The Factory Manager or his alternate will keep the contact with officers of Director of Factories Punjab about the various aspects of the Onsite emergency plan. He will ensure that the provision of Factories Act 1948 and the manufacture storage & import of Hazardous Chemical Rule 1989 (under EP Act) are fulfilled to the satisfaction of the Director of factories.

f) **Other External Agencies & Organization:** The Manager of the factory will keep arrangement with other external agencies on the matters connected with on Onsite Emergency Plan.

g) **Making plan in Advance:** The Factory Manager of the company will be responsible for making the plan in advance and keeping it up-to-date to the satisfaction of occupier of the plant and the concerned statutory body of the area.

Rescue and Relief Operations:

Different components of the rescue and relief operation are prescribed below point wise.

1. **<u>Communication System</u>**

a) **Raising the Fire Alarm:** The occurrence of fire in any part of the factory will be communicated to the shift in charge with the help of internal telephone system by one who sees it for the first time. Important officials have also been provided with the mobile phones. In case it is required they will be contacted with the help of these systems. On receiving the first information about fire, the security supervisor on duty will sound the alarm which is provided on the main gate.

b) **Emergency Alarms: -** The site emergency controller / site incident controller will take the decision as to whether the emergency should be declared or not.

Table 7.24: Detail about the alarm & siren

Location of siren	Type of siren	Range of siren	Type of emergency	Duration of sound	Type of sound
Main gate	Hooter / alarm	5 km	General siren	20-30 second	Continuous
-do-	-do-	-do-	Fire / explosion	45 second	10 second on 5 sec off 3 times
-do-	-do-	-do-	All clear	3 minutes	continuous

2. Declaring the major emergency

The responsibility of declaring the major emergency lies with the main site emergency controller/ site incident controller. As indicated in foregoing sections there are several persons nominated to function as alternate site main controller. In addition to this there is a provision that till site emergency controller does not assumes his office, the site incident controller will act as site emergency controller. Even otherwise as soon as he comes to know about the incident he will quickly assess the situation and report to the site emergency controller.

The decision of declaration of emergency should be taken after due consideration because it may involve closure of the plant and heavy losses. Under no circumstances, however the decision should be delayed. In case the site emergency controller is not available due to any reason, the site incident controller will take the decisions without loss of much time. He may consult the site incident controller and other key personnel of the other shifts in charges and general shift people in deciding the matter.

3. Making the emergency known

The emergency call is made known to different categories of people as mentioned below:

a) To those who are within works:

The sounding of alarm will be followed by messages by intercoms, mobile phones indicating the declaration of emergency. Nature and place of emergency and the instruction to shut down the plant and assuming the emergency duties assigned to respective employees. The persons nominated to make the emergency known to them in the plant within the works are given below in table.

Table 7.25: Details of the persons nominated to make the emergency known

S.no.	Name of person designated	In emergency shifts	Mobile no.	Designation in the company
1.	Site Emergency Controller	Mr. Pawan Kumar Bhalla	98145-56256	General Manager
2.	Site Incident Controller	Mr. Sandeep Singh	78886-22173	Chief Engineer
3.	Fire Fighting & Rescue team leader	Mr. Rashpal Singh	95017-39867	Security
4.	Communication team leader	Mr. Charanjit Singh	98551-15542	Superintendent

b) To key personnel outside normal working hours:-

The information regarding the emergency beyond normal working hours will be passed on to the key personnel with the help of internal and / or external telephones and mobile phones. In case the telephones are not working, the runners will be sending to the information regarding type & place of incident and other essential information is communicated within the shortest possible period.

5. Information on the preliminary hazard analysis

i. Type of Accidents

Hazard Assessment in view of Qualitative and Quantitative Risk Assessment has been carried out. The Risk identified and estimated the Explosion and Toxic radii to the facility and surrounding.
The methods employed for hazard identification in this study are:

- Identification of major hazards based on Manufacture, Storage and Import of Hazardous Chemicals;
- Identification of hazardous units and segments of plants and units based on relative ranking technique.

The chemical properties studied for hazard assessment.

A. Qualitative Risk Assessment:

Qualitative Risk Assessment has been carried out for the following areas:

- Hazard involving during Pre-Construction/ Construction Phase
  - ✓ Fall from work at height during slab structure
  - ✓ Dust Exposure during excavation
- Storage and Handling of Acids; Spillage of Acids during transferring
- Storage and Handling of Flammable Chemicals; Leakage and spillage
- Storage and Handling of Toxic Chemicals; Exposure of toxic fumes
- Storage and Handling of other Solid/ Finished Products; Dust Exposure

HIRA study carried out for above mentioned activities quantified the risks as per Risk Matrix and initial Risk reduced at Residual Risk.

B. Quantitative Risk Assessment

Accidents are considered as:

- Vapour Cloud Explosion
- Pool Fire
- Flash Fire
- Fireball
- Leakage from Pipeline due to damage by external sources, sabotage.
- Ruptured of Pipeline and Storage Tanks
- Catastrophic Rupture

ii. Hazards

Hazards are identified which are:

- ✓ Fire due to flammable liquid.
- ✓ Vapour cloud explosion.
- ✓ Spillage of Flammable/Toxic chemical due to leakage
- ✓ Spillage from Tank Truck overflow while loading and unloading operation.
- ✓ Failure caused by corrosion defects.
- ✓ Failure of Civil structure.
- ✓ Failure of Mechanical seal.
- ✓ Exposure to fugitive dust, noise, and other emissions.
- ✓ Fire in Electric Panels.

iii. Safety relevant components

- ✓ Safety Gadgets will be provided to all contract and Employees.
- ✓ Fire Water network line and Hydrant monitor will be installed as per fire load of the plant.
- ✓ Active fire protections with CO_2, DCP Fire Extinguishers, Foam Trolley and passive protections for early detection by smoke and heat detectors, interlocked with Water Sprinkler system.

6. Details about the site

It is located at V.P.O Paniar Village, Dist. Gurdaspur, Punjab- 143531. Project boundary map is given in ***Ch.2***

a) Location of dangerous substances.

Location of Hazardous Substances will be at Storage tank yard for solvents, Acids, Fuel Oil, Raw Material Storage for Solid & Liquid Chemicals and Finished Product storage area. This area will be classified as per Hazardous Area Classification (HAC) or Chemical Compatibility.

b) Seat of key personnel

Key Personnel are at Control Room of Every Plant.

c) Emergency control room

Emergency control room will be established and equipped with communication system, Emergency Alarm Panel, Factory layout (Entry, Exit & Emergency Gates), Fire Hydrant network layout, Details of mutual Aid Industries Safety Gadgets, Extra Fire Extinguishers. ECC room will be manned round the clock.

7. Description of hazardous chemicals at plant site

Hazardous chemicals study carried out as per:

- ✓ Identification of major hazards based on Manufacture, Storage and Import of Hazardous Chemicals;
- ✓ Identification of hazardous units and segments of plants and units based on relative ranking technique.

8. Likely dangers to the plant

As enumerated in the classification of emergency like Gas leakages, Fire & Explosion due to leakage and rupture of pipeline and storage tanks.

9. Enumerate effects of Accident

a) Stress and strain caused during normal operation

- ✓ Leakages & Spillages of hazardous chemicals.
- ✓ Overpressure of the reactor.
- ✓ Overflow of Hazardous chemicals.

b) Fire and explosion inside the plant and effect if any, of fire and explosion outside.

Risk assessment has been carried out to find out the maximum credible loss scenario. The fire and Explosion dispersion contours due to various scenarios and weather conditions are plotted using 2D Risk Modeling.

The radii of Heat radiation and toxic due to leakage and catastrophic rupture of pipeline and storage tanks are plotted using DNV Phast 6.7 for 2D.

Consequence modelling also carried out to emphasize quantitative Risk for Hazardous Chemical Storage.

Safety Organization & Safety Committee:

Safety organization: overall general manager of the company is responsible for safe working of the plant and provide safe working environment to the staff and worker' Even though safety of plant & personnel is primarily a responsibility of the line management & supervision, there is a facility department, who support the Factory Manager/General manager who play advisory role for improvement of safety in the plant. The organization chart giving the structure of safety along with other department of the plant are given below:

Safety committee: The Gurdaspur cooperative sugar Mills Limited Gurdaspur (pb) will develop safety committee whose chairman will be Labour welfare House (LWO) of the company & secretary will be Mr. Jaswinder Singh (security officer) & it will involves various categories of managers/ officers and workers in discussion. Members are from management' staff and worker side will be there in the committee. Safety committee assembles every three months to discuss important safety related

Table 7.26: Details of the safety committee members

S. No.	Name of responsible person	Designation	Phone no.
1.	Mr. Pawan Kumar Bhalla	Chairman	98145-56256
2.	Mr. Manjinder Singh	Sectary	98888-80467
3.	Mr. Sandip Singh	Coordinator	78886-22173
4.	Mr. Charanjit Singh	Member	98551-15542
5.	Mr. Raghubir Singh	Member	82839-29216
6.	Mr. Sandeep Singh	Member	81959-17175

10. Details regarding:

(i) Warning, alarm, safety, and security Systems:

At vulnerable locations the warning alarms during operation and emergency situation will be assigned. Following various Safety & Security Systems will be provided to avoid unsafe conditions and Accidents:

Warning:

1. Safety Signage's
2. Warning alarm at critical overshoot parameter.
3. Danger Signage's at Electrical panel
4. Signage's at restricted area.
5. Pathways (Man/Material) inside plant

Alarms:

1. Critical Parameter Deviation Hooter.
2. Emergency Alarms.

Safety System: Plan has

1. The Safety Policy (HSE Policy)
2. Regulars Inspection and Monitoring of Hazardous area.
3. Periodic Safety Trainings for each employees and Contract workers.
4. PPE's as per operation and product's nature.
5. Mock Drills
6. Fire & Safety Trainings
7. OHC with qualified doctors and Male Nurse.
8. Well-equipped emergency vehicle.
9. Awareness Programme for Chemical Exposure and Adverse effects.

Security System:

1. Security persons at gate & at other vulnerable locations.
2. Cameras at critical areas.

(ii) Alarm and hazard control plans in line with disaster control and hazard control Planning, ensuring necessary technical and Organizational precaution:

The Disaster control plan will be prepared and in line with Onsite Emergency and Off-site Emergency. The necessary precautions are warning alarms, Safety-Interlocks, SOP's for specific operation, cause & effect analysis for each instrument and equipment will also prepared to ensure the technical and organizational precaution.

The communication system will be also developed within Disaster management center and Plant intercommunication plan already developed.

❖ Safety Gadgets / PPEs'

Use of appropriate PPE's such as safety helmet, shoes, goggles, welders goggles, Full face mask with canister/ cartridge, Self-contained breathing Apparatus with full-face mask, face shield, ear plug/ muff, hand gloves, heat resistant hand gloves, aprons, suits & full body safety harness.

(iii) Reliable measuring instrument, control units and servicing of such equipment.

Proper functioning of instrument and Equipment the reliability function for Detectors, gauges and weigh balance plan is prepared. Periodic schedule for Maintenance & Calibration is prepared. Calibration is carried out with standard solution and methods.

(iv) Precautions in designing of the foundation and load bearing parts of the building

Designing of foundation and load bearing parts of the building are complying the requirements of Seismic Resistance design / Zone III.

(v) Continuous surveillance of operations

- Control room will have DCS System operated by trained operator.
- Round the clock monitoring of operations by trained manpower.
- Immediate corrective measures by the authorized personnel.
- Cameras at vulnerable locations

11. Details of communication facilities available during Emergency and those required for an off-site Emergency

Communication facilities are established as per emergency communication plan enumerated in the diagram On-site & Off-Site Emergency.

On-site Emergency plan is aligned with District disaster management plan (Off-Site):

12. Details of fire-fighting and other facilities available and those required for an off-site emergency

Safety & Fire department will be developed with trained fireman and safety gadgets like CO_2, DCP Fire Extinguishers, Foam Trolley and passive protections for early detection by smoke and heat detectors, interlocked with Water Sprinkler system.

During Off-site emergency the mutual agreement aid will be developed.

- ✓ The Fire tender with water & foam, and Fire Extinguisher
- ✓ Emergency Vehicle if required, Trained Fire man.

13. **Details of first aid and hospital services Available and its adequacy**

❖ **First Aid/ Antidotes**

- Wash affected areas/ eyes with copious amounts of water.
- Move to fresh air or administer Oxygen.
- Artificial respiration.
- Give copious drinks of water.
- Induce vomiting.
- Remove contaminated clothing.
- Antibiotics/ steroid eye drops.
- Analgesic for pain, antibiotic for prevention of infection

Action plan for OHS standard implementation will be incorporated. Safety trainings (on Safe Material Handling, First Aid, & all Safety Aspects) as per Gujarat Factory Rules will be strengthened more.
M/s. The Gurdaspur Cooperative Sugar Mills Limited Gurdaspur (Pb) will maintain first aid boxes and will be available on the gate and inside plant area of the plant and company will develop dispensary and doctor Dr. R. K Attri with dispenser will be available in the dispensary in case of any emergency.

Trained Emergency Core Team Members & first aiders

Almost all the employees will be made familiar with the first aid and periodically imparted first aids training with the help of outside agency (St John Ambulance Chandigarh) However, the following employees have been earmarked as trained first aider.

Table 7.27: Details of the trained First aider

S. No.	Name of trained First aider	Designation	Contact Number
1.	Dr. R. K Attri	Medical officer	98760-13274
2.	Mr. Fateh Bahadur Singh	Fitter Helper	99143-94787
3.	Mr. Rashpal Singh	Instrument Mechanic	70875-71163
4.	Mr. Baljeet Singh	Dispenser	94636-61114

Table 7.28: Detail of other Medical Facilities

S. No	Hospitals	Address	Facilities Available	Phone No.
1.	Civil Hospital	Bypass Babri Gurdaspur	All Emergency facilities are available	--
2.	Community Health Center	Singowal Dinanagar	Emergency facilities available	01875-220135
3.	Abrol Hospital Gurdaspur	29JV, 289 Sadar Bazar Gurdaspur	Emergency facilities available	98760-02748
4.	RP Arora Medicity Hospital	BSF Road Gurdaspur	Emergency facilities available	79470-59821

Arrangement for Transportation of Person

Transportation of persons through manual stretcher and car/ ambulance.

Evacuation Routes

The main emergency management plan involves rescue of the victim through a safe route, ascertaining the level of injury/ fatality, deciding on the extent of medical action required, rushing the patient to nearest hospital as the case may be. In addition of course informing close relatives of the extent of injury and proposed treatment is important.

Emergency Medical Action

The actual rescue operation would be carried out by the "Core Team Members" as identified in the action plan of emergency, the evacuation route will be selected would be the shortest one. Victim would be carried out for treatment on stretcher from the site. The role of the rescue team includes hearing of the siren rushing to the spot with stretcher and first aid box. In addition, they should inform the site incident controller/ site emergency controller and company doctors and request his immediately presence, incase outside assistance from hospital is deemed essential necessary arrangement at the hospital would be made immediately.

Medical Officer

1. M/s The Gurdaspur Cooperative Sugar Mills Limited Gurdaspur (Pb) will appoint a full time medical officer Dr. Baljeet Singh (Mill Dispensary) who will rush to the emergency control center as soon as facilities he comes to know the declaration of emergency
2. He will guide the site main controller about the suitability of sending the injured person to the other medical facilities available nearby seeing the condition of the patient
3. The trained first aider, during this process should continue giving first aid till such time as necessary, in addition monitoring the condition of victim throughout this or deal is essential, any sign of deterioration in breathing & infection.
4. After bringing the affected person to the hospital, he will follow the instruction of the medical officer.

Off-Site Emergency Plan

The Off-site emergency plan deals with measures to prevent and control emergencies affecting public and the environment outside the premises.

Table 7.29: Off-Site Emergency Planning

S.No.	Code of Practice	Objective	Line of Action
1.	In Case of catastrophic rupture of ethyl alcohol	To deal with the incidence and carry out prompt rescue operations affecting general public	Activating District Emergency Control Centre The Company will take all the measures by providing necessary information/details on the nature, extent and likely effects of incident. The company will provide all necessary support to the authorities like District Magistrate & Collector, Factory Inspector, Police Department, Fire Brigade, Health & Medical Services, Pollution Control Board, Explosive Department, etc. in controlling the emergency.

Risk assessment modelling, in case of Catastrophe leak concentration of these chemicals leading to Off-Site Emergency is done. Arrangement to control the emergency, public information and online detectors will be installed at vulnerable locations. Below are various arrangements to control the Off-Site Emergency.

Disclosure of Information to Public and Neighbor industries

Company will prepare a booklet for all major hazardous chemicals as applicable to MAH unit as per Factory Act & Rules and circulate among general public and neighbor industries. First aid, emergency treatment, probable types of emergencies that can arise. Preventive steps will be taken to control emergency. Emergency warning siren code system, to make them aware in advance. The Gurdaspur Cooperative Sugar Mills Ltd. will carry out group get together, acquaintance round, meeting with neighboring public, population to train and make them aware about our operation and preparedness.

Disclosure of Information to Workers

Company will prepare a booklet for all major hazardous chemicals as applicable to MAH unit as per Factory Act & Rules and circulate among all workers of the unit.

Local Crisis Group

As per central government notification and DISH office for preparation of offsite emergency plan and Gurdaspur sugar mill will become member of local level crises group, will set up disaster management

center of industrial area using existing available facility of industries in the area with facility and emergency contact phone numbers.
During emergency with in local group reach in and around industrial area any one can contact DMC – control room situated in both the factories and manned round the clock will initiate actions and arrange to organize resource mobilization and communication.

Communication and warning by Disaster Management Center
When a disaster occurs, the industry affected by the disaster will immediately inform the disaster management center with all available information, the DPMC will act as per the contingency plan and DPMC will also communicate immediately to district Collectorate. The integration of on – site plan with district contingency plan and various functions to be carried out are mentioned in chart OFF – SITE emergency plan as follow:
Natural calamities mitigation plan
Natural calamities are the occurrence that causes damage, economic disruption, loss of life deterioration of health and health services on sufficient scale to warrant an extraordinary response from outside the affected community or area or it is crises situation which cannot be dealt by the affected community with its own resources. Classification of natural calamities Natural Calamities can be classified as under-

Wind related: Cyclone, tornado
Water related: Earthquakes, Tsunami, Landslides, Volcanic eruption, and soil erosion.
Due To natural reasons: Forest fire, Epidemic Any of the above mentioned calamities may lead to emergency in & around the plant and community nearby area. Any of the above mentioned calamities may trigger manmade emergency cited earlier in this plan. To declare emergency same three level of emergency structure shall be followed as mentioned earlier
As a matter of fact natural calamities being act of God cannot be controlled, through better awareness and preparedness play a vital role in faster restoration. Some do;s and don’ts for various natural calamities are mentioned below as part of awareness.

EARTHQUAKE- SAFETY
- Tell the facts about earthquake to your family members
- Construct new buildings with earthquake resistant method and strengthen the
- old buildings
- Insure your house and family members
- Take the training for first aid and fire fighting
- Keep your important documents, some cash and necessary articles ready in a bag get your house insured before the earthquake
- Identify special skills of neighbor(medical, technical) so that it can be utilized in emergency
- Do not keep cots near the glass window
- Do not keep heavy and fragile things in the selves
- Do don’t hang photo frames, mirrors, or glasses up your bed

During Earthquake
- If already inside, than stay indoors! Get under a heavy desk or table and hang on to it. If fire breaks out, drop on the floor and crawl towards the exist
- If you are out doors during the quake, keep away from buildings, tree and electricity lines. Walk towards open places, in clam and composed manner.

- If you are in a school, get under a desk or table and hold on.
- Do not stop on or under bridge or overpass or under trees, light posts, power lines, or signs. Stay inside the car until shaking stops. Do not panic.

After the Earthquake

- Switch off electric lines. Listen to radio- TV and other media for government announcement
- Check for injuries to yourself and those around you. Take first aid where you can. Extinguish fire, if any.
- Examine walls, floors, doors, staircases and windows to make sure that the building is not in danger of collapsing.
- Insect for Gas leaks- if you smell gas or hear blowing or hissing noises, open a window and quickly leave the building. Don't light you kitchen stove if you suspect a gas leak. Do not keep telephones lines busy unnecessarily.
- Do not be panic of the aftershocks. Do not enter into the unsafe or risky houses or buildings.

Flood- Safety

Do's and Don'ts after flood

- Where is a possibility of spread of water borne diseases after flood, and the hence medical treatment should be taken immediately.
- Sprinkle medicines in the stagnant dirty water.
- Inspect your house for any cracks or other damage. Check all the walls, floor, Ceiling, doors and windows, so that any chance of house failing down can be known and you can be aware about the immediate danger.
- If the floodwater has entered the house or has surrounded the house, then it is Advisable not to enter such house
- Keep listening to weather forecast on radio and television. Move to your residence only when instructed by the competent authority. It is not safe to believe that the problems have ended after the flood water have receded
- Inform the competent authority/officer for restoration of the necessary connections like gas, electricity, telephone, drainage, etc.
- Beware of the various insects or poisonous snakes that may have been dragged inside the house along with the floodwater.
- Destroy the food commodities that have affected by floodwater.
- Check properly all the electric circuits, floor level furnace, boilers, gas cylinders, or electric equipment like motor pump etc. Check whether any inflammable or explosive item has not entered along with the floodwater.
- Do not enter deep, unknown waters.
- Do not go near the riverbank even the floodwater has receded.

CYLONE –SAFETY

A cyclone is storm accompanied by high speed whistling and howling winds. It brings torrential rains.

Where does a cyclone come from?

A cyclonic storm develops over tropical oceans like the Indian Ocean and Bay of Bengal and the Arabian Sea. Its strong winds below at great speed, which can be more than 118 kilometers per hour.

What are the visible signs of a cyclone?

When a cyclonic storm approaches, the skies begin to darken accompanied by lightning and thunder and a continuous downpour of rain.

How does a cyclone affect us?

A cyclone causes heavy floods. It uproots electricity supply and telecommunication lines. Power supply shuts down and telephones stop functioning.

Road and rail movements come to halt because floods damage rail tracks and breach roads. Rail movements are also disrupted because of communication failure. The inclement weather conditions also disrupt Air services Seaports stop work due to high winds, heavy rains and poor visibility Sometimes ships overturn or are washed ashore the high seed winds bends and plucks out trees and plants

- A cyclone tears away wall sidings and blows off roofs of houses.
- Houses collapse and people are rendered homeless. In villages kachha houses get blown away. The speeding winds cause loose metal and wooden sheets to fly turning them to potential killers. Broken glass pieces can cause serious injuries.
- The floodwater can take time to recede.
- The floodwater can take time recede.
- The floodwater can turn the fields salty

Bridges, dams and embankments suffer serious damages.

Floods wash human beings and animals and make water unfit for drinking. There can be outbreak of diseases like cholera, jaundice or viral fever due to intake of impure water. Water gets contaminated because of floating corpuses of animals and human beings and mixing of sewage stored food supplied, gets damaged.

The warning stage. This is the stage when a cyclone gets formed The warning is given 24 hours before he anticipated time of arrival of a cyclone.

Cyclone arrival

This warning is issued 12 hours before a cyclone is due to hit the land, the warning gives information about cyclone and will continue until the winds subside. In sea ports, danger signal are hoisted about the impending cyclone. From where can people access cyclone warnings?

Warnings about storms,

Their intensity and the likely path they may take are regularly broadcasted by radio and television network continuously until the storm passes over.

Storm- Safety

- Watch out for broken and other sharp items in debris,
- Watch out for snakes and insects. Try to call for help.
- Listen to the advice of local officials and emergency workers.
- Be sure that the storm has subsided before venturing out.
- It is advisable to wait for the "all clear message" on radio and TV networks.
- Wait for emergency relief teams to arrive. It may take a little time before relief becomes effective. Stay away from flooded areas
- Volunteer to help people who may need assistance like.
  Bringing evacuated people back home and in recording damages suffered
  Rendering first aid to the wounded Donating blood
- Locating places where dead bodies can be kept until they are disposed of
- Organizing clearing-up so that normalcy returns as soon as possible.

THUNDERSTROM & LIGHTNING STRIKES-SAFETY

Thunderstorm is invariably accompanied by lighting a single stroke of lighting has 125,000,000 volts of electricity. That’s enough power to light a 100-watt light bulb for more than 3 months, or enough to

seriously hurt or to kill someone. Knowing what steps to take in the event of an oncoming thunderstorm & lightning can save lives.
Lighting is something you should not be careless about, so seek a safe shelter immediately. When you see lighting, follow these safety rules.

INDOORS

- Stay or go indoors if you hear thunder, don't go outside unless absolutely necessary stand clear from windows, doors and electrical appliances.
- **Stay away from anything that conduct electricity.** This includes fireplaces, radiators, stoves, metal pipes, sinks and phones. In plug appliance well before a storms nears-never during.
- **Don't use any plug-in electricity appliances** like TV, music systems, mixer/blender, iron press, hair dryers, or electric razors. If lighting strikes your House they can conduct the charge to you.
- **Don't use the telephone during the storm**. Lighting may strike telephone lines outside. Use the telephone only for emergencies quickly. Avoid contact with piping including sinks, baths and faucets.

OUTDOORS

- When outdoors, seek shelter from lighting Building are best for shelter, but if no buildings are available, you can find protection in cave, ditch, or a canyon. Tress is not good cover! Tall trees attract lighting. Never use a tree as a shelter.
- **Stay in your vehicle if you are traveling.** Vehicles given you excellent lighting protection. Get in a hard topped car.
- **Get out of the water.** This includes getting off small boats on the water. Immediately get out and away from pools, lakes, and other bodies of water.
- **Victims** of lighting shock should be administered CPM (cardio pulmonary resuscitation) i.e. artificial respiration, if necessary. Seek medical attention immediately.
  When you feel the electrical charge- if your hair stands on end or skin tingles- lighting may be about to strike near you. Immediately crouch down and cover your ears.
- Do not lie down or place your hands on the ground.
- If you can't find shelter, avoid the tallest object in the area. If only isolated trees are nearby, your best protection is to crouch in the open, keeping twice as far away from isolated trees as the trees are high. Avoid areas that are higher than the surroundings landscape. Spread out- don't stand in a crowd of people.
- Don't use metal objects outside. Keep away from metals objects including bikes, electric or telephone poles, fencing, machinery, etc.

SOME CHECK POINTS:

Following check point suggested by CIMAH RULE are most helpful assessing the adequacy of the emergency plan. At the time of training these can be checked.

a) Does the plan cover the range of incidents that can realistically be anticipated?
   The incident considers should range small events that can be deals with the works personnel without outside help. To major emergency plans. Including the following points:-
   - I) The events considered, any way they were included or excluded:
   - II) The typical routes to these events.
   - III) The timescale involved
   - IV) The size of lesser events if the development is interrupted
   - V) The likelihood of events, so fat as can be assessed.

b) Have the consequences of the various incidents considered been adequately assessed. For eg., each incident should be assessed in terms of the quantities of hazardous materials that could be released, the rate of release, the effects of explosions, the effects of thermal radiation from firs. The effects of toxic gases, etc.

c) Are there sufficient resources in terms of personnel and equipment on the site to carry out the emergency plan for the various incidents in conjunction with public emergency services? For eg. Is there sufficient water for cooling? And if this water is applied via hoses, are there sufficient people to operate them?

d) Have the timescales been assessed correctly?

The time element is of great significant but is often overlooked. For eg. time will elapse the start of the incident and arrival of the fire brigade who will then need further time to /deploy their men and equipment. In such circumstances the works resources should seek to contain the incident until the fire brigade takes over. Some toxic releases may take place quickly.

e) Is there a logical sequence of action for each person given a role in the plan?

f) Were key personnel, especially the nominated incident controller, consulted in the preparation of the plan?

g) Is there 24 hour cover to take account of absences due to sickness and holidays, minimum shift manning, operator only periods, silent hours, shut-down periods, only security personnel being present, or for unmanned sites etc.?

h) Is there satisfactory co-operation with the local emergency services and district or regional emergency planning officers?

i) At sites where an off-site plan to protect people and the environment outside the site in the event of an incident is appropriate what is the procedure for initiating the off-site plan and is this satisfactory?

RECODS AND UPDATING THE PLAN

All records of various on-site and off-site emergency plans of the factory in the jurisdiction, the district emergency control (contingent) plan and modification by experiences and suggestions, the rehearsals and conclusion of such plan and the inquiries shall be well maintained and preserved by the district emergency authority or the emergency planning officer and the factory inspectorate for purpose of review and further guidance. The necessary data bank shall also be maintained for the utility of industries and others.

New information and the deficiencies (omission or short-comings) identified during the rehearsal should be reviewed and incorporated in the document for continual up-dating of the plan and such information should be communicated to the concerned authorities.

EMERENCY INSTRUCTION BOOKLET

At many places in this plan, it is mentioned that the duties/functions of particular roles shall be mentioned in the last annexure given as emergency instruction booklet. For workers the instruction given in their own language.

7.6.1.2 Occupational Health Centre

M/s. The Gurdaspur Cooperative Sugar Mills Ltd. will develop Occupational health center and prepared the Occupational Health Surveillance Programme which will be followed right from the project construction & erection phase and the same shall be incorporated for the new facility. 24X7 full-fledged First-Aid and qualified doctor will be provided. As per policy and norms, all of the workmen will

be put to medical examination and testing periodically and at set intervals and based on the medical report actions will be taken.

Occupational Health & Safety Management Plan

OHS Program will be implemented and a safety committee will be formed comprising personnel from management, supervisors and contractors.

OHS program will be designed to address the specific needs of the individual workplace. OHS program will have the following seven elements:

- An OHS policy statement, aim of the program and the responsibilities for health and safety
- Regular inspection of premises, machinery, tools, equipment and work practices
- Appropriate written instructions for workers
- Periodic management meetings to discuss health and safety
- Investigation of accidents and other incidents in order to take action to prevent similar incidents
- Records and statistics.
- Instruction and supervision of workers.

Monitoring Parameters and Frequency

The monitoring parameters and frequency of monitoring for the proposed project will be carried out as follows:

Table 7.30: Occupational monitoring parameters

S. No.	Item	Parameters
1.	Occupational Health	Pre-Employment checkup: Vision, Audiometry, Chest, Lungs, Urine, Complete blood count, etc.
		Periodical checkup: Vision, Audiometry, Spirometry, Urine, RBS, Complete blood count, , etc.
		Post-employment check-up: Vision, Audiometry, Spirometry, Chest, Lungs, Urine, Complete blood count, etc

Health Checkup

- Periodic Medical Checkup, at least twice a year, will be followed as Per Factories Act to ensure the health of working staff and maintain the healthy work environment. It will be implemented.

First Aid & Antidotes

- The First Aid kit will be as per Factories Act.
- Antidotes will be provided by qualified doctors as per identified Chemicals

Emergency Vehicle

Ambulance van with all first aid facilities including oxygen cylinder will be available 24x7.

Name of the key persons in case of emergency

S. No.	Name of the person	Phone Numbers
1.	DC Office Gurdaspur	01874-247500
2.	ADC Office Gurdaspur	01874-245407
3.	Fire Brigade Gurdaspur	01874-244659
4.	Civil Hospital Gurdaspur	01874-222530
5.	Police Station Dina nagar	01875-220048
6.	Ambulance control room	100

7.	Fire Brigade Pathankot	0186-2220101
8.	Fire Brigade Batala	91157-96801
9.	Fire Brigade Dera Baba Nanak	77102-27101
10.	Punjab Pollution Control Board Batala	01871-226033

Mock Drills

To evaluate the effectiveness of emergency preparedness and to spread the awareness among employees mock drill will be carried out at the interval of every six months.

After completion of the mock drill, summary report shall be made and corrections will be done if any weakness has been observed.

Frequency of Mock Drills

On-site emergency: Once every 6 months

Off-site emergency: Once every year

7.7 SUMMARY

The Gurdaspur Cooperative Sugar Mills Ltd. handles some hazardous chemicals. Details about their storage, quantity to be stored, possible hazards and control measures are given in detail. Quantitative risk assessment (QRA) has been carried out for Ethyl Alcohol. Fire, explosion, toxic release or combinations of them are the hazards associated with industrial plants using hazardous chemicals. Hazard identification and qualitative / quantitative risk assessment have been developed to improve upon the integrity, reliability and safety of industrial plants, the same has been discussed in detail. Further, the Gurdaspur Cooperative Sugar Mills Ltd. has prepared the Disaster Management Plan (onsite/offsite emergency plan) to effectively utilize all the resources at its disposal for the protection of life, environment and property.

CHAPTER 8

PROJECT BENEFITS

8.0 GENERAL

This chapter gives information on direct and indirect benefits to the environment, nation and proponent. The proposed project is economically and technically workable because it will fulfill the peak demand time of the market. In addition to that, the proposed Sugar, Cogeneration and Distillery/Ethanol plant will be totally environment friendly and eco-friendly with **zero pollution** to the environment. The proposed unit will generate new employment opportunity, which will have beneficial impact and will improve the local economies to the area in terms of physical, ecological, biological, and other tangible benefits.

8.1 PHYSICAL BENEFITS

Major benefits of the project are as follows:

Infrastructure:

- The unit will construct tar roads for easy access to the work site. It will also help in transportation of raw materials and products to and from the industry. This will improve the transportation facilities and road connectivity in the area.
- Villages in study area will be benefited from CER activities to be undertaken by the unit. CER activities along with budgetary is given in chapter 10.
- Industry shall adopt RWH systems and recharge the rainwater to bore wells and that will improve the ground water table.

Enhancement of Green Cover:

- Establishment of green belt in industrial area and its surrounding will help in improving aesthetic beauty of the surrounding environment giving a pleasant look and improving air quality. In addition, green belt will help in arresting dust emissions as well as noise.

Local Employment:

- There will be increase in some small-scale businesses like tea stall, catering services, heavy motor garage, cycle / motorcycle shop etc. around the project area.

8.2 SOCIAL BENEFITS

Employment Potential: The employment of local people as a part of CER in primary and secondary sectors of project shall upgrade the prosperity of the region. This in-turn will improve the socio-economic conditions of the area. This project will provide temporary employment to many unskilled and semi - skilled laborers in nearby villages. This project will also help in generation of indirect employment to those people who render their services for the personnel directly working in the project and during operational phase, considerable number of people will be benefited by provision of various services, such as transportation, technical services, skilled and semi - skilled services and indirectly it will flourish various business activities. Thus, the direct and indirect employment generation by this project will be highly significant. 100-125 nos. of people will get direct employment during construction phase. Technical staff for plant operation, general staff for administrative work and other ancillary services i.e. security, O&M contractor and maintenance services will have

required during operation phase. Around 332 nos. technical people will get direct and other contractor worker will get indirect employment during operation phase.

Power Generation:
The plant will export 21750 kW during season to the PSPCL's grid after meeting the complete internal requirements for the GCSML's sugar, Distillery and cogeneration plant (including the losses) at a reasonable rate.

8.3 FINANCIAL BENEFITS

- Proposed project will gain income and upsurge the turnover of The Gurdaspur Cooperative Sugar Mills Ltd.
- 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
- The proposed facility will bring business to many local vendors in terms of providing accommodation to contract workers, transportation, provision of construction equipment and getting sub-contracts during infrastructure development and operational phases.

8.4 OTHER TANGIBLE BENEFITS

- Need for the proposed products are based on the demand and supply gap in the current market. With increasing utilization of the current products, in future, to cater the requirement of all the products, it is essential to have the proposed manufacturing unit.
- The company will cater needs of the domestic market also.
- The demand for sulfur free sugar is increasing and most of the growing demand for sulfur free low ICUMSA sugar comes from food industries and pharmaceutical industries.
- The Indian Government is encouraging blending of Absolute alcohol with petrol. The present demand of Absolute alcohol in the country is 3250 million litres considering 10% blending. Due to continuous increase in petrol consumption, there is increase in demand of Absolute alcohol. The price of Absolute alcohol will have tendency to go up as petrol prices are increasing.

8.5 SUMMARY

This venture of the proponents will bring improvement in the physical infrastructure of the surrounding area. It will recharge the groundwater by rain harvesting, the road structure will be repaired, massive greening drive will improve the aesthetics, organic fertilizer and nursery will be available to the people, and generally, the land prices will go up.

The project activity and the management will support the local villagers and provide other forms of assistance for the development of public amenities in this region. The management will recruit skilled and unskilled workers from the nearby villages. Total approx. 332 Nos. of manpower will be employed. Proposed project would help in increasing living standard of the nearly populations/ habitants through CER program. This is envisaged as a major positive benefit to this area.

CHAPTER 9

ENVIRONMENTAL COST BENEFIT ANALYSIS

9.0 GENERAL

Environmental Cost Benefit Analysis (CBA) is an analytical way to make an educated decision regarding the commencement of an industrial activity or similar trade/commercial/infrastructure activity. This involves a comparison of the costs of an action with considerations of the benefits associated with that action. CBA assists the regulators to evaluate the benefits and challenges imposed by the upcoming activity in commercial terms with respective to the impact on the environmental scenario such as human well-being, quality of life and environmental wellbeing.

An important component of a CBA is a base situation, which is a situation when no changes take place. All decisions are then compared to the base situation. Once the base and a relevant time are established, benefits and costs can be calculated in terms of human and environmental well-being. In this case, a benefit is defined as anything that increases human well-being, and a cost is anything that decreases it. CBA aims to maximize economic efficiency at a point where marginal benefits and marginal costs are equal.

9.1 APPLICABILITY OF CBA AND SUMMARY

As per the EIA Notification 2006 & its subsequent amendments, this chapter on the 'Environmental Cost Benefit Analysis' is applicable only if it is recommended at the Scoping stage.

During the scoping/ToR stage, no recommendation of environmental cost benefit analysis was suggested by the appraisal committee.

CHAPTER 10

ENVIRONMENTAL MANAGEMENT PLAN

10.0 INTRODUCTION

The environment management plan is prepared with a view to facilitate effective environmental management of the project, in general and implementation of the mitigation measures in particular. The EMP provides a delivery mechanism to address potential adverse impacts and to introduce standards of good practice to be adopted for all project works. For each stage of the program, the EMP lists all the requirements to ensure effective mitigation of every potential biophysical and socio-economic impact identified in the EIA. For each impact or operation, which could otherwise give rise to impact, the following information is presented:

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

Environmental management practices for mitigation of various impacts associated with the project activity on different environmental components are described below:

10.1 AIR ENVIRONMENT

10.1.1 Construction Phase

During construction phase, particulate matter will be the main pollutant, which will be generated during the site demolition and development activities and vehicular movement on the road. Further, concentration of NOx and CO may also slightly increase due to increased vehicular traffic movement. However, the increase in ambient concentrations of air quality will be negligible. As most of the construction equipment will be mobile, the emissions are likely to be fugitive. The dust generated will also be fugitive in nature, which can be controlled by suitable mitigation measures like sprinkling of water, applying gravel surface to cover soil etc.

The impacts will be localized in nature and the areas outside the proposed project site premises are not likely to have any major adverse impact with respect to ambient air quality.

Following mitigation measures are proposed to reduce the impacts:

- Dust suppression by regularly water spraying on vulnerable areas of the construction sites shall be practiced.
- Preparation of paved internal movement roads will be taken up at the initial stage of civil construction work
- Wetting or covering stockpiles on construction materials, the proper location of material stockpiles and covering loaded trucks during the transportation of material shall be ensured.

- Separate civil construction material storage yard will be created within the site and it will be enclosed.
- Use of low-emission vehicles and wherever feasible, construction equipment powered by electricity shall be preferred.
- Maintenance of engines and use of PUC Certificates vehicles will be ensured. Contractors will be required to strictly implement these measures.
- Engines of idle vehicle machineries/equipment not in use shall be turned off.
- All construction workers will be provided with appropriate Personal Protective Equipment (PPEs) like dust mask, ear plug, helmet, safety belt etc. and made to wear them during working hours.
- Regular inspection for proper implementation of mitigation measures will be done.
- Use of firewood for cooking and open air burning of any kind of wastes will be prohibited.

10.1.2 Operational Phase

The major sources and management for air pollution are:

Flue gas emission

- The unit proposes to install one no. of 145 TPH capacity of steam boiler for Sugar Plant & Co-generation Plant. Bagasse will be used as fuel. 65 meters chimney & Electrostatic Precipitator will be installed with the boiler.
- The unit proposes to install one no. of 45 TPH capacity of steam boiler for Distillery/Ethanol Plant. Concentrated spent wash and Bagasse will be used as fuel. 83 meters chimney & Electrostatic Precipitator will installed with the boiler.
- The unit also proposes to install three numbers of D.G. sets (2 nos. of 1000-kVA capacity each+ 1 no. of 625-kVA capacity) as stand by. Height of chimney will be 6.5 meters above enclosure.

Fugitive Emission

For control of fugitive emission below mentioned practices will be implemented:

- The raw materials will be stored in closed containers and will be handled through closed system to avoid the handling losses.
- System of leak detection and repair of pump/pipeline based on preventive maintenance.
- Material handling pumps shall have mechanical seals to prevent leakages. Also, breather valve will be provide to prevent losses.
- Storage tank will be vented through trap receiver & condenser operated on cooling water.
- Proper earthing will be provided wherever solvent handling is done.
- Entire plant will be flameproof.
- The sprinkling of water will be done along the internal roads in the plant in order to control the dust arising due to the movement of vehicular traffic.
- Thick greenbelt will be developed in and around the plant to arrest the fugitive emissions.

Fly ash handling

The ash handling system envisaged for the cogeneration plant is of two types:

- Submerged belt conveyor system for grate ash
- Conventional Screw conveyor/belt conveyor system for fly ash

The total ash quantity generated in the boiler, by the burning of bagasse is approximately 1030 kg/hr. Ash removed from the grate is approximately 400 kg/hr. and the Fly Ash quantity is approximately 630 kg/hr.

The ash received in the grate discharge hoppers will be around 500°C, with ash lumps of size 200 mm Maximum. The ash from sash riddling hopper will be dry and powdery in nature and occasionally with hot solids. The temperature of the ash will be around 200°C maximum.

The fly ash from Electrostatic Precipitator Hoppers will be dry and powdery in nature and occasionally with hot solids. The temperature of ash will be around 200°C maximum.

The fly ash from the Air Heater Hopper will be dry and powdery in nature and occasionally with hot solids. The temperature of the ash will be around 300°C maximum.

The ash generated will be initially stored in silo and suitably supplied to the brick manufactures through trucks or the ash generated from the bagasse has high potash value, same will be used to mix with press mud and use for bio-compost production and then sell it to farmers as fertilizer. Fly ash Handling system is attached as Annexure-VI.

10.2 WATER ENVIRONMENT

10.2.1 Construction Phase

During the construction phase, Sewage will be expected to generate due to domestic activities of workers and staff personnel during construction phase. On-site sanitation facilities will be provided to construction workers.
Following management plan are proposed to reduce such impacts:

- The proponent shall ensure to implement good operation practices to optimize the use of water, so as to reduce the depletion of water resource to maximum possible extent.
- Proper drinking water facility and sanitation facility within the unit will be made available to the construction workers.
- Proper management to avoid spillage of effluent which may cause seepage and contaminate ground water.
- Storm water drainage system will be provided.

10.2.2 Operational Phase

Total industrial Waste Water Generation will be 2391 KLD, out of which 1320 KLD process water, 218 KLD RO Reject and 44 KLD Floor/equipment washing will be treated in ETP/MEE. 565 KLD from boiler/cooling tower blowdown will be treated in RO. MEE Condensate, 347 KLD RO Permeate, and 59 KLD Boiler Condensate will be recycled. Treated effluent from ETP/MEE will be used for irrigation in farm lands of the unit. Thus, there will be a zero liquid discharge.

Sewage quantity of 45 KLD will be generated and it shall be treated in STP of 50 KLD capacity. Treated water will be used in gardening within plant premises. Details of wastewater generation from sugar/cogeneration and Distillery unit are given below:

Table 10.1: Wastewater Generation

S No	Particulars	Waste Water Generation (KLD)
A.	**Domestic**	45
B.	**Industrial**	
1.	Process	1,320
2.	Boiler	59
3.	Cooling Tower	794
4.	WTP waste (MGF Backwash, DM regeneration & RO Reject)	218
5.	**Total**	**2,391**
6.	**Total (A+B)**	**2,436**
7.	MEE Condensate	1,320
8.	RO Permeate	347
9.	Boiler Condensate	59

Sugar and Cogeneration Effluent System

The source of effluent from a sugar plant has been mainly from the mill house, boiling house pumps, centrifugal pumps and laboratory.

In general water from mill house will be contaminated with oil/grease. The origin of leaking places of water and oil mixing places could be completely arrested and avoided by adopting the collection pit and dry cleaning methods. Water used for cooling bearings in the mill forms part of wastewater stream from the mill house. The effluent from the mill house also consists of floor cleanings, which will be contaminated spilled / splashed sugar juice. Basically, this water contains organic matter like sucrose, bagacillo and oil and grease with a BOD of 2000 ppm and COD of 5000 ppm.

The second stream of wastewater is generated from the boiling house and occurs as a result of faulty transportation of juice by pumps and from the parts of the boiling house units like juice heaters, clarifiers, filtration units for press mud. In this total operation the water to be treated contains the mixture of spilled juice, water used for cooling pumps and separation of mud from juice. The BOD of this portion of effluent is about 400 ppm and the COD will be about 1000 ppm.

The water from cooling tower contains entrained juice spilling out as a result of vacuum created in the pans used for low temperature boiling of the juice. This volume of water is increased by condensing vapour from the pans. The BOD of this water will be about 100 ppm and the COD will be about 150 ppm.

The water used to remove scales in the juice heaters, evaporators, pans, etc. contains sodium hydroxide in small percentage. It is possible to use this water to neutralize acidity at any point in the process of effluent treatment.

Liquid Effluent from Power Plant

Effluent from water treatment plant

Hydrochloric acid and sodium hydroxide will be used as regenerates in the Demineralized water plant for the boilers. The acid and alkali effluents generated during the regeneration process of the ion-

exchangers will be drained into an epoxy lined underground neutralizing pit. Generally, these effluents are self-neutralizing. However, provisions will been made such that the effluents will be neutralized by addition of either acid or alkali to achieve the required pH of about 7.0. The effluent will then be pumped into the effluent treatment ponds which form part of the sugar plant's effluent disposal system. The neutralizing pit will be sized to collect the effluents generated from the plant. The effluent from the neutralizing pit will be pumped by 2 x 100% capacity pumps to the sugar plant's effluent treatment system.

Chlorine in cooling water

From the auxiliary cooling water system, residual chlorine of about 0.2 ppm is maintained at the outlet. This chlorine dosing is done mainly to prevent biological growth in the cooling tower system. This value would not result in any chemical pollution of water and also meets the national standards for the liquid effluent. This water will also be pumped to sugar plant effluent pond.

Steam generator blow down

The salient characteristics of blow down water from the point of view of pollution are, the pH and temperature of water since suspended solids are negligible. The pH would be in the range of 9.8 to 10.3 and the temperature of blow down water will be 1000 C The quantity of blow down is very small and hence, it is proposed to put the blow down into the trench and leave it in sugar plant effluent ponds.

Sewage from various buildings in the plant

Sewage from various buildings in the power plant area will be conveyed through separate drains to the septic tank. The effluent from the septic tank will be disposed in soil by providing disposing trenches. There will be no ground pollution because of leaching due to this. Sludge will be removed occasionally and disposed off as land fill at suitable places.

❖ Waste Water Treatment System

The sugar factory effluents need not be considered to be alarmingly polluting in character as they are easily treatable and bio-degradable excepting the oils and greases from mills which are normally removed even before reaching the treatment systems. The quantity and quality of generation of effluent is itself controllable by adopting methods like dry cleaning with bagasse. Therefore, the generation of effluent in a sugar factory is more intensely practice driven than process driven.
The scheme of effluent treatment plant shall be:

Bar Screen chamber → O & G trap → Equalization tank → Buffer tank → Up flow Anaerobic Sludge Blanket Reactor (UASBR) → Extended aeration tank → Secondary clarifier Multigrade Filter → Activated Carbon Filter → To irrigation

Table 10.2 Characteristics of the Raw & Treated Effluent

S.No	Parameters	Characteristics of the raw effluent	Units	S.No	Parameters	Characteristics	Units	Parameters
1.	Flow	1000	m^3/day	**1.**	Flow	1000	m^3/day	Flow
2.	COD	3000	ppm	**2.**	COD	250	ppm	COD
3.	BOD	2000	ppm	**3.**	BOD	30	ppm	BOD
4.	TSS	500	ppm	**4.**	pH	>7.0	-	pH
5.	O & G	100	ppm					
6.	TDS	3000	ppm					

Figure 10.1: ETP Flow Diagram for sugar and cogeneration Plant

Process description

Wastewater treatment for the plant will be based on discharges of the various wastewaters to ponds for clarification and filtration. Oily water will be treated separately to remove oil / grease before discharge into effluent ponds. The oily water collection in the plant is basically due to floor cleaning, leaky oil filters, etc.

Clarification is used to settle out large suspended particles and condition smaller colloidal particles to make them settle. A pond, reservoir tank or tank is used to allow larger particles to settle in a matter of hours. The finer particles overflow and are made to settle more quickly by the addition of chemical agents, coagulants and polymers that cause agglomeration to sizes large enough to settle out of suspension.

Filtration will be made to a porous barrier across flowing liquid to remove suspended materials. Filtration can be used to supplement clarification and permits reducing suspended solids to the parts per billion level.

As required and with approvals from appropriate regulating bodies, final waste stream pH is controlled by combining various plant streams to provide a neutral pH product. Where needed, acid or alkali addition will be used to achieve the final pH.

The sugar factory effluents need not be considered to be alarmingly polluting in character as they are easily treatable and bio-degradable excepting the oils and greases from mills which are normally removed even before reaching the treatment systems. The quantity and quality of generation of effluent is itself controllable by adopting methods like dry cleaning with bagasse. Therefore, the generation of effluent in a sugar factory is more intensely practice driven than process driven.

The milling effluent stream will be combined with the process house effluent stream. Both the streams will have separate provisions for removal of grit, oil and grease as well as notches for flow in a well-controlled factory the BOD levels will not exceed 2000 ppm and the quantity should not exceed 2100 cum/day. There are a number of factories operating with less than 500cum/day of effluent successfully.

Hence, designing a system of treatment for 2100 cum/day of effluent with a BOD of maximum 2000 ppm will be more than adequate measurement. The combined stream of both will have another trap for grit / oil / grease removal. A final measurement weir will be provided after the mixing of spray pond surplus effluent just before the equalization pond. The equalization pond will be of suitable size with a recirculation pump.
Anaerobic ponds of suitable size will be provided. Milk of lime and urea or Ammonium Sulphate will be added at the entry of equalization system for neutralization and nutrients. Cowdung slurry also will be added for microbial seeding to initiate anaerobic reaction.

The over flow from the anaerobic system will flow into the aerobic lagoon of suitable size with suitable numbers of fixed aerators. Sludge recirculation pumps will be provided in the aerated and unaerated lagoons. The effluent after aeration will be taken to a clarifier of suitable size with stirrer, over flow wier etc., to separate the aerated sludge and the clear treated effluent. The clear treated effluent which will be of less than 30 BOD will be discharged for irrigation within the factory for greenery development as well as for sugarcane research farm.

The sludge from the clarifier will be dried in open sludge drying bed of suitable size. The dried sludge will be good manure. Similarly, the excess sludge from the anaerobic system will also be pumped out periodically and dried which also has a good manureal value. By effective control on the quantity of generation of effluent and good treatment as above, it is possible to have a zero pollution factory without the need for letting out the treated effluent into public discharge systems.

Distillery Effluent Treatment System

GCSML's 120 KLPD Ethanol plant is designed on the "Zero Effluent Discharge" concept. The design philosophy being that the effluents will be used within the distillery or treated and let out as a non-polluting discharge. The new concept of spent wash concentration and incineration is adopted in the design which ensures that the discharge from the distillery is devoid of the dark, acidic high BOD and COD effluent. Even the streams with lesser pollutants are properly treated and let out.

Two streams of liquid discharges from the distillery, with the spent wash evaporation system are the evaporator condensate and the spent lees from the distillation section. These two streams are proposed to be treated in a system with the combination of UASB, extended aeration system, membrane bio reactor (MBR) and Reverse osmosis (RO) system and is designed for removal of organic acids, COD and BOD. The condensate treated by such system can be reused in the alcohol manufacturing process as process water or cooling water makeup thereby reducing the requirement of fresh water as well as solving the problem of waste disposal to a great extent.

The proposed treatment methodology is based on following principle operating systems:

1. Up flow Anaerobic Sludge Blanket Reactor
2. Extended Aeration
3. Membrane bio reactor (MBR)
4. Reverse Osmosis (RO)

Up flow Anaerobic Sludge Blanket (UASB) reactor is provided for the primary anaerobic treatment of Condensate & Spent lees effluent. The UASB reactor shall be constructed in MS with suitable epoxy coating inside the tank. The reactor consists of three zones viz. Influent distribution zone, Reaction zone, Gas solid liquid separation zone. The liquid to be treated enters into the bottom through influent distribution zone and uniformly distributed in the tank. In the reaction zone the anaerobic bacteria are maintained in the form of sludge blanket. When the upward rising wastewater penetrates through the sludge blanket, the organic matter in the waste water comes in contact with the bacterial population and is degraded anaerobically to methane rich biogas, the end product of anaerobic digestion. The biogas so produced is bubbled through the effluent and is separated out in the third section i.e. Gas-Solid-Liquid separation zone. The suspended solids, rich in bio-mass, are also separated to prevent escape of solids from the reactor. In gas solid liquid separation a hood fabricated in Mild Steel and duly painted with corrosion resistant paint is provided. The hood separates the solid from the overflowing reactor content. Gas collectors are provided for collection and conveyance of gas. The treated effluent overflows through a launder and will be taken to a secondary treatment system.

The secondary treatment consists of extended aeration, membrane bio reactor (MBR) and Reverse osmosis (RO) system. The permeate of the RO system, will be collected in a tank and used as the process water or make up water for the process cooling towers. The sludge generated from UASB, extended aeration and MBR system will be collected in the sludge pit and taken to decantation system for separation of solids and the separated solids will be disposed off suitably. The filtrate from the decantation system will be recycled to equalisation tank/clarifier.

Figure 10.2: ETP Flow Diagram for Distillery Plant

Action plan to control ground water pollution

The proposed distillery will be based on "Zero Effluent Discharge". The following measures will be adopted to prevent groundwater pollution-

- Concentrated spent wash from distillery operation will be burnt in the incineration boiler of Gurdaspur Sugar mills (Distillery Division) for generation of steam.
- Storage areas shall be made of pucca platform (preferably concrete / clay compacted) and provided with garland drains and sedimentation pit to avoid seepage and contamination of ground water.
- Maximum recycling and reuse of wastewater after treatment.
- The spent wash holding tank will be made up of RCC & steel.
- Two piezometers will be installed to keep a proper check on ground water quality and levels.
- Spillage of chemicals/ oils/ alcohol etc. will be avoided as best possible.
- Treatment of secondary streams like spent lees, condensates, blow downs, etc. shall be in closed loop & any discharge outside the distillery shall not be done.
- Process effluent/any waste water shall not be allowed to mix with storm water.
- The storm water will be discharged through separate conveyance system.

10.3 SOLID/HAZARDOUS WASTE MANAGEMENT

10.3.1 Construction Phase

Main solid waste generation during construction phase will be construction debris like rubble, brick bats, steel scrap, wooden scrap, sand, gravel etc and diesel /oil. This construction materials shall be stored in designated storage yards to reduce the spills into unwarranted areas. Proper segregation, collection, storage and disposal of waste material generated during construction phase will implemented to minimize its impact on soil quality.

Following mitigation measures are proposed to reduce impacts due to solid/hazardous waste:

- Usage of appropriate monitoring and control facilities for construction equipment's deployed
- All hazardous wastes such as cement bags, concrete waste, shall be securely stored, under a shed for eventual transportation and disposal to the authorized vendors
- The solid waste generation due to workers dwelling on the site will be segregated and wet waste will be treated by composting & dry waste will be transported and disposed off as per construction waste disposal guidelines.
- All the chemicals used during construction phase will be stored safely and shall have proper bund wall for the maximum volume of chemicals stored

10.3.2 Operational Phase

All the solid/hazardous/ Non-Hazardous wastes to be generated at the end of manufacturing process or waste treatment process will be stored on impervious floor having roof, boundary wall and leachate collection as well as transfer facility. Management of wastes shall be done as per Hazardous and Other Wastes [Management and Tran's boundary Movement] Amendment Rules, 2016.

Detail Solid hazardous management is given in **Table 10.3.**

Table 10.3: Hazardous waste generation

S. No.	Type of Waste	Category	Quantity	Disposal
1.	Used Oil	Sch: I /5.1	9 kL/A	Generation, collection, storage, and used as lubricant in plant

				machineries

Table 10.4: Non-hazardous waste generation

S. No.	Type of Waste	Quantity	Disposal
1.	Bagasse Ash	20 TPD	Will be sold to brick manufacturer/ Mixed with pressmud and used as manure
2.	Incineration & Boiler Ash	42 TPD	Will be sold to brick manufacturer/ Mixed with pressmud and used as manure
3.	ETP sludge	1.5 TPD	Will be used for greenbelt development within premises
4.	Yeast sludge	6.0 TPD	Will be used for greenbelt development within premises

Solid and hazardous waste management Plan:

- Maximum re-cycling and utilization of generated solid waste shall be done as per the guidelines.
- Unit will prepare Hazardous waste disposal plan, as per applicable statutory conditions under the Hazardous Wastes Management Rules, 2016 and same will be implemented.
- EMC will keep a record of quantity of solid and hazardous waste generated and their proper disposal.
- A separate storage area shall be provided with proper sign boards/labels for storage of hazardous waste.
- The concerned person will prepare a site manual on the total program and activities of solid/hazardous waste management.
- Regular training of employees engaged in solid waste management works.
- The concerned person will prepare a site manual on the total program and activities of solid/hazardous waste management.
- Regular training of employees will be conducted who will be engaged in solid waste management works.

10.4 NOISE ENVIRONMENT

10.4.1 Construction Phase

The noise levels created by construction equipment will vary greatly depending on factors such as the type of equipment, the operation being performed, and the conditions of the equipment. The dominant source of noise will be generated during construction phase due to vehicular movement like movement of earth movers, tractors and operation of construction equipment like welding, concrete or asphalt mixing, power tools etc.

Following measures shall be taken for abatement of noise during construction phase:

- Management will ensure effective set-up of traffic management system in order to minimize the usage of horns and other such equipment, which may add to noise generation. Further, the management will restrict the movement of heavy vehicles during night.
- No idling of machine shall be allowed during construction activities Night time construction activities and vehicular movement shall not be allowed
- All machineries to be used for construction purpose will be of highest standard and company will emphasize compliance of noise pollution control norms by this equipment.

- Further, it will also be ensure to carry out periodic and regular maintenance of the equipment, machines and spare parts, which shall include lubrication, replacement of defective parts etc. in order to bring down the decibel of noise to maximum possible extent.
- Feasibility of putting up acoustic enclosure / temporary barrier around areas with high noise levels will also be explored.
- Management will ensure that no hazard is caused due to noise generation during the course of work. For this purpose, the management shall ensure that the workers are provided with individual protective equipment like ear muffs or ear plugs in areas with high exposure to noise.

10.4.2 Operational Phase

Noise will be generated due to various industrial activities, operation of utilities, plant machineries, vehicular movement *etc*. As discussed in previous chapters, there will be some impacts on noise environment due to the proposed project. Noise level within the plant premises will be measured regularly.

Following measures shall be adopted for abatement of noise during the operation phase:

- Acoustic laggings, enclosures and silencers will be provided wherever necessary for high noise generating equipment.
- Manufacturers and suppliers of machine/equipment like cane handling equipment's i.e. Belt Conveyor, Compressors, Turbine and generators (STG) will be manufactured as per OSHA/ MoEFCC guidelines.
- Noise generating equipment like pump, motors, compressors, blower, engines etc. will be mounted on sturdy concrete foundations with proper and suitable rubber padding to reduce vibrations and thereby noise generation.
- Safety blow off valves, discharge pipes, relief valves, etc. will be equipped with silencers.
- Greenbelt will be developed and maintained around high noise generating area as well as plant premises to help in attenuation of noise.
- Regular lubrication and preventive maintenance will be done to reduce vibration and noise generation.
- Supply ducts and grills on the ventilation and air conditioning system will be suitably sized for minimum noise level
- All vehicles shall maintain speed limit inside the premises and unusual acceleration of engine and loud horns will be prohibited.
- The workers working in the high noise areas like compressor houses, crushers, crystallizer, , blowers, generators, feed pumps, steam generation plant and turbo generator area will be provided with PPEs like ear plugs, ear muffs etc.
- Periodic monitoring of noise levels as per post-project monitoring plan will be done on regular basis.
- Layouts of equipment foundations and structures will be designed keeping in view the requirement of noise abatement;
- Occupational Health & Safety System for evaluation of exposure of noise pollution on the associated staff and comparing it with permissible exposure and subsequently taking corrective actions will be developed.
- Hearing Conservation Program will be implemented.

10.5 OCCUPATIONAL HEALTH AND SAFETY

10.5.1 Construction Phase

Occupational health and safety of the construction workers will be ensured with the following measures.

- Pre-medical health check-up will be carried out for all the workers and job will be assigned accordingly.
- The management shall ensure that all workers employed are trained for the given job.
- The management shall ensure that all workers/employees are provided with basic Personal Protective Equipment (PPEs) like ear plug/muff, safety helmet, face mask, safety gloves, safety goggles, safety shoes etc.
- The management will also ensure that the quality of these PPEs is properly checked before providing to the workers. It shall also be ensured that all the safety equipment are placed properly and are available instantaneously when required.
- Management will also ensure to have safety and first aid facility for the workers/ employees engaged in the working of the plant in order to provide them with necessary treatments in case of accidental mishaps or their health breakdown.

10.5.2 Operational Phase

The company is very much concerned in terms of health, safety and environment protection. The unit will recruit qualified safety manager and will engaged doctors for regular health checking of the employees. Medical aid will be arranged with the help of local hospital. Plant will ensure well-stocked first aid. Annual health check for employees will be carried out and record will be maintained. Regular training to plant personnel in safety firefighting and first aid will be provided.

Following key safety measures will be implemented in the proposed plant:

I. Safety training will be provided to the employees.
II. Safety Sirens with Alarm System in case of emergency will be provided.
III. Work permit system will be introduced to avoid un-authorized person‘s entry
IV. The workers exposed to noisy sources will be provided with ear muffs/plugs.
V. Assembly points will be defined for safe gathering of the employees during the times of emergency.
VI. Fire Hydrant System will be installed.
VII. Fire Extinguishers will be provided.
VIII. The fire and safety equipment will be properly utilized and maintained regularly.
IX. Mock drills will be periodically conducted and factors like response time will be evaluated.
X. Fire squad team will be formed for handling any emergency situation and regular training of squad team is conducted.
XI. First Aid Facility and training will be provided.
XII. Use of Personal Protective Equipment (PPEs) will be exercised. Proper training on use of PPEs, characteristics of the material handled and safety precautions to be adopted will be given to the workers.
XIII. Health check-ups will be organized at regular intervals.
XIV. Safety / Health records and MSDS will be maintained.

XV. Pre & post medical check-ups will be done for all the workers. Workers will be regularly examined and the medical records will be maintained for each workers

Budget of Rs. 190 Lakhs is allocated for occupational health and safety.

Housekeeping

Proper housekeeping is an essential part of sound environmental management. It will be rigorously seen that there is no accumulation of wastes, especially combustible wastes inside the plant area.

In summer dry grasses and vegetation growing inside the plant area will be cut and removed. All firefighting equipment and warning devices will be kept in perfect working conditions at all the times. It will be seen that all personnel are aware of the implications of environmental pollution and simple practices to avoid pollution.

For Preventive Maintenance

Do's:

- Inspection of Storage Area, Earthing and Bonding system.
- Inspection of all Fire Fighting Facilities /Check Alarms operation.
- Ensuring that operators/workers etc. follows the SOPs, Safety procedures and standards, work permit system etc.
- Make sure fire extinguishers are fully charged and ready for action.
- Inspections of plant, machinery, tools, equipment, premises, work practices, processes, procedures and general environment must be carried out for the health and safety of plant, people and surrounding.
- On-site and Off-site Emergency Plans shall be reviewed and updated as per the requirement.

Don’ts:

- Don't allow anyone who hasn't received specific safety and operational training to get indulge in any site activity.
- Don't perform your own maintenance.
- Don’t compromise on Design and Engineering part.
- Don't perform any activity without proper permit.
- Don't panic if you are in a risky situation.
- Don't allow spilled chemicals to drain to sewers/gutters etc.

10.6 CORPORATE ENVIRONMENT RESPONSIBILITY

Corporate Environment Responsibility (CER) is linked to sustainability and mainly based on the social and environmental consequences. A budget of **Rs. 665.24 Lakhs** i.e. 1 % cost of the proposed project as per OM of MoEFCC vides F. No. 22-65/2017-IA.III dated 01/05/2018 is allocated for Corporate Environment Responsibility (CER) under proposed project and will be implemented in next 5 years nearby village i.e. Nano Nagal, Saidipur, Talwandi, Bhola, Ghulla, Mokha, Bhangwan.

Table 10.5: CER Activities with year wise budget (Rs. in Lakhs)

S. No.	Particulars	Description	Year					Total
			1	2	3	4	5	
1.	Infrastructure	Development /Repairing of Roads, Provide Drinking water	40	40	50	60	60	**250**

		facilities, Contribution in construction of facility in Anganwadi and primary school, etc. at Saidipur, Talwandi and Ghulla Village.						
2.	Health	Up gradation of Existing Hospital and/or Aarogya Kendra, Organize free health medical checks-up, eye camp, blood donation camp. Provide first aid box and training at Nano Nagal, Bhola and Mokha Village.	30	30	40	40	40	**180**
3.	Environment	Tree plantation with tree guard, Development of garden at Gram panchayat in Talwandi, Ghulla, and Saidipur village	10	10	10	15	15	**60**
4.	Education	Donation in school like computers, books for library, Projector for digital learning, School kits like bags, note books, crayons etc. Organize painting completion at Nano Nagal, Talwandi and Bhangwan Village.	20	20	20	20	20	**100**
5.	Sports	Development of playground at village school and provide sports equipments, Organize vocational training in Bhola and Saidipur Village	10	10	15	20	20.24	**75.24**
		Total (Rs. in Lakhs)	**110**	**110**	**135**	**155**	**155.24**	**665.24**

10.7 GREEN BELT DEVELOPMENT

The main objective of the greenbelt is to provide a barrier between the plant and the surrounding areas. The greenbelt helps to capture the fugitive emissions and to attenuate the noise generated in the plant apart from improving the aesthetics of the plant site. In order to control the industrial pollutants, dense tree plantations are necessary.

As the sedimentation pattern of the pollutants, ambient and ground level concentration of pollutants are usually determined by the direction and speed of prevailing wind and vertical and horizontal thermal gradients prevailing in the area, the belt of plantations will be designed accordingly. The width of the tree belt depends on the gaseous emissions, availability of land and site characteristics etc.

Geometry of planting of tree is more important in order to have effective wind break by the plantation. For an effective green belt, a mixture of tree species is necessary and some shrubs and grasses will be inter-cropped. As far as possible, there will be no gaps in the green belt. Where opening is imperative, alignments to roads will be such that open gaps are prevented to overcome funneling action of wind.

The unit will developed 1,37,391 m^2 greenbelt area in plant premises and periphery of the project site for meet the minimum criteria of 33% Greenbelt area of the total plot area. The trees will be planted in several rows with a tree density of 1500 trees/ha with adequate width around the plant boundary and maintained as per CPCB guidelines. The inter-spaces will be planted with grasses, bushes and

hedges. Greenbelt is thus a set of rows of trees planted in such a way that they form an effective barrier between the plant and the surroundings.

A greenbelt will be developed around the periphery and within the plant premises. The greenbelt landscape plan will provide benefits to improve beautification. It will also result in the prevention of landed gradation due to construction activities; enhancing the canopy cover as a wind breaker wall and restrict the carry away of the Particulate Matter (PM) outside the premises as well as for noise abatement. After the project implementation, regular assessment will be done to make sure that greenbelt is growing adequately with all necessary works like thick plantation, rearing, irrigation, fertilization, re-plantation (if required), pest control and other factors. Regular records of the greenbelt development as suggested in environmental monitoring plan will be maintained.

Multi-layered plantation comprising of medium height trees (6-8m height) and shrubs (3-5m height) will be proposed for the green belt. The plan comprises of a three year program from 1st year to 3th year for greenbelt maintenance.

(i) Plan for 1st year (Trees/Saplings Plantation)
The work plan for the first year, during the construction phase
- Digging of pits and soil conditioning
- Planting of saplings
- Surveillance maintenance and irrigation of the saplings to achieve maximum survival

(ii) Plan for 2nd year (Additional Trees/Saplings Plantation + Replacing Dead Trees)
The work plan for the second and third year
- Maintenance and irrigation of species planted earlier.
- Survey of the area to identify the locations for replantation and causality replacement
- Removal of dead trees and replantation based on specific location requirements
- Maintenance and irrigation of plants to achieve a targeted survival rate of 75%.

(iii) Plan for 3rd year (Replacing Dead Trees + Maintaining the Greenbelt)
The work plan for the third year
- Maintenance and irrigation of species planted earlier.
- Survey of the area to identify the locations for replantation and causality replacement
- Removal of dead trees and replantation based on specific location requirements
- Maintenance and irrigation of plants to achieve the targeted rate at 100%.

(iv) The work plan for subsequent years comprises (Maintenance)
- Maintenance of plantation.
- Clearing of afforested areas to remove undesirable species
- Replacement of dead and diseased/malformed species with new ones

Considering 90% of Survival rate, Approx. 37,783 Nos. of trees and 75,566 Nos. of Shrubs will be planted within one year.

Selection of Species for Greenbelt:
The following points will be considered for selection of plants species:

- Greenbelt absorbs both gaseous as well as particulate pollutants to a great extent. For absorbance of gases, the duration of the foliage should be longer.
- Characteristics of tree/plants including shapes of crowns considered necessary for effective removal of dust particles.
- Greenbelt/Plant species having good root system will be selected, so that soil erosion rates can be controlled significantly.

Plant species in the Greenbelt Area

The relevant species for the greenbelt development are given in below Table.

Table 10.6: Plant species for Green Belt Development

Plant Species	Common Name	Habit	Tolerance Limit	Stomatal Index	Mode of Regeneration
Acacia auriculiformis	*northern black wattle*	Tree	T	10.9	Seeds
Azadirachta indica	*Neem tree*	Tree	T	29.2	Seeds
Bougainvillea spectabilis	*Paper Flower*	Shrub	T	32.53	Cutting
Delonix regia	*Gulmohar*	Tree	S	14.38	Seeds / stem cutting
Nerium indicum	*Indian Oleander*	Shrub	T	15.7	Cutting
Polyathia longifolia	*Ashoka*	Tree	S	22.27	Seeds
Syzygium cumini	*Jambu*	Tree	T	20.60	Seed, cutting, grafting, budding
Terminalia catapppa	*Badam*	Tree	T	20.9	Seeds
Thespesia populneoides	*Indian tulip tree*	Tree	T	29.81	Seeds/ cutting

Source: Guidelines for Greenbelt Development, CPCB, March, 2000.

All the above mentioned species are ideally suited for the ecological habitat of the site. Their planting should be interspersed with each other to create mixed canopy of the plants and the ideal distance for planting all trees is 2 m X 2 m.

The trees and shrubs selected from the above mention list based on its availability shall be, planted as greenbelt of 10 m width around the plant boundary. The plantation will be in this recommended pattern:

Following activities shall be carried out for maintaining the greenbelt area:

- Annual planning for tree plantation with specific number of trees to be planted shall be made. The fulfilment of the plan will be monitored by the EMC every six months
- A plan for post plantation care will be reviewed in the monthly meetings. Any abnormal death rate of planted trees shall be investigated and acted upon immediately
- Watering of the plants, weeding, hoeing will be carried out for minimum 3 years

For the Calculation of Cost for Green belt Development, following parameters have been considered.

For Capital Cost

a) Cost of Sapling (Trees)
b) Shrub/Herbs
c) Transportation Charges
d) Planting cost (Including soil workings, pits etc.)
e) Fencing Cost

For Recurring Cost:

a) Cost of drip irrigation
b) Annual weeding and soil working
c) Req. of water for irrigation
d) Fertilization Cost
e) Security and Vigilance

A budget of Rs. 85.00 Lakhs as a capital cost and Rs. 20.00 Lakhs per Annum as a recurring cost has been allocated for green belt development.

Table 10.7: Three Year Greenbelt Development Programme

Year	No. of Trees / Plants to be planted	No. of Shrubs to be planted
1st Year	30,000	70,000
2nd Year	7000	5000
3rd Year	783	566

10.8 ODOR CONTROL PLAN

Activity

- Typical compounds generating odor in sugar industry are acids, ethyl alcohol, / butyl alcohol, 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 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), Sludge from fermentation and ETP
- Causes of odor are bad management of fermentation house, long retention of fermented wash, unattended drains, CPU unit, & ETP.

Impacts

- Nausea, insomnia, and discomfort.
- Nasal irritation; trigger symptoms in individuals with breathing problems or asthma.

Mitigation measures

- 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 use of bleaching powder in the drains to avoid growth of sulphur decomposing micro-organisms to control H_2S generation.
- Better housekeeping by regular steaming of all fermentation equipment's
- Regular steaming of all fermentation equipment.
- Use of efficient bio-cides to control bacterial contamination.
- Control of temperature during fermentation to avoid in-activation / killing of yeast.
- Avoiding staling of fermented wash.
- Spent wash treatment shall be through integrated evaporated followed by incineration boiler
- Spent wash from evaporation would be in a closed tank and directly send to the incineration in boiler.
- Spent wash storage lagoon has capacity of 5 days; however spent wash is usually consumed within 2-3 days.
- Well planned Greenbelt will be developed in and around the plant premises to suppress the odor

Table 10.8: Odour mitigation efforts

Sr. No.	Probable source of odour	Attenuation by
1.	Milling plant, detention of effluent	Quick draining, aerobic condition
2.	Stale press mud	Consume quickly to compost yard
3.	Fermentation	Covered, CO_2 captured and scrubbed and recovered. Avoids odour escape
4.	Distillation column	Now multi pressure- vacuum improved hardware.
5.	Spent wash incineration system	A closed system, continuous feeding of concentrated spent wash & no question of odour
6.	Concentrated Spent wash storage	Only 15 days storage, that too in the emergency for repairs/ maintenance of machinery
7.	Press mud - Composting yard	Fully aerobic by special turning machine, viable dedicated culture and fine spraying of water getting immediately absorbed.

10.9 CLEANER PRODUCTION TECHNIQUES

The following guidelines will be used to implement a cleaner production approach:

1. Identify the hazardous substance to be phased out, on the basis of the precautionary principle;
2. Undertake a chemical / material flow analysis;
3. Establish a time schedule for the phase-out of the hazardous substance in the production process, as well as its accompanying waste management technology;
4. Implement and further develop cleaner production processes and products;
5. Provide training and technical and financial support;
6. Actively disseminate information to the public and ensure their participation in decision-making;
7. Facilitate substance phase-out with regulatory and economic incentives;
8. Facilitate the transition to cleaner production with social planning, involving workers and communities affected.

9. The cost of complying with environmental legislation can be significantly reduced by companies that adopt cleaner production techniques. The latter are often more cost-effective than control technologies. The costs of dealing with wastes are reduced, and there is potential for new markets to be discovered through innovations or the sale of by-products.
10. Cleaner production will reduce environmental risks and liabilities and lead to greater competitiveness. By demonstrating a commitment to cleaner production, companies can also improve their public image and gain the confidence of consumers.

10.9.1 Concept of Waste Minimization, 3R's (Reuse, Recycle & Recover Techniques), Energy and Natural Resource Conservation Measures

10.9.1.1 Minimization – 3R's Waste

(A) Reuse:

- Molasses, cane juice, sugar syrup of sugar unit will be used as a raw material for proposed 120 KLPD distillery operations.
- ETP sludge will be dewatered using filter press and will be used as manure.
- Spent Lees and PR lees will be reused in the process.

(B) Recycle:

- Process condensate from MEE, cooling tower and boiler blow down will be treated & recycled within the process.
- Domestic waste water will be treated in STP and recycled in greenbelt development

(C) Recovery:

- Concentrated spent wash recovered from the process will be used as fuel in the boiler of Distillery Division.
- CO_2 generated during the fermentation process will be recovered by CO_2 Scrubbers and sold to authorized vendors.
- Water conservation & recirculation system shall be installed for recovery of cooling water.

10.9.1.2 Rain Water Harvesting (RWH)

Gurdaspur Sugar has decided to installed Rain Water Harvesting system to help reduce fresh water consumption. Storm water network will be designed throughout the site for collection of rooftop as well as internal runoff during the monsoon season. Pipeline and storm water drainage will be connected/ diverted to water harvesting tank without any contamination or after removing impurities i.e. leaves, floating materials, birds drop out etc.

During rainy season, the rainwater will be collected from roofs top in collection tank having 150 kL capacity and the collected water will be used for industrial activities. Average 100 rainy days, average rainfall 1167.8 mm and following basic details have been worked for designing the Rain Water Harvesting System:

S. No.	Area		Particulars
1.	Total Area available for Water Harvesting	:	**Roof Top Areas:** 25274+374.25+361+15173= 41182.25 m^2
2.	Average annual Rainfall	:	1167.8 mm
3.	Total Rain Water that can be harvested per year	:	(41182.25) * (1.1678) * (0.8)= 38,474.11

Total : 38,474.11~ 38,475 m^3

The effectiveness of the drainage system depends on proper cleaning of drainage pipes/channels etc. Regular checking before & during the monsoon will be done to see that none of the drains/drainage facilities are clogged and are efficient to collect the rainwater under rain water harvesting program. The clogged drains will be cleaned up immediately on report of any clogging or blockage.

10.9.1.2 Energy Conservation

Energy conservation measures would be implemented to ensure that use of non-renewable resources is minimized. A key component for achieving energy conservation would be the development of an energy management action Plan. This plan would be included as part of the construction and operational EMPs. The energy management action plan would be consistent with the energy conservation measures during both construction and operation phase.

Energy Conservation during Construction Phase

The following mitigation measures would be undertaken during construction works:

- Efficient work scheduling and methods that minimise equipment idle time and double handling of material;
- Throttling down and switching off construction equipment when not in use;
- Switching off truck engines while they are waiting to access the site and while they are waiting to be loaded and unloaded;
- Switching off site office equipment and lights and using optimum lighting intensity for security and safety purposes;
- Regular maintenance of equipment to ensure optimum operations and fuel efficiency.

Energy Conservation during Operation Phase

The following mitigation measures would be implemented during site operations:

- Design of buildings and terminal layout would aim to achieve the following energy efficiencies;
- Employing renewable energy sources such as day lighting and solar energy for administration and street lighting; and
- Designing roads on the site to reduce transportation distances.

Energy Efficient Equipment

Large energy savings could be achieved in using energy efficient equipment. The following actions are examples of how energy savings could be achieved by the terminal operator(s):

- Using energy efficient electrical appliances;
- Installing lighting control devices where appropriate and linking to photoelectric operations; and
- Providing sufficient energy metering and switching for energy management.

Energy would also be conserved through efficiency in work schedules and practices such as:

- Use of modern storage systems for the efficient stacking and retrieval of finished products;
- Switching off truck engines while they are waiting to access the site and while these are waiting to be loaded and unloaded;
- Throttling down and switching off idle equipment;
- Regular maintenance of all powered equipment to ensure appropriate energy consumption;
- Communication and education of energy conservation measures to employees.

Reduction in Carbon Footprint

- CO_2 generated during the fermentation process will be collected by utilizing CO_2 Scrubbers and sold to vendor, thus GHG emissions will be reduced.
- Solar lights will be installed along the plant boundary and road.
- Adequate development of greenbelt in and around plant premises to enhance carbon sequestration.
- Concentrated spent wash and biomass will be used as fuel in slop fired incineration boiler (145 TPH) of Distillery Division.
- Optimal use of energy in form of electricity and other appliance

10.10 BUDGET FOR EMS

The proposed cost of the project will be Rs. 665.24 Crore. Environment protection will be monitored and implemented by an environment management cell. Unit has allocated about Rs. 1790.24 lakhs towards environmental protection measures. The greenbelt, safety measures and other components of the EMP shall be implemented along with the commissioning of the proposed project. The budgetary provision made for environmental management is briefly illustrated in **Table 10.9**.

Table 10.9: Capital cost of Environmental Management system

S. No.	Name of the unit	Capital Cost Rs. Lakhs	Operating cost Rs. Lakhs/Month	Maintenance Cost Rs. Lakhs/Month	Total Recurring Cost Rs. Lakhs/Month
1.0	**Water Environment**				
1.1	Primary, secondary & tertiary ETP	250.00	0.75	0.25	1.00
1.2	STP	75.00	0.50	0.50	1.00
1.4	MEE for concentrated effluent	80.00	10.00	0.75	10.75
1.5	RO plant	75.00	5.00	0.50	5.50
1.6	Laboratory & Monitoring	120.00	0.50	0.50	1.00
	Total Water environment	**600.00**	**16.75**	**2.50**	**19.25**
2.0	**Air Environment**				
2.1	ESP for boiler	150.00	0.75	0.50	1.25
2.2	Scrubber for CO_2	50.00	0.5	0.05	0.55
2.2	Air monitoring	-	1.25	0	1.25
	Total Air environment	**200.0**	**2.50**	**0.55**	**3.05**
3.0	**Hazardous waste**				
3.1	Storage facility	50.0	0	2.0	2.0
	Total	**50.0**	**0**	**2.0**	**2.0**
4.0	**Occupational health and safety**				
4.1	OHC (AC room + stretcher)	25	0	0.25	0.25
4.2	Medical kits, oxygen cylinder & antidotes	15	0.10	0	0.10
4.3	Medical check up	0	1.50	0	1.50
4.4	Safety training, safety equipments like PPE's & Fire equipment like fire extinguishers, fire proximity suits	25	0.50	0	0.50

4.5	Fire hydrant system	75	0	1.50	1.50
4.6	PLC control for process	50	0	0.50	0.50
	Total	**190**	**2.1**	**2.25**	**4.35**
5.0	**Green belt Development**				
5.1	Gardener	0	3.00	0	3.00
5.2	Plants, fencing, rain water harvesting	85.00	0	17.00	17.00
	Total	**85.00**	**3.00**	**17.00**	**20.00**
6.0	**CER Activity**	**665.24**	**-**	**-**	**-**
	Grand Total	**1790.24**	**24.35**	**24.30**	**48.65**

The annual recurring cost of environmental control for the proposed project has been estimated to be Rs. 583.80 Lakhs/Annum of the total EMS cost.

10.11 ENVIRONMENTAL POLICY

10.11.1 Corporate Environmental Policy (CEP)

Gurdaspur Sugar will laid down Corporate Environmental Policy that includes the standard operating procedures (SOP) for reporting on the performance of environmental management system for improvement. Further, the administrative order of company to deal with the environmental issues and the reporting mechanism of non-compliance / violation of environmental norms. Environmental Policy is attached as **Annexure IV.**

Corporate Environmental policy comprises of the following:

1. Creating awareness among its personal on the impact of their actions on the environment and encouraging sound environmental management practices in their day to day activity.
2. Adoption of State of Art Technology for Prevention and Control of Environmental impacts.
3. Commit ourselves to prevent pollution & protect the environment by preventing or minimizing the environmental impacts of its activities & products through appropriate design, manufacturing, distribution, use & disposal practices.
4. According the highest importance to continual improvement and prevention of pollution by instituting the practices and procedures which would reduce wastage and reduce energy to conserve natural resources. Review facilities and programs on regular basis and establish monitorable targets, quantified as appropriate for continuous improvement of our environmental performance.
5. Conversion of waste into wealth and optimum utilization of natural resources helps in reducing carbon footprints.
6. Identification and Evaluation of Non-Conformance and/or Non-Compliances to determine specific corrective and preventive actions. Management review of corrective actions to ensure the status and effectiveness of the actions. Ensure that the policy is made available to interested parties & is reviewed on periodic basis.

10.11.2 Environmental Management Cell (EMC)

The unit will formulate the Environmental Management Cell for the proposed plant. The company will develop a well-defined hierarchical system or administrative order to deal with the environmental issues and for ensuring compliance with the EC conditions. EMC is involved personnel of plant level as well as corporate level for interaction with technical and statutory bodies to deal with environmental requirements/issues at all level. The system of reporting of non-compliances/violations of environmental norms to the Board of Directors of the company and/or

shareholders or stakeholders involves the following hierarchy: Manager (EHS) is head of the Environmental Management Cell with subordinates involving Sugar/Distillery/Cogen team, Environmental Engineer, Environmental Chemist, Safety Officer, etc.

Figure 10.3: EHS/SH&E Organization Chart

10.11.3 Role and Responsibility of EMC

The major duties and responsibilities of EMC are:

- To implement the EMP.
- To assure regulatory compliance with all relevant rules and regulations stipulated by SPCB / CPCB / MoEFCC.
- To treat the sewage and effluent to be generated from the proposed project in a full-fledged ETP & STP for adequate treatment.
- To ensure regular operation and maintenance of air pollution control devices.
- To minimize environmental impacts of operations as by strict adherence to the EMP.
- To initiate environmental monitoring as per approved schedule;
- Review and interpretation of monitoring as per approved schedule;
- Review and interpretation of monitoring results and corrective measures in case monitored results are above the specified limit.
- To plan and schedule environmental conservation and protection activities for the purpose of achieving environmental standards and to improve methods of environmental management practices.
- To improve working environment for employees by implementing mitigation/control measures for Occupational Health and Safety and by improving condition of workplace environment.
- To make budgetary provision and allocate funds for environment management system and to ensure timely revision of budgetary provisions.

- To implement and ensure effective implementation of planned mitigations including R&D program for innovative technologies for better environment, resource conservation / recovery / recycling / reuse especially to promote waste utilization.
- To encourage and inspire employees and contractor for highest performance and attentive response for environmental conservation, protection and improvement.
- Maintain documentation of good environmental practices and applicable environmental laws as ready reference.
- Maintain environment related records.
- Coordination with regulatory agencies, external consultant, monitoring laboratories.
- Maintain log of public complain and the action taken.

Figure 10.4: Environmental Management Plan

10.12 SUMMARY

The main purpose of EMP is to minimize the identified potential environmental impacts to be generated from the proposed project and to mitigate the consequences. Construction activities will be carried out during daytime only. Regular water sprinkling will be done to reduce PM concentration in the atmosphere. PPEs will be provided to workers and first aid facilities shall be kept at designated locations during construction phase. During operation phase, the industry shall maintain comprehensive environment management plan in place for the proposed unit, which shall covers all the environment protection measures to mitigate improvised environmental impact. Solid/Hazardous Waste Management will be done as per HW [Management, Handling and Trans boundary Movement] – 2016. Noise level within the plant premises will be measured regularly and will maintain range within permissible limit. Occupational Health and Safety (OHS) is been introduced in the chapter for construction phase as well as operation phase. Rs. 665.24 Lakhs has been allocated for CER activities for next three years. Approx. 37,783 Nos. of trees and 75,566 Nos. of shrubs will be planted within next three years. Rs. 1790.24 lakhs is been allotted as capital cost for EMS and Rs. 583.80 Lakhs/annum is allotted as a recurring cost for EMS. The unit will developed an Environmental and safety Management Cell (EMC) for proposed project as an integrated managerial body from various disciplines to co-ordinate the project activities concerned with implementation of environment control measures and management.

CHAPTER 11

SUMMARY AND CONCLUSION

11.0 INTRODUCTION

The Gurdaspur co-operative sugar mills Ltd. is a unit of Punjab state federation of co-operative sugar mills. The existing capacity of sugar plant is 2,000 TCD to produce white sugar by double sulphitation process. Due to olden technology and age, efficiency of plant and machineries are far behind the current technology leading to potential losses.

Now, the unit wishes to dismantle the existing 2000 TCD and propose to develop new 5000 TCD Sugar Plant along with 33.65 MW Cogeneration Power Plant and 120 KLPD Distillery/Ethanol Plant at V.P.O Paniar, Dist. Gurdaspur, Punjab.

As per the latest EIA Notification of Ministry of Environment and Forests, Govt. of India (MoEFCC) dated 14th September 2006 and its amendments, the proposed project is covered under the 5(g), 5g(a), 1(d) & 5(j) as Category-'A' for which prior Environmental Clearance (EC) is necessary. Based on the TOR conditions stipulated by EAC vide letter No.IA-J-11011/502/2021-IA-II(I) dated 8th December 2021, EIA report has been prepared. Public hearing is applicable, which will be conducted as per guidelines.

11.1 PROJECT DESCRIPTION

The Gurdaspur Cooperative Sugar Mills Ltd. is planning to set-up a new 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant at Paniar Village, Dist. Gurdaspur, Punjab-143531.Total cost of the proposed project will be Rs. 665.24 Crores. Proposed project will be developed in 3,92,545 m2 area.

As per the amended EIA Notification-2006: proposed project is covered under the 5(g), 5g(a), 1(d) & 5(j) Category-'A'. Hence, Environmental clearance is required.

Total power requirement for the proposed project will be 11.9 MW. Power supply will be from own 33.65 MW Co-generation Power Plant & Punjab State Power Corporation Limited. Surplus power will exported to PSPCL's Grid.

The total fresh water requirement will be 2887 KLD which will be met by own water reservoir.

Total industrial Waste Water Generation will be 2391 KLD. The plant will operate with zero effluent discharge scheme. Sewage quantity of 45 KLD will be generated and it shall be treated in STP of 50 KLD capacity. Treated water will be used in gardening.

100 - 125 nos. of people will get direct employment during construction phase and around 332 nos. technical people will get direct and other contractor worker will get indirect employment during operation phase.

Management of generated wastes will be done as per HW (Management, Handling and Tran's boundary Movement) rules, 2016.

11.2 DESCRIPTION OF THE ENVIRONMENT

The generation of primary data as well as collection of secondary data and information from the site and surroundings was carried out during 1st December 2021 to 28th February 2022. The EIA study is being done for the core zone and area within 10 km distance (buffer zone), both of which together comprise the study area.

Ambient Air Quality Monitoring

Sr. No.	Criteria Pollutants	Unit	Maximum Value	Minimum Value	Prescribed Standard
1.	PM_{10}	µg/m^3	75.1	63.3	100
2.	$PM_{2.5}$	µg/m^3	45.1	37.7	60
3.	SO_2	µg/m^3	7.7	4.9	80
4.	NO_2	µg/m^3	13.6	10.0	80
5.	CO	mg/m^3	<1.0	<1.0	2.0

All the results of ambient air quality parameters have been found within the limit as per NAAQS standards. Based on comparison study of results for tested parameters with NAAQS, it is interpreted that current ambient air quality of studied locations is well within the NAAQS limits and it can be considered satisfactory based on AQI index calculated. This interpretation is considered based on the results found for particular locations during the specific study period. The project will be developed on the private land and the nearest habitat to the project lies about 1 km project from the project. Due to the usage of the solid fuel in the boiler, there might be the chances of the incremental change in the current ambient air quality.

Noise Monitoring

Sr. No.	Parameter	Unit	Maximum Value	Minimum Value
1.	Ld (Day)	dB(A)	61.4	48.6
2.	Ln(Night)	dB(A)	56.4	43.2

Out of total 8 nos. of locations for noise monitoring 3 nos. of locations are monitored in the existing industry and 5 nos. of locations are monitored in surrounding villages within 3-4 km radius from the project site. Noise level in all the locations are within the standard norms prescribed by MoEF&CC. Noise level measured at villages is mainly due to vehicular movements of local people located within and nearby the villages. The nearby village surrounding to the project site is about 1 km away from the project site and results of the same are found within the prescribed norms during the baseline survey. Due to the project activities, there might be chances of incremental value in the noise levels due to increase in vehicular movement & plant activities. The interpretation can be considered based on the baseline survey conducted during the study period.

Soil Quality and Characteristics

Sr. No.	Parameter	Unit	Maximum Value	Minimum Value
1.	pH	-	8.37	6.92
2.	Electrical Conductivity	dS/m	0.20	0.12
3.	Exchangeable	meq/100gm	8.20	3.65

	Sodium			
4.	Exchangeable Potassium	meq/100gm	38.87	17.13
5.	Total Nitrogen percentage	%	89.60	68.97

Based on soil analysis data it is concluded that soil at the project site is neutral in reaction. The soils are high in nitrogen status, medium in phosphorus and medium in available potassium status. Soil of Barren Land and Grass Land is also having medium concentration of Nitrogen and high availability of Potassium, these soils can also be brought in agricultural purpose after the addition of Phosphorous. The levels of total Fe, Cu, Cr, B and Zn are within the limits as per Dutch Pollutant Standard for Soil. Soil at the project site should be periodically monitored for EC, pH and ESP besides OC, available P and K. In the proposed project, there will be utilization of the treated wastewater generated from the process in the agricultural farming of Sugar Cane within the plant premises only. Due to usage of treated wastewater as irrigation water and excessive usage of manure will result to increase the organic carbon content, nitrogen & phosphorous and there is also chance of acidification in soil.

Ground water

Parameters	**Unit**	**Minimum**	**Maximum**
pH	--	6.35	7.56
TSS	mg/l	14	25
TDS	mg/l	275	502
Total Hardness	mg/l	198	378
Total Alkalinity	mg/l	182	361
Chlorides	mg/l	6	48
Sulphate	mg/l	17.9	99
Iron	mg/l	0.75	1.91

Based on comparison study of test results and summary report with drinking water norms as per IS: 10500 :2012, it is interpreted that all the results for ground water samples are beyond the desirable limit range but they are within the permissible limit except iron in Bhola, Ghulla, Nano Nagal & Paniar. Ground water samples collected from the villages Bhola, Ghulla, Nano Nagal & Paniar should not be used for drinking purpose and other ground water sources can be utilized in drinking purpose. It is suggested that, it is better that these water sources should be used for drinking purpose after proper treatment i.e. filtration, R.O. treatment. This water can be used for all domestic purposes as well as irrigation purposes.

Surface Water

Parameters	**Unit**	**Minimum**	**Maximum**
pH	--	6.84	7.21
TDS	mg/l	110	248
TSS	mg/l	8	12
Total Hardness	mg/l	88	160
Dissolved Oxygen	mg/l	5.4	5.8

COD	mg/l	10	21
BOD	mg/l	3	6
Total Nitrogen	mg/l	0.5	0.6
Iron	mg/l	0.09	0.81

Based on test result data comparison study with CPCB standard, it is interpreted that surface water quality of Upper Bari Doab Canal meet with the criteria B to E and Dala Lake meet with the criteria D & E. According to the classification, water sourced from Upper Bari Doab Canal can be used for outdoor bathing, drinking water source with conventional treatment followed by disinfection, Propagation of wild life, fisheries & Irrigation, industrial, cooling, controlled waste disposal, while the water sourced from Dala Lake can be used for Propagation of wild life, fisheries & Irrigation, industrial, cooling, controlled waste disposal. Bathing, washing and other activities were observed in most of lakes/ponds located in study area. Results of COD and BOD also indicate towards the organic contamination in surface water body due to Bathing, washing and other activities. DO level for all the locations are >4.0 mg/L. DO level >4.0 mg/L is considered suitable for the survival of aquatic life and <4.0 mg/L is not considered suitable for aquatic life survival. The wastewater from the proposed project is planned to utilize for irrigation purpose in own sugar cane farms within the plant premises and hence, there will be least possibility for surface water contamination due to the proposed project.

Ecology and Biodiversity

The proposed project comes under the private land and the study area is majorly covered with agricultural land and range land. The soils of the district are alluvial and fertile. It is divided into three zones, i.e. sub mountainous, kandi and plain. The major crops cultivated are Rice, Maize, Sesamum, Sugarcane, Wheat & Rapeseed and Mustard. Fruit crops are Mangos, Litchi, Kinnow, Guava, Orange & Malta, Amla, Pear, Plum, Peach, Lemon, Ber, etc. and vegetables are Potato, Onion, Winter Vegetables and Summer Vegetables. Among the enumerated flora in the study area, none of them were assigned any threat category by Red data book of Indian Plants. None of the sighted floral species can be assigned endemic species category of the study area. Common faunal species has been noted during the primary survey. During the survey, it is observed that there is presence of a bird sanctuary within the study area and it is having vast range of bird species, which are listed in the IUCN Red data book. As per IUCN Red List there are 23 nos. of Avifauna likely to be found at the Bird Sanctury located within the study area, out of which 3 nos. of avifaunal species listed as vulnerable species as per IUCN Red list and remaining are listed as least concern species. Among the reptiles, Indian Cobra (Naja naja), and Common rat snake (Ptyas Mucosus) were provided protection as per Schedule-II of Wild life protection act, (1972). Among mammals; Common Mongoose (Herpestes edwardsi), is a schedule –II animals. Conservation plan for such protected species should be submitted to concerned forest depart of the region

Socio economic

All the respondents across all socio-economic groups, age, gender and locations have expressed their views about the location. According to them, all villages are having basic infrastructural facilities but some villages need to be improved in some areas like, sanitation, road, etc. For sanitation, village panchayats can use Swachh Bharat Mission scheme. It will improve quality of life by increasing their employment opportunities and also by bringing about a positive change, like; employment, developmental activities, indirect employment, etc., while some are not having any idea about the upcoming project and its impacts. Most of the villages are having educational institutes up to secondary and higher secondary schools. Students needs to commute to the main hub in nearby vicinity for further studies. The study area consisting majority of the area as an agricultural land and primary profession of the people in the study area is agricultural farming. Almost all the villages have more than 50 % people as non-workers. People's willingness and

ability to be employed in the production activities need to be given importance. The respondents have suggested measures which need to be taken up for welfare of the people. The Company needs to undertake various activities in education, infrastructure development, and health and environment area as a part of Corporate Social Responsibility (CSR) and Corporate Environment Responsibility (CER).

11.3 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The proposed project has no major adverse impact on surrounding environment. During the movement of trucks, fugitive emissions will be minimized by water sprinkling on roads and regular vehicular maintenance. Trucks used for transportation will be closed / covered with tarpaulin sheet to avoid dust dispersion at site. Only PUC vehicle will be used for the transportation. The emission from the proposed project will not be significant to cause any damage to the people as all necessary and efficient modern air pollution control technologies are already planned to prevent impacts on worker and people of the nearby area. The final gaseous emissions will be well within the permissible limits prescribed by PPCB/CPCB/MoEFCC. Unit will provide separate entry and exit for the smooth traffic movement. The electricity will be supplied by Punjab State Power Cooperation Limited; hence D.G. set will be used only in case of power failure. Water shall be sourced from reservoir. Rainwater harvesting plan shall be implemented; hence no major impact will be envisaged on surface or ground water resources. Effluent will be treated in proposed well designed treatment facility with Zero liquid discharge scheme. Proper sanitation facilities will be provided within the premises to prevent contamination of water due to runoff. Solid / hazardous waste generated from the process and ETP will be properly handled with adequate solid / hazardous waste management facilities. All the solid / hazardous waste generated will be packed in HDPE bags and stored in Hazardous waste storage facility having impervious layer. The collection, storage and disposal of solid / hazardous waste shall be carried out as per Hazardous and other wastes (Management and Trans boundary Movement) Rules, 2016. The adequate greenbelt will be developed in and around the plant shall greatly serve as an efficient barrier for prevention of air outside the plant premises.

11.4 ANALYSIS OF ALTERNATIVES

No alternative site study has been carried out as proposed project will be developed in area already in possession of Gurdaspur Sugar Mills. The project site is located where all necessary infrastructure facilities will be easily available. A part from this, no ecologically sensitive, no notified national park, wild life sanctuary, biosphere reserve, no reserved and protected forests are present within the study area. Also, some alternatives for technology were considered for the proposed project.

11.5 ENVIRONMENTAL MONITORING PLAN

The environmental monitoring plan enables environmental management system with early sign of need for additional action and modification of ongoing actions for environment management, improvement and conservation. The environmental monitoring locations will be decided considering the environmental impacts likely to occur due to the operation of proposed project as the main aim of the monitoring program is to track, timely and regularly, the change in environmental conditions and to take timely action for protection of surrounding environment. Environmental sampling and monitoring will be done as per the guidelines provided by MoEFCC/CPCB/PPCB. Laboratory will be set up with manpower and facilities for self-monitoring of pollutants generated in the industry. Along with other budgets, budget for environmental management will be prepared and revised regularly as per requirement. Cost of the Environment Monitoring will be approx. Rs. 16.00 Lakhs/Annum.

11.6 ADDITIONAL STUDIES

The Gurdaspur Cooperative Sugar Mills Ltd. handles some hazardous chemicals. Details about their storage, quantity to be stored, possible hazards and control measures are given in detail. Quantitative risk assessment (QRA) has been carried out for Ethyl Alcohol. Fire, explosion, toxic release or combinations of them are the hazards associated with industrial plants using hazardous chemicals. Hazard identification and qualitative / quantitative risk assessment have been developed to improve upon the integrity, reliability and safety of industrial plants, the same has been discussed in detail. Further, the Gurdaspur Cooperative Sugar Mills Ltd. has prepared the Disaster Management Plan (onsite/offsite emergency plan) to effectively utilize all the resources at its disposal for the protection of life, environment and property.

11.7 PROJECT BENEFIT

This venture of the proponents will bring improvement in the physical infrastructure of the surrounding area. It will recharge the groundwater by rain harvesting, the road structure will be repaired, massive greening drive will improve the aesthetics, organic fertilizer and nursery will be available to the people, and generally, the land prices will go up.

The project activity and the management will support the local villagers and provide other forms of assistance for the development of public amenities in this region. The management will recruit skilled and unskilled workers from the nearby villages. Total approx. 332 Nos. of manpower will be employed. Proposed project would help in increasing living standard of the nearly populations/ habitants through CER program. This is envisaged as a major positive benefit to this area.

11.8 ENVIRONMENTAL COST BENEFIT ANALYSIS

During the scoping/ToR stage, no recommendation of environmental cost benefit analysis was suggested by the appraisal committee.

11.9 ENVIRONMENTALMANAGEMENT PLAN

The main purpose of EMP is to minimize the identified potential environmental impacts to be generated from the proposed project and to mitigate the consequences. Construction activities will be carried out during daytime only. Regular water sprinkling will be done to reduce PM concentration in the atmosphere. PPEs will be provided to workers and first aid facilities shall be kept at designated locations during construction phase. During operation phase, the industry shall maintain comprehensive environment management plan in place for the proposed unit, which shall covers all the environment protection measures to mitigate improvised environmental impact. Solid/Hazardous Waste Management will be done as per HW [Management, Handling and Trans boundary Movement] – 2016. Noise level within the plant premises will be measured regularly and will maintain range within permissible limit. Occupational Health and Safety (OHS) is been introduced in the chapter for construction phase as well as operation phase. Rs. 665.24 Lakhs has been allocated for CER activities for next three years. Approx. 37,783 Nos. of trees and 75,566 Nos. of shrubs will be planted within next three years. Rs. 1790.24 lakhs is been allotted as capital cost for EMS and Rs. 583.80 Lakhs/annum is allotted as a recurring cost for EMS. The unit will developed an Environmental and safety Management Cell (EMC) for proposed project as an integrated managerial body from various disciplines to co-ordinate the project activities concerned with implementation of environment control measures and management.

11.10 CONCLUSION

The Gurdaspur Cooperative Sugar Mills Ltd. is proposing development of a new 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant. The waste generation in form of gas (flue gas), effluent and solid waste may have impacts on environmental parameters but the proponent has planned and installed most efficient technologies for prevention of emission and treatment of effluent. Further, the solid / hazardous waste will be utilized within the premises. Hence, there would not be any considerable impacts on environment. With the implementation of the mitigation measures and EMP, the proposed project activities will have positive beneficial effect on the local population, economic output and other related facilities viz. employment, development of business, transportation etc. Rapid risk assessment including emergency response plan and DMP has been prepared to handle any sort of emergencies.

Hence, looking to the overall project justification, process, pollution potential and pollution prevention measures / technologies installed by proponent, environmental management activities of proponent; it has been concluded that the proposed project would not have any considerable impacts on environment as well as socio-economic and ecological conditions of the project area. Hence, proposed project is considered environmentally safe.

CHAPTER 12

DISCLOSURE OF CONSULTANT ENGAGED

12.0 GENERAL

The Gurdaspur Cooperative Sugar Mills Ltd. have appointed Eco Chem Sales and Services (ECSS) for carrying out this Environmental Impact Assessment Study as per the EIA notification, 2006 as amended till date. ECSS has approved EIA coordinators and Field Area Experts for undertaking Environmental and related studies in twenty one (26) approved sectors by NABET, Quality Council of India, New Delhi.

12.1 BRIEF RESUME AND NATURE OF CONSULTANCY

ECO CHEM SALES and SERVICES (ECSS) is one of the leading companies in the field of Environmental Consultancy Service providers in India. We are NABET Accredited consultant for conducting Environmental Impact Assessment Studies (EIA) and obtaining Environmental Clearances. We also take up services which include and are not limited to Environment Monitoring and Testing, Environment Audit, Risk Assessment Studies, Turnkey solutions, Operation and Maintenance contracts and obtaining various statutory clearances from Ministry of Environment, Forest and Climate Change (MoEFCC) and State Pollution Control Boards. ECSS also has branch offices in Vapi, Dahej and Vadodara, Gujarat.

The accreditation certificate number NABET/EIA/2023/SA 0156 is valid up to 15th March, 2023

12.2 EIA TEAM MEMBER

Work presented in this report was carried out by Eco Chem Sales and Services with active co-operation from The Gurdaspur Cooperative Sugar Mills Ltd. The name of the team members associated in the preparation and studies of EIA/EMP is mentioned in Table 12.1.

Table 12.1: EIA Team Member

Name of Internal Team Member	Activity / Area	Involvement	Under Approved Expert
		Actual Work Performed	
Ms. Dipti Patel	Quality Check & Team Member	Understanding of project; Guidance in writing & modification in Contents; Impact Assessment; Review of EIA/EMP report.	EIA Coordinator
Mr. Jenish Barot	Assisting in EIA Report Writing	Coordination for data collection, data analysis, coordination with FAEs, team members; compiling the primary & secondary data for EIA report; EIA/EMP report preparation, assistance in report preparation to FAE.	EC, All FAEs
Mr. Parth Malavia	Meteorology, Air Quality Modeling & prediction (AQ)	Assisted FAE for Air Quality modeling, identification of impacts and mitigation measures, and contribution to EIA documentation	FAE AQ
Mr. Harshil Rajan	Solid and Hazardous waste (SHW)	Assisting in solid waste generation calculation, preparing solid waste disposal plan, assistance in FAE Report writing, assisting in identifying hazardous waste generation sources and preparing environmental management plan.	FAE SHW

12.3 LABORATORY INVOLVED FOR BASELINE MONITORING AND OTHER ANALYSIS

Baseline Monitoring and Analysis has been done by ECSS in-house NABL Approved Laboratory Ecosystem Resource Management Pvt. Ltd. (ERM). ERM having valid NABL Certificate number TC – 6603, issued on dated 15/11/2019 valid till 14/11/2022 and MoEFCC recognition S.O. 5768 (E).-S. No. 169 issued dated 15/11/2018 valid till 14/11/2023.

Annexure I TOR Letter

No.IA-J-11011/502/2021-IA-II(I)

Goverment of India

Minister of Enviroment,Forest and Climate Change

Impact Assessment Division

***

Indira Paryavaran Bhavan,
Vayu Wing,3rd Floor,Aliganj,
Jor Bagh Road,New Delhi-110003
08 Dec 2021

To,

M/s THE GURDASPUR CO-OPERATIVE SUGAR MILLS LTD.
Kothi No-1, Mill Colony, V.P.O- Paniar, Teh-Dinanagar, Dist. Gurdaspur,
Gurdaspur-143531
Punjab

Tel.No.-; Email:gsugarmills@yahoo.com

Sir/Madam,

This has reference to the proposal submitted in the Ministry of Environment, Forest and Climate Change to prescribe the Terms of Reference (TOR) for undertaking detailed EIA study for the purpose of obtaining Environmental Clearance in accordance with the provisions of the EIA Notification, 2006. For this purpose, the proponent had submitted online information in the prescribed format (Form-1) along with a Pre-feasibility Report. The details of the proposal are given below:

1. Proposal No.:	IA/PB/IND2/242940/2021
2. Name of the Proposal:	Proposed Project of 5000 TCD Sugar Plant along with 33.65 MW Co-generation Power Plant and 120 KLPD Distillery/Ethanol Plant by The Gurdaspur Cooperative Sugar Mills Ltd.
3. Category of the Proposal:	Industrial Projects - 2
4. Project/Activity applied for:	5(g) Distilleries 5(j) Sugar Industry 5g(a)-Grain Based distilleries for Ethanol Blended Petrol
5. Date of submission for TOR:	04 Dec 2021

In this regard, under the provisions of the EIA Notification 2006 as amended, the Standard TOR for the purpose of preparing environment impact assessment report and environment management plan for obtaining prior environment clearance is prescribed with public consultation as follows:

5(c): STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR PETRO-CHEMICAL COMPLEXES (INDUSTRIES BASED ON PROCESSING OF PETROLEUM FRACTIONS & NATURAL GAS AND/OR REFORMING TO AROMATICS)AND INFORMATION TO BE INCLUDED IN EIA/EMP REPORT

A. STANDARD TERMS OF REFERENCE

1) Executive Summary

2) Introduction

i. Details of the EIA Consultant including NABET accreditation

ii. Information about the project proponent

iii. Importance and benefits of the project

3) Project Description

i. Cost of project and time of completion.

ii. Products with capacities for the proposed project.

iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.

iv. List of raw materials required and their source along with mode of transportation.

v. Other chemicals and materials required with quantities and storage capacities

vi. Details of Emission, effluents, hazardous waste generation and their management.

vii. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)

viii. Process description along with major equipments and machineries, process flow sheet (quantative) from raw material to products to be provided

ix. Hazard identification and details of proposed safety systems.

x. Expansion/modernization proposals:

a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing Iexisting operation of the project from SPCB shall be attached with the EIA-EMP report.

b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification 2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.

4) Site Details

i. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.

ii. A toposheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)

iii. Details w.r.t. option analysis for selection of site

iv. Co-ordinates (lat-long) of all four corners of the site.

v. Google map-Earth downloaded of the project site.

vi. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.

vii. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.

viii. Landuse break-up of total land of the project site (identified and acquired), government/ private - agricultural, forest, wasteland, water bodies, settlements, etc shall be included. (not required for industrial area)

ix. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area

x. Geological features and Geo-hydrological status of the study area shall be included.

xi. Details of Drainage of the project upto 5km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects)

xii. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.

xiii. R&R details in respect of land in line with state Government policy

5) Forest and wildlife related issues (if applicable):

i. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)

ii. Landuse map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland *(in case of projects involving forest land more than 40 ha)*

iii. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.

iv. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden-thereon

v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area

vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife.

6) Environmental Status

i. Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.

ii. AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.

iii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with - min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.

iv. Surface water quality of nearby River (100m upstream and downstream of discharge point) and other surface drains at eight locations as per CPCB/MoEF&CC guidelines.

v. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.

vi. Ground water monitoring at minimum at 8 locations shall be included.

vii. Noise levels monitoring at 8 locations within the study area.

viii. Soil Characteristic as per CPCB guidelines.

ix. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.

x. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-

I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.

xi. Socio-economic status of the study area.

7) Impact and Environment Management Plan

i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.

ii. Water Quality modelling - in case of discharge in water body

iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.

iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.

v. Details of stack emission and action plan for control of emissions to meet standards.

vi. Measures for fugitive emission control

vii. Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.

viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.

ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.

x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.

xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.

xii. Action plan for post-project environmental monitoring shall be submitted.

xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.

8) Occupational health

i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers

ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.

iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved,

iv. Annual report of heath status of workers with special reference to Occupational Health and Safety.

9) Corporate Environment Policy

i. Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.

ii. Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.

iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.

iv. Does the company have system of reporting of non compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report

10) Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.

11) Enterprise Social Commitment (ESC)

i. Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan shall be included. Socio-economic development activities need to be elaborated upon.

12) Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.

13) 'A tabular chart with index for point wise compliance of above TOR.

B. SPECIFIC TERMS OF REFERENCE FOR EIASTUDIES FOR PETRO-CHEMICAL COMPLEXES (INDUSTRIES BASED ON PROCESSING OF PETROLEUM FRACTIONS & NATURAL GAS AND/OR REFORMING TO AROMATICS)

1. Detailsonrequirementof raw material (naphtha/gasfeedstock),itssource of supply and stor a geat the plant.
2. Complete process flow diagram for all products with material balance.
3. Brief description of equipments for various process (cracker, separation, polymerization etc)
4. Details of proposed source-specific pollution control schemes and equipments to meet the national standards.
5. Detailson VOC emission control system from vents, stacks, fugitive emissions and flare management, etc.
6. Details on proposed LDAR protocol.
7. Ambientair quality should include hydrocarbon (methane and non methane), VOC and VCM (if applicable).
8. Action plan to meet the standard prescribed under EPA for petrochemical complex.
9. Risk Assessment & Disaster Management Plan

? Identification of hazards

? Consequence Analysis

? Measures for mitigation of risk.

***

5(g): STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR DISTILLERIES AND INFORMATION TO BE INCLUDED IN EIA/EMP REPORT

A. STANDARD TERMS OF REFERENCE

1) Executive Summary

2) Introduction

i. Details of the EIA Consultant including NABET accreditation

ii. Information about the project proponent

iii. Importance and benefits of the project

3) Project Description

i. Cost of project and time of completion.

ii. Products with capacities for the proposed project.

iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.

iv. List of raw materials required and their source along with mode of transportation.

v. Other chemicals and materials required with quantities and storage capacities

vi. Details of Emission, effluents, hazardous waste generation and their management.

vii. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)

viii. Process description along with major equipments and machineries, process flow sheet (quantative) from raw material to products to be provided

ix. Hazard identification and details of proposed safety systems.

x. Expansion/modernization proposals:

a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing Iexisting operation of the project from SPCB shall be attached with the EIA-EMP report.

b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification

2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.

4) Site Details

i. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.

ii. A toposheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)

iii. Details w.r.t. option analysis for selection of site

iv. Co-ordinates (lat-long) of all four corners of the site.

v. Google map-Earth downloaded of the project site.

vi. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.

vii. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.

viii. Landuse break-up of total land of the project site (identified and acquired), government/ private - agricultural, forest, wasteland, water bodies, settlements, etc shall be included. (not required for industrial area)

ix. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area

x. Geological features and Geo-hydrological status of the study area shall be included.

xi. Details of Drainage of the project upto 5km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects)

xii. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.

xiii. R&R details in respect of land in line with state Government policy

5) Forest and wildlife related issues (if applicable):

i. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)

ii. Landuse map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland *(in case of projects involving forest land more than 40 ha)*

iii. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.

iv. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden-thereon

v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area

vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife

6) Environmental Status

i. Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.

ii. AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.

iii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with - min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.

iv. Surface water quality of nearby River (100m upstream and downstream of discharge point) and other surface drains at eight locations as per CPCB/MoEF&CC guidelines.

v. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.

vi. Ground water monitoring at minimum at 8 locations shall be included.

vii. Noise levels monitoring at 8 locations within the study area.

viii. Soil Characteristic as per CPCB guidelines.

ix. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.

x. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.

xi. Socio-economic status of the study area.

7) Impact and Environment Management Plan

i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.

ii. Water Quality modelling - in case of discharge in water body

iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.

iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.

v. Details of stack emission and action plan for control of emissions to meet standards.

vi. Measures for fugitive emission control

vii. Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.

viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.

ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.

x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.

xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.

xii. Action plan for post-project environmental monitoring shall be submitted.

xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.

8) Occupational health

i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers

ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.

iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved,

iv. Annual report of heath status of workers with special reference to Occupational Health and Safety.

9) Corporate Environment Policy

i. Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.

ii. Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.

iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.

iv. Does the company have system of reporting of non compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report

10) Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.

11) Enterprise Social Commitment (ESC)

i. Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time

bound action plan shall be included. Socio-economic development activities need to be elaborated upon.

12) Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.

13) 'A tabular chart with index for point wise compliance of above TOR.

B. SPECIFIC TERMS OF REFERENCE FOR EIASTUDIES FOR DISTILLERIES

1. List of existing distillery units in the study area along with their capacity and sourcing of raw material.
2. Number of working days of the distillery unit.
3. Details of raw materials such as molasses/grains, their source with availability.
4. Details of the use of steam from the boiler.
5. Surface and Ground water quality around proposed spent wash storage lagoon, and compost yard.
6. Plan to reduce spent wash generation within 6-8 KL/KL of alcohol produced.
7. Proposed effluent treatment system for molasses/grain based distillery (spent wash, spent lees, condensate and utilities) as well as domestic sewage and scheme for achieving zero effluent discharge (ZLD).
8. Proposed action to restrict fresh water consumption within 10 KL/KL of alcohol production.
9. Details about capacity of spent wash holding tank, material used, design consideration. No. of peizometers to be proposed around spent wash holding tank.
10. Action plan to control ground water pollution.
11. Details of solid waste management including management of boiler ash, yeast, etc. Details of incinerated spent wash ash generation and its disposal.
12. Details of bio-composting yard (if applicable).
13. Action plan to control odour pollution.
14. Arrangements for installation of continuous online monitoring system (24x7 monitoring device)

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5(j): STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR SUGAR INDUSTRY INFORMATION TO BE INCLUDED IN EIA / EMP REPORT

A. STANDARD TERMS OF REFERENCE

1) Executive Summary

2) Introduction

i. Details of the EIA Consultant including NABET accreditation

ii. Information about the project proponent

iii. Importance and benefits of the project

3) Project Description

i. Cost of project and time of completion.

ii. Products with capacities for the proposed project.

iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.

iv. List of raw materials required and their source along with mode of transportation.

v. Other chemicals and materials required with quantities and storage capacities

vi. Details of Emission, effluents, hazardous waste generation and their management.

vii. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)

viii. Process description along with major equipments and machineries, process flow sheet (quantative) from raw material to products to be provided.

ix. Hazard identification and details of proposed safety systems.

x. Expansion/modernization proposals:

a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing Iexisting operation of the project from SPCB shall be attached with the EIA-EMP report.

b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification

2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.

4) Site Details

xiv. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.

i. A toposheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)

ii. Details w.r.t. option analysis for selection of site

iii. Co-ordinates (lat-long) of all four corners of the site.

iv. Google map-Earth downloaded of the project site.

v. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.

vi. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.

vii. Landuse break-up of total land of the project site (identified and acquired), government/ private - agricultural, forest, wasteland, water bodies, settlements, etc shall be included. (not required for industrial area)

viii. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area

ix. Geological features and Geo-hydrological status of the study area shall be included.

x. Details of Drainage of the project upto 5km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects)

xi. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.

xii. R&R details in respect of land in line with state Government policy

5) Forest and wildlife related issues (if applicable):

i. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)

ii. Landuse map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland *(in case of projects involving forest land more than 40 ha)*

iii. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.

iv. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden-thereon

v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area

vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife

6) Environmental Status

i. Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.

ii. AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.

iii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with - min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.

iv. Surface water quality of nearby River (100m upstream and downstream of discharge point) and other surface drains at eight locations as per CPCB/MoEF&CC guidelines.

v. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.

vi. Ground water monitoring at minimum at 8 locations shall be included.

vii. Noise levels monitoring at 8 locations within the study area.

viii. Soil Characteristic as per CPCB guidelines.

ix. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.

x. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.

xi. Socio-economic status of the study area.

7) Impact and Environment Management Plan

i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.

ii. Water Quality modelling - in case of discharge in water body

iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.

iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.

v. Details of stack emission and action plan for control of emissions to meet standards.

vi. Measures for fugitive emission control

vii. Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.

viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.

ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.

x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.

xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.

xii. Action plan for post-project environmental monitoring shall be submitted.

xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.

8) Occupational health

i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers

ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.

iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved,

iv. Annual report of heath status of workers with special reference to Occupational Health and Safety.

9) Corporate Environment Policy

i. Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.

ii. Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.

iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.

iv. Does the company have system of reporting of non compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report

10) Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.

11) Enterprise Social Commitment (ESC)

i. Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise

Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan shall be included. Socio-economic development activities need to be elaborated upon.

12) Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.

13) 'A tabular chart with index for point wise compliance of above TOR.

B. SPECIFIC TERMS OF REFERENCE FOR EIASTUDIES FOR SUGAR INDUSTRY

1. Complete process flow diagram describing each unit, its processes and operation sinproduction of sugar, along with material and energy inputs and outputs (material and energy balance).
2. Details on water balance including quantity of effluent generated, recycled & reused. Effort stominimize effluent is charge and to maintain quality of receiving water body.
3. Details of effluent treatment plant, inlet and treated water quality with specific efficiency of each treatment unit in reduction in respect to fall concerned / regulated environmental parameters.
4. Numberofworkingdaysof thesugar productionunit.
5. Detailsoftheuseofsteamfromtheboiler.
6. Detailsofproposedsource-specificpollutioncontrol schemes andequipments to meet the national standards.
7. Collection, storage, handling and transportation of molasses,
8. Collection, storage and handling of bagasse and pressmud.
9. Flyash management plan for coal based and bagasse and action plan
10. Details on water quality parameter ssuchas Temperature, Colour, pH, BOD, COD, Total Kjeldhal Nitrogen, Phosphates, Oil & Grease, Total Suspended Solids, Total Coli form bacteria etc.
11. Details on existing ambient air quality and expected, stack and fugitive emissions for PM10, PM2.5, SO2*, NOx*, etc., and evaluation of the adequacy of the proposed pollution control devices to meet standards for point sources and to meet AAQ standards. (*-As applicable)

***

Annexure II Plot Allotment Letter

Annex-A

1	2	3	5	6	7	8
ਖਾਤਾ ਨੰ.	ਖਸਰਾ ਨੰ.	ਮਾਲਕ ਦਾ ਨਾਮ ਅਤੇ ਹਿੱਸਾ	ਜਿਸ ਦਾ ਕਬਜਾ ਹੈ	ਕਿਸਮ ਦੀ ਕਾਸ਼ਤ	ਕੁਲ ਰਕਬਾ ਜਾਂ ਅਸਾਮੀ ਦਾ ਰਕਬਾ	ਕਿਰਾਇਆ ਜਾਂ ਲਗਾਨ ਦੀ ਕਿਸਮ	ਵਿਸ਼ੇਸ਼ ਕਥਨ
509/ 493 ਕੁਲ 55.92 ਮਾਲ 34.95 ਸਵਾਈ 20.97 (ਪੜੀ) ਤਰਫ ਜਾਨੂ ਪੜੀ ਬੀਜਾ (ਨੰਬਰਦਾਰ) ਨਦਾਰਦ	748	ਦੀ ਗੁਰਦਾਸਪੁਰ ਕੋਆਪਰੇਟਿਵ ਸੁਗਰ ਮਿਲ ਲਿਮਟਿਡ ਮਕਬੂਜਾ ਮਾਲਕ ਪਨਿਆੜ (ਗੁਰਦਾਸਪਰ)		45 // 23/2	1-0 (0-5-5.86) ਗੈ ,ਮ ਖੰਡ ਮਿਲ	
			ਕੁਲ	ਜਿੱਤੇ 1	1-0 (0-5-5.86)	
					1 ਕਨਾਲ 0 ਮਰਲਾ (0 ਹੇਕਟੇਅਰ 5 ਏਅਰ 5.86 ਸੈਂਟੇਅਰ) ਗੈਰਮਜ਼ਰੂਆ 1 ਕਨਾਲ 0 ਮਰਲਾ (0 ਹੇਕਟੇਅਰ 5 ਏਅਰ 5.86 ਸੈਂਟੇਅਰ) ਗੈ ,ਮ ਖੰਡ ਮਿਲ	
	749	ਮਕਬੂਜਾ ਖੰਡ ਮਿਲ		33 // 21	7-11 (0-38-19.22) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
				33 // 22/1	3-16 (0-19-22.26) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
				33 // 22/2/1	1-3 (0-5-81.74) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
				33 // 23/2	3-0 (0-15-17.57) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
				33 // 24/1	4-0 (0-20-23.43) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
				34 // 25/1	3-2 (0-15-68.16) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
				46 // 11/2/1	1-16 (0-9-10.54) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
				46 // 17/1	4-16 (0-24-28.11) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	

ਜਮਾਬੰਦੀ 2017 2018 ਪਿੰਡ-- ਪਨਿਆੜ-313imported ਹੱਦਬਸਤ ਨੰ:- 313 ਤਹਸੀਲ- ਦੀਨਾਨਗਰ ਜ਼ਿਲਾ- ਗੁਰਦਾਸਪੁਰ

1	2	3	4	5	6	7	8
ਖੇਵਟ ਨੰ:/ ਮਾਲ/ਪੈਤੀ ਨੰਬਰ	ਖਤੌਨੀ ਨੰਬਰ/ ਖਾਤਾ	ਮਾਲਕ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਕਾਸ਼ਤਕਾਰ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਸਿੰਚਾਈ ਦਾ ਸਾਧਨ	ਮੁਰੱਬਾ ਅਤੇ ਖਸਰਾ ਨੰਬਰ	ਰਕਬਾ ਅਤੇ ਭੋਂ ਦੀ ਕਿਸਮ	ਵਿਸ਼ੇਸ਼ ਕਥਨ
					46 // 17/2	2-13 (0-13-40.52) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					46 // 18	7-11 (0-38-19.22) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					46 // 19	7-11 (0-38-19.22) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					46 // 22	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					46 // 23/1/1	2-8 (0-12-14.06) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					47 // 9	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					47 // 11	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					47 // 12	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					47 // 13	7-17 (0-39-70.98) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					49 // 9/2	6-2 (0-30-85.73) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					49 // 10/2	7-7 (0-37-18.05) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	

ਟ੍ਰਾਂਜ਼ੈਕਸ਼ਨ ਨੰ 9127 ਕੁੱਲ ਪਨੇ: 5 ਕੁੱਲ ਫੀਸ: 125 ਕਰਮਚਾਰੀ ਦਾ ਨਾਮ/ਅਹੁਦਾ: ਡਿਊਟੀ ਪਟਵਾਰੀ

ਕੰਪਿਊਟਰ ਮਾਲ ਰਿਕਾਰਡ ਮੁਤਾਬਿਕ ਨਕਲ ਦੁਰੁਸਤ ਹੈ।

ਪ੍ਰਿੰਟਰ ਮਿਤੀ: 22-09-2020 03:28:09 PM ਪਟਵਾਰੀ ਵਲੋ ਮਾਲ ਰਿਕਾਰਡ ਮਿਤੀ: 15/09/2020 ਨੂੰ ਕੰਪਿਊਟਰ ਵਿਚ ਦਰਜ ਹੈ।

ਕਰਮਚਾਰੀ ਦੇ ਹਸਤਾਖਰ

ਸਿਟੀ ਵੇਚੀ-2017 2018 ਪਿੰਡ- ਪਠਿਆਣ-313imported ਹੱਦਬਸਤ ਨੰ:- 313 ਤਹਿਸੀਲ- ਦੀਨਾਨਗਰ ਜ਼ਿਲ੍ਹਾ- ਗੁਰਦਾਸਪੁਰ

1	2	3	4	5	6	7	8
ਖਾਤਾ ਨੰ./ ਮਾਲ/ਪੱਤੀ ਹਦਬਸਤ	ਖਸਰਾ ਨੰਬਰ/ ਲਫ਼ਾ ਨੰ	ਮਾਲਕ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਕਾਸ਼ਤਕਾਰ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਸਿਰਾਈ ਦਾ ਨਾਮਾ	ਪ੍ਰਤੀਕਾ ਅਤੇ ਖਸਰਾ ਨੰਬਰ	ਰਕਬਾ ਅਤੇ ਉੱਤੇ ਦੀ ਕਿਸਮ	ਵਿਸ਼ੇਸ਼ ਹਵਾਲਾ
					49 // 11/1	6-9 (0-32-62.78) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
					49 // 11/2	1-11 (0-7-84.08) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
					49 // 12/1	3-12 (0-18-21.09) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
					49 // 19/2	1-1 (0-5-31.15) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
					49 // 20	7-18 (0-39-96.27) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
					49 // 21/1	5-5 (0-26-55.75) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
					320	2-12 (0-13-15.23) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
					321	0-16 (0-4-4.69) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	

1	2	3	4	5	6	7	8
ਵੇਰਵਾ ਨੰ:/ ਮਾਲ/ਪੱਤੀ, ਨੰਬਰ	ਖਤੌਨੀ ਨੰਬਰ/ ਲਗਾਨ	ਮਾਲਕ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਕਾਸ਼ਤਕਾਰ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਸਿੰਚਾਈ ਦਾ ਸਾਧਨ	ਮੁਰੱਬਾ ਅਤੇ ਖਸਰਾ ਨੰਬਰ	ਰਕਬਾ ਅਤੇ ਕੁੱਲ ਦੀ ਕਿਸਮ	ਵਿਸ਼ੇਸ਼ ਕਥਨ
					327	2-2 (0-10-62.30) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
				ਕੁਲ	ਕਿੱਤੇ 28	133-19 (6-77-59.55)	
						133 ਕਨਾਲ 19 ਮਰਲਾ (6 ਹੈਕਟੇਅਰ 77 ਏਅਰ 59.55 ਸੈਂਟੇਅਰ) ਗੈਰਮਜਰੂਆ 133 ਕਨਾਲ 19 ਮਰਲਾ (6 ਹੈਕਟੇਅਰ 77 ਏਅਰ 59.55 ਸੈਂਟੇਅਰ) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
	750		ਦੀ ਗੁਰਦਾਸਪੁਰ ਕੋਆਪਰੇਟਿਵ ਸੂਗਰ ਮਿਲ ਲਿਮਟਿਡ ਪਨਿਆੜ (ਗੁਰਦਾਸਪਰ) ਹਿੱਸੇਦਾਰ, ਰਾਹਿਨ ਚਰਨ ਦਾਸ ਪੁੱਤਰ ਰੋਲੂ ਰਾਮ ਮੁਰਤਹਿਨ ਮਕਬੂਜਾ ਖੱਡ ਮਿਲ ਮੁਰਤਹਿਨ		46 // 23/1/2	4-1 (0-20-48.72) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ.	
				ਕੁਲ	ਕਿੱਤੇ 1	4-1 (0-20-48.72)	
						4 ਕਨਾਲ 1 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 20 ਏਅਰ 48.72 ਸੈਂਟੇਅਰ) ਗੈਰਮਜਰੂਆ 4 ਕਨਾਲ 1 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 20 ਏਅਰ 48.72 ਸੈਂਟੇਅਰ) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ.	

ਟ੍ਰਾਂਜ਼ੈਕਸ਼ਨ ਨੰ 9127 ਕੁੱਲ ਪਨੇ: 5 ਕੁੱਲ ਫੀਸ: 125 ਕਰਮਚਾਰੀ ਦਾ ਨਾਮ/ਅਹੁਦਾ: ਡਿਊਟੀ ਪਟਵਾਰੀ

ਕੰਪਿਊਟਰ ਮਾਲ ਰਿਕਾਰਡ ਮੁਤਾਬਿਕ ਨਕਲ ਦੁਰੁਸਤ ਹੈ।

ਪਟਵਾਰੀ ਵਲੋ ਮਾਲ ਰਿਕਾਰਡ ਮਿਤੀ 15/09/2020ਤਕ ਕੰਪਿਊਟਰਾਇਜ਼ ਦਰਜ ਹੈ।

ਕਰਮਚਾਰੀ ਦੇ ਹਸਤਾਖਰ

ਪ੍ਰਿੰਟਿੰਗ ਮਿਤੀ : 22-09-2020 03:28:09.710ਸ਼ਾਮ

ਜਮਾਬੰਦੀ-2017 2018 ਪਿੰਡ- ਪਨਿਆੜ-313imported ਹਦਬਸਤ ਨੰ:- 313 ਤਹਸੀਲ- ਦੀਨਾਨਗਰ ਜਿਲਾ- ਗੁਰਦਾਸਪੁਰ

1	2	3	4	5	6	7	8
ਖਾਤਾ ਨੰ./ ਮਾਲ/ਪੱਤੀ, ਨੰਬਰਦਾਰ	ਖਤੌਨੀ ਨੰਬਰ/ ਲਗਾਨ	ਮਾਲਕ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਕਾਸ਼ਤਕਾਰ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਸਿਰਲੇਖ ਦਾ ਸਾਧਨ	ਖੇਤਰ ਅਤੇ ਪਸਾਰ ਨੰਬਰ	ਸ਼ਕਤਾ ਅਤੇ ਵੀ ਦੀ ਕਿਸਮ	ਵਿਸ਼ੇਸ਼ ਨੰਬਰ
	751		ਮਕਬੂਜਾ ਉਦਯੋਗ ਵਿਭਾਗ ਪੰਜਾਬ ਚੰਡੀਗੜ	ਟਿਊਵਵੈਲ	58 // 2/1	6-8 (0-32-37.49) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	58 // 2/2	1-12 (0-8-9.37) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	58 // 3/1	0-16 (0-4-4.69) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	58 // 10/1	1-6 (0-6-57.61) ਚਾਹੀ	
				ਕੁਲ	ਕਿਤੇ 4	10-2 (0-51-9.16)	
				10 ਕਨਾਲ 2 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 51 ਏਅਰ 9 16 ਸੈਂਟੇਅਰ) ਮਜਰੂਆ 10 ਕਨਾਲ 2 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 51 ਏਅਰ 9.16 ਸੈਂਟੇਅਰ) ਚਾਹੀ			

ਮਿਜਾਨ ਕਿਤੇ 34 ਰਕਬਾ 149 ਕਨਾਲ 2 ਮਰਲਾ (7 ਹੈਕਟੇਅਰ 54 ਏਅਰ 23.29 ਸੈਂਟੇਅਰ) ਮਜਰੂਆ 10 ਕਨਾਲ 2 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 51 ਏਅਰ 9.16 ਸੈਂਟੇਅਰ) 10 ਕਨਾਲ 2 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 51 ਏਅਰ 9.16 ਸੈਂਟੇਅਰ) ਚਾਹੀ

ਗੈਰਮਜਰੂਆ 139 ਕਨਾਲ 0 ਮਰਲਾ (7 ਹੈਕਟੇਅਰ 3 ਏਅਰ 14.13 ਸੈਂਟੇਅਰ) ਸਾਲਮ 34

ਟ੍ਰਾਂਜ਼ੈਕਸ਼ਨ ਨੰ 9127 ਕੁੱਲ ਪੰਨੇ: 5 ਕੁੱਲ ਫੀਸ: 125

ਕਰਮਚਾਰੀ ਦਾ ਨਾਮ/ਅਹੁਦਾ: ਡਿਊਟੀ ਪਟਵਾਰੀ

ਪੰਨਾ 5 ਦਾ 5

ਪ੍ਰਿੰਟਿੰਗ ਮਿਤੀ : 22-09-2020 03:28:09.710 ਸਾਮ

ਪਟਵਾਰੀ ਵਲੋਂ ਮਾਲ ਰਿਕਾਰਡ ਮਿਤੀ 16/09/2020 ਤਕ ਕੰਪਿਊਟਰ ਵਿਚ ਦਾਖਲ ਹੈ।

ਕੰਪਿਊਟਰ ਮਾਲ ਰਿਕਾਰਡ ਮੁਤਾਬਕ ਨਕਲ ਦੁਰੁਸਤ ਹੈ।

ਕਰਮਚਾਰੀ ਦੇ ਹਸਤਾਖਰ

ਜਮਾਂਬੰਦੀ- ਪਿੰਡ- ਹੱਦਬਸਤ ਨੰ:- ਤਹਿਸੀਲ- ਜ਼ਿਲ੍ਹਾ-

1	2	3	4	5	6	7	8
ਖੇਵਟ ਨੰ:/ ਮਾਲ/ਪੱਤੀ, ਨੰਬਰਦਾਰ	ਖਤੌਨੀ ਨੰਬਰ/ ਲਗਾਨ	ਮਾਲਕ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਕਾਸ਼ਤਕਾਰ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਸਿੰਚਾਈ ਦਾ ਸਾਧਨ	ਚੁੱਹਰਾ ਅਤੇ ਖਸਰਾ ਨੰਬਰ	ਹਕਬਾ ਅਤੇ ਝੌਂ ਦੀ ਕਿਸਮ	ਵਿਸ਼ੇਸ਼ ਕਥਨ

ਸਮਾਂਬੰਦੀ:-2017 2018 ਪਿੰਡ- ਪਨਿਆੜ-313imported ਹੱਦਬਸਤ ਨੰ:- 313 ਤਹਸੀਲ- ਦੀਨਾਨਗਰ ਜ਼ਿਲਾ- ਗੁਰਦਾਸਪੁਰ

1	2	3	4	5	6	7	8
ਖੇਵਟ ਨੰ:/ ਮਾਲ/ਪੱਤੀ, ਨੰਬਰਦਾਰ	ਕਤੌਨੀ ਨੰਬਰ/ ਲਗਾਨ	ਮਾਲਕ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਕਾਸ਼ਤਕਾਰ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਸਿੰਚਾਈ ਦਾ ਸਾਧਨ	ਮੁਰੱਬਾ ਅਤੇ ਖਸਰਾ ਨੰਬਰ	ਰਕਬਾ ਅਤੇ ਭੋਂ ਦੀ ਕਿਸਮ	ਇੰਤਕਾਲ ਕਰਨ
270/ 253 ਕੁਲ 121.50 ਮਾਲ 75.94 ਸਵਾਈ 45.56 (ਪੱਤੀ) ਤਰਫ ਕਲੂ ਪਤੀ ਬਿਜਾ (ਨੰਬਰਦਾਰ) ਬਲਦੇਵ ਸਿੰਘ	430	ਦੀ ਗੁਰਦਾਸਪੁਰ ਕੋਆਪਰੇਟਿਵ ਸੁਗਰ ਮਿਲ ਲਿਮਟਿਡ ਪਨਿਆੜ (ਗੁਰਦਾਸਪਰ)	ਮਕਬੂਜ਼ਾ ਖੰਡ ਮਿਲ		33 // 22/2/2	2-13 (0-13-40.52) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	ਰਪਟ ਨੰ 247 ਆਡ ਰਹਿਨ ਮਿਤੀ 23/2/2011 ਖਸਰਾ ਨੰ 64//13/2/5 (1-4) ਬਾਹੱਕ ਐਨ ਐਚ ਏ ਆਦੀ
					34 // 21	7-11 (0-38-19.22) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					35 // 25/2	1-14 (0-8-59.96) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	ਬਰੂਏ ਰਪਟ ਨੰ 314 ਆਡ ਰਹਿਨ ਮਿਤੀ 24/5/2019 ਵਲੋ-ਦੀ ਗੁਰਦਾਸਪੁਰ ਕੋਆਪਰੇਟਿਵ ਸੂਗਰ ਮਿਲ ਲਿਮਟਿਡ ਪਨਿਆੜ (ਗੁਰਦਾਸਪਰ) ਖੇਵਟ ਨੰਬਰ 270 ਨੰਬਰ ਖਸਰਾ-45//26-46//3/2-46//3/3-46//7-46//8--46//13--46//15--47//1--47//2--47//3--47//4/1-47//7--47//8--47//10--47//14--46//14 ਰਕਬਾ (95-12) ਸਾਲਮ ਬਹੱਕ- ਦੀ ਗੁਰਦਾਸਪੁਰ ਸੈਂਟਰਲ ਕੋਆਪਰੇਟਿਵ ਬੈਂਕ ਲਿਮਟਿਡ ਗੁਰਦਾਸਪੁਰ ਬਦਲੇ ਰਕਮ 100000.00 ਰੁਪਏ ਵਾ ਬਹੱਕ- ਪੰਜਾਬ ਸਟੇਟ ਕੋਆਪਰੇਟਿਵ ਬੈਂਕ ਲਿਮਟਿਡ ਚੰਡੀਗੜ 81553000.00/-ਰੁਪਏ ਕੁਲ ਰਕਬਾ 81653000/-ਰੁਪਏ ਵਿਚ ਆਡ ਰਹਿਨ ਹੋ ਚੁਕੀ ਹੈ
					45 // 5/2	4-14 (0-23-77.53) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					45 // 6	7-12 (0-38-44.51) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					45 // 14/2	3-4 (0-16-18.74) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					45 // 15	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					45 // 16	7-11 (0-38-19.22) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					45 // 17	5-19 (0-30-9.85) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					45 // 24/1	2-4 (0-11-12.89) ਗੈਰਮੁਮਕਿਨ	
					45 // 24/3	3-8 (0-17-19.91) ਗੈਰਮੁਮਕਿਨ	

ਟਾਈਕਸ਼ਨ ਨੰ 9127 ਕੁੱਲ ਪੰਨੇ: 6 ਕੁੱਲ ਫੀਸ: 150 ਕਰਮਚਾਰੀ ਦਾ ਨਾਮ/ਅਹੁਦਾ: ਡਿਊਟੀ ਪਟਵਾਰੀ

ਕੰਪਿਊਟਰ ਮਾਲ ਰਿਕਾਰਡ ਸੁਤੰਤਰਕ ਨਕਲ ਦੇਰੂਸਤ ਹੈ।

ਕਲਾਨਾਰੀ ਦੇ ਹਸਤਾਖਰ

ਜਮਾਂਬੰਦੀ 2017 2018 ਪਟਵਾਰ ਪਨਆਰ-313imported ਹੱਦਬਸਤ ਨੰ:- 313ਤਹਸੀਲ- ਦੀਨਾਨਗਰ ਜ਼ਿਲਾ- ਗੁਰਦਾਸਪੁਰ

1	2	3	4	5	6	7	8
ਖੇਵਟ ਨੰ:/ ਮਾਲ/ਪੱਤੀ, ਨੰਬਰਦਾਰ	ਖਤੌਨੀ ਨੰਬਰ/ ਲਗਾਨ	ਮਾਲਕ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਕਾਸ਼ਤਕਾਰ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਸਿੰਚਾਈ ਦਾ ਸਾਧਨ	ਮੁਰੱਬਾ ਅਤੇ ਖਸਰਾ ਨੰਬਰ	ਰਕਬਾ ਅਤੇ ਭੋਂ ਦੀ ਕਿਸਮ	ਵਿਸ਼ੇਸ਼ ਕਥਨ
					45 // 25	6-4 (0-31-36.31) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					46 // 1	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					46 // 10	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					46 // 11/1	5-8 (0-27-31.63) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					46 // 12	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					46 // 20/1	1-6 (0-6-57.61) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					46 // 20/2	6-5 (0-31-61.61) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					46 // 21	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					46 // 23/2	1-11 (0-7-84.08) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					47 // 18/2	5-14 (0-28-83.39) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					47 // 19	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	

ਟ੍ਰਾਂਜ਼ੈਕਸ਼ਨ ਨੰ 9127 ਕੁੱਲ ਪੰਨੇ: 6 ਕੁੱਲ ਫ਼ੀਸ: 150 ਕਰਮਚਾਰੀ ਦਾ ਨਾਮ/ਅਹੁਦਾ: ਡਿਊਟੀ ਪਟਵਾਰੀ ਕੰਪਿਊਟਰ ਮਾਲ ਰਿਕਾਰਡ ਮੁਤਾਬਿਕ ਨਕਲ ਦੁਰੁਸਤ ਹੈ।

ਪੰਨਾ 6 ਦਾ 2 ਪ੍ਰਿੰਟਰੇ ਮਿਤੀ: 22-09-2020 03:27:07:557 ਸ਼ਾਮ ਪਟਵਾਰੀ ਵਲੋ ਮਾਲ ਰਿਕਾਰਡ ਮਿਤੀ 11-09-2020 ਤਕ ਕੰਪਿਊਟਰ ਵਿਚ ਦਰਜ ਹੈ। ਕਰਮਚਾਰੀ ਦੇ ਹਸਤਾਖਰ

ਜਮਾਂਬੰਦੀ-2017 2018 ਪਿੰਡ- ਪਨਿਆੜ-313imported ਹੱਦਬਸਤ ਨੰ:- 313 ਤਹਸੀਲ- ਦੀਨਾਨਗਰ ਜ਼ਿਲਾ- ਗੁਰਦਾਸਪੁਰ

1	2	3	4	5	6	7	8
ਖੇਵਟ ਨੰ:/ ਮਾਲ/ਪੈਤੀ, ਨੰਬਰਦਾਰ	ਖਤੌਨੀ ਨੰਬਰ/ ਲਗਾਨ	ਮਾਲਕ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਕਾਸ਼ਤਕਾਰ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਸਿੰਚਾਈ ਦਾ ਸਾਧਨ	ਪੁਖਤਾ ਅਤੇ ਖਸਰਾ ਨੰਬਰ	ਰਕਬਾ ਅਤੇ ਹੱਦ ਦੀ ਕਿਸਮ	ਵਿਸ਼ੇਸ਼ ਨਵਰਣ
					47 // 20	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
					47 // 23/1	3-4 (0-16-18.74) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
					49 // 1	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
					49 // 2/1	6-0 (0-30-35.14) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
					49 // 2/2	1-18 (0-9-61.13) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
					49 // 3/1	0-15 (0-3-79.39) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
				ਕੁਲ	ਕਿਤੇ 28	148-15 (7-52-46.24)	
						148 ਕਨਾਲ 15 ਮਰਲਾ (7 ਹੈਕਟੇਅਰ 52 ਏਅਰ 46.24 ਸੈਂਟੇਅਰ) ਗੈਰਮਜਰੂਆ 5 ਕਨਾਲ 12 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 28 ਏਅਰ 32.80 ਸੈਂਟੇਅਰ) ਗੈਰਮੁਮਕਿਨ 143 ਕਨਾਲ 3 ਮਰਲਾ (7 ਹੈਕਟੇਅਰ 24 ਏਅਰ 13.44 ਸੈਂਟੇਅਰ) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
	431		ਮਕਬੂਜਾ ਖੱਡ ਮਿੱਲ		33 // 24/2	3-16 (0-19-22.26) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	

ਜਮਾਂਬੰਦੀ-2017 2018 ਪਿੰਡ- ਪਨਿਆੜ-313imported ਹੱਦਬਸਤ ਨੰ:- 313 ਤਹਿਸੀਲ- ਦੀਨਾਨਗਰ ਜ਼ਿਲਾ- ਗੁਰਦਾਸਪੁਰ

1	2	3	4	5	6	7	8
ਖੇਵਟ ਨੰ:/ ਮਾਲ/ਪੱਤੀ, ਨੰਬਰਦਾਰ	ਖਤੌਨੀ ਨੰਬਰ/ ਲਗਾਨ	ਮਾਲਕ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਕਾਸ਼ਤਕਾਰ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਸਿੰਚਾਈ ਦਾ ਸਾਧਨ	ਮੁਰੱਬਾ ਅਤੇ ਖਸਰਾ ਨੰਬਰ	ਰਕਬਾ ਅਤੇ ਭੋਂ ਦੀ ਕਿਸਮ	ਵਿਸ਼ੇਸ਼ ਕਥਨ
					33 // 25/1	0-7 (0-1-77.05) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					45 // 26	0-6 (0-1-51.76) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					46 // 3/2	3-16 (0-19-22.26) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					46 // 3/3	2-13 (0-13-40.52) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					46 // 7	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					46 // 8	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					46 // 13	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					46 // 14	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					46 // 15	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					47 // 1	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					47 // 2	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	

ਦਾਖਿਲਾ ਨੰ 9127 ਕੁੱਲ ਪਨੇ: 6 ਕੁੱਲ ਫੀਸ: 150 ਕਰਮਚਾਰੀ ਦਾ ਨਾਮ/ਅਹੁਦਾ: ਡਿਊਟੀ ਪਟਵਾਰੀ 63-2

ਕੰਪਿਊਟਰ ਮਾਲ ਰਿਕਾਰਡ ਮੁਤਾਬਿਕ ਨਕਲ ਦੁਰੁਸਤ ਹੈ।

ਕਰਮਚਾਰੀ ਦੇ ਹਸਤਾਖ਼ਰ

ਪ੍ਰਿੰਟਿੰਗ ਮਿਤੀ : 22-09-2020 03:27:07:357 ਸ਼ਾਮ ਪਟਵਾਰੀ ਵਲੋਂ ਮਾਲ ਰਿਕਾਰਡ ਮਿਤੀ 23/09/2020 ਤਕ ਕੰਪਿਊਟਰ ਵਿਚ ਦਰਜ ਹੈ।

ਜਮਾਂਬੰਦੀ-2017 2018 ਪਿੰਡ- ਪਨਿਆੜ-313imported ਹੱਦਬਸਤ ਨੰ:- 313 ਤਹਿਸੀਲ- ਦੀਨਾਨਗਰ ਜ਼ਿਲ੍ਹਾ- ਗੁਰਦਾਸਪੁਰ

1	2	3	4	5	6	7	8
ਖਾਤਾ ਨੰ./ ਮਾਲ/ਖੇਤੀ, ਨੰਬਰ	ਖਤੌਨੀ ਨੰਬਰ/ ਲਗਾਨ	ਮਾਲਕ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਕਾਸ਼ਤਕਾਰ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਸਿੰਚਾਈ ਦਾ ਸਾਧਨ	ਨੰਬਰ ਅਤੇ ਖਸਰਾ ਨੰਬਰ	ਰਕਬਾ ਅਤੇ ਹੈ ਦੀ ਕਿਸਮ	ਵਿਸ਼ੇਸ਼ ਹਵਾਲਾ
					47 // 3	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
					47 // 4/1	5-15 (0-29-8.68) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
					47 // 7	2-8 (0-12-14.06) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
					47 // 8	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
					47 // 10	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
					47 // 14	0-10 (0-2-52.93) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
				ਕੁਲ	ਕਿੱਤੇ 16	99-11 (5-3-58.07)	
						99 ਕਨਾਲ 11 ਮਰਲਾ (5 ਹੈਕਟੇਅਰ 3 ਏਅਰ 58.07 ਸੈਂਟੇਅਰ) ਗੈਰਮਜ਼ਰੂਆ	
						99 ਕਨਾਲ 11 ਮਰਲਾ (5 ਹੈਕਟੇਅਰ 3 ਏਅਰ 58.07 ਸੈਂਟੇਅਰ) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	

ਟਾਈਟਲ ਨੰ 9127 ਕੁੱਲ ਪਨੇ: 6 ਕੁੱਲ ਫੀਸ: 150 ਕਰਮਚਾਰੀ ਦਾ ਨਾਮ/ਅਹੁਦਾ: ਡਿਊਟੀ ਪਟਵਾਰੀ

ਸੀਪਿਊਟਰ ਮਾਲ ਰਿਕਾਰਡ ਪੁਸਤਕ ਨਕਲ ਦੁਰੁਸਤ ਹੈ।

ਪੰਨਾ 6 ਦਾ 5 ਪ੍ਰਿੰਟਿੰਗ ਮਿਤੀ : 22-09-2020 03:27:07:357 ਸਾਮ ਪਟਵਾਰੀ ਵਲੋ ਮਾਲ ਰਿਕਾਰਡ ਮਿਤੀ 18/09/2020 ਤਕ ਕੰਪਿਊਟਰ ਵਿਚ ਦਰਜ ਹੈ।

ਕਲੰਡਰ ਇਸਤਰ

ਜਮਾਂਬੰਦੀ-2017 2018ਪਿੰਡ- ਪਨਿਆੜ-313imported ਹੱਦਬਸਤ ਨੰ:- 313ਤਹਿਸੀਲ- ਦੀਨਾਨਗਰ ਜ਼ਿਲਾ- ਗੁਰਦਾਸਪੁਰ

1	2	3	4	5	6	7	8
ਖੇਵਟ ਨੰ:/ ਮਾਲ/ਪੱਤੀ, ਨੰਬਰਦਾਰ	ਖਤੋਨੀ ਨੰਬਰ/ ਲਗਾਨ	ਮਾਲਕ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਕਾਸ਼ਤਕਾਰ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਸਿੰਚਾਈ ਦਾ ਸਾਧਨ	ਮੁਰੱਬਾ ਅਤੇ ਖਸਰਾ ਨੰਬਰ	ਰਕਬਾ ਅਤੇ ਭੋਂ ਦੀ ਕਿਸਮ	ਵਿਸ਼ੇਸ਼ ਕਥਨ
	432		ਪੰਜਾਬ ਉਦਯੋਗ ਵਿਭਾਗ	ਟਿਊਵਵੈਲ	59 // 10/1	4-16 (0-24-28.11) ਚਾਹੀ	
				ਕੁਲ	ਕਿਤੇ 1	4-16 (0-24-28.11)	
				4 ਕਨਾਲ 16 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 24 ਏਅਰ 28.11 ਸੈਂਟੇਅਰ) ਮਜਰੂਆ 4 ਕਨਾਲ 16 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 24 ਏਅਰ 28.11 ਸੈਂਟੇਅਰ) ਚਾਹੀ			
ਮਿਜਾਨ ਕਿਤੇ	47	ਰਕਬਾ 253 ਕਨਾਲ 2 ਮਰਲਾ (12 ਹੈਕਟੇਅਰ 80 ਏਅਰ 32.42 ਸੈਂਟੇਅਰ) ਮਜਰੂਆ 4 ਕਨਾਲ 16 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 24 ਏਅਰ 28.11				4 ਕਨਾਲ 16 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 24 ਏਅਰ 28.11 ਸੈਂਟੇਅਰ) ਚਾਹੀ	
ਗੈਰਮਜਰੂਆ ਸੈਂਟੇਅਰ)	248 ਕਨਾਲ 6 ਮਰਲਾ (12 ਹੈਕਟੇਅਰ 56 ਏਅਰ 4.31			ਸਾਲਮ 47			

4-16

ਟ੍ਰਾਂਜੈਕਸ਼ਨ ਨੰ 9127 ਕੁੱਲ ਪੰਨੇ: 6 ਕੁੱਲ ਵੀਸ: 150 ਕਰਮਚਾਰੀ ਦਾ ਨਾਮ/ਅਹੁਦਾ: ਡਿਊਟੀ ਪਟਵਾਰੀ ਕੰਪਿਊਟਰ ਮਾਲ ਰਿਕਾਰਡ ਮੁਤਾਬਿਕ ਨਕਲ ਦੁਰੁਸਤ ਹੈ।

ਪ੍ਰਿੰਟ ਮਿਤੀ: 22-09-2020 03:27:07:357 ਸ਼ਾਮ ਪਟਵਾਰੀ ਵਲੋ ਮਾਲ ਰਿਕਾਰਡ ਮਿਤੀ: 18/09/2020 ਤਕ ਕੰਪਿਊਟਰ ਵਿਚ ਦਰਜ ਹੈ। ਕਰਮਚਾਰੀ ਦੇ ਹਸਤਾਖਰ

ਜਮਾਂਬੰਦੀ-2017 2018 ਪਿੰਡ- ਪਨਿਆੜ-313imported ਹੱਦਬਸਤ ਨੰ:- 313 ਤਹਿਸੀਲ- ਸ੍ਰੀਹਰਗੋਬਿੰਦਪੁਰ ਜ਼ਿਲਾ- ਗੁਰਦਾਸਪੁਰ

1	2	3	4	5	6	7	8
ਖਾਤਾ ਨੰ:/ ਮਾਲ/ਪੱਤੀ, ਨੰਬਰਦਾਰ	ਖਤੌਨੀ ਨੰਬਰ/ ਲਗਾਨ	ਮਾਲਕ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਕਾਸ਼ਤਕਾਰ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਸਿੰਚਾਈ ਦਾ ਸਾਧਨ	ਮੁਰੱਬਾ ਅਤੇ ਖਸਰਾ ਨੰਬਰ	ਰਕਬਾ ਅਤੇ ਝੋਨੇ ਦੀ ਕਿਸਮ	ਵਿਸ਼ੇਸ਼ ਕਥਨ
4/ 4 ਕੁਲ 143.31 ਮਾਲ 89.57 ਸਵਾਈ 53.74 (ਪੱਤੀ) ਤਰਫ ਕੰਲਾ (ਨੰਬਰਦਾਰ) ਘਨਸਾਮ ਸਿੰਘ	10	ਦੀ ਗੁਰਦਾਸਪੁਰ ਕੌਆਪਰੇਟਿਵ ਸ਼ੂਗਰ ਮਿਲ ਲਿਮਟਿਡ ਮਕਬੂਜਾ ਮਾਲਕ ਪਨਿਆੜ (ਗੁਰਦਾਸਪਰ)			34 // 22	7-4 (0-36-42.17) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					46 // 2	7-19 (0-40-21.56) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					46 // 3/1	0-11 (0-2-78.22) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					46 // 9	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					46 // 11/2/2	0-16 (0-4-4.69) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					46 // 16	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					50 // 1	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					50 // 2	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					50 // 3	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					50 // 4	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					50 // 5	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	

ਫ੍ਰਾਂਕਿੰਗ ਨੰ 9117 ਕੁੱਲ ਪਨੇ: 8 ਕੁੱਲ ਫੀਸ: 200 ਕਰਮਚਾਰੀ ਦਾ ਨਾਮ/ਅਹੁਦਾ: ਡਿਊਟੀ ਪਟਵਾਰੀ

ਕੰਪਿਊਟਰ ਦੇ ਰਿਕਾਰਡ ਮੁਤਾਬਿਕ ਨਕਲ ਦੁਰੁਸਤ ਹੈ।

ਪੰਨਾ 8 ਦਾ 1 ਪ੍ਰਿੰਟਿੰਗ ਮਿਤੀ : 22-09-2020 02:53:10 750ਸਾਮ ਪਟਵਾਰੀ ਵਲੋ ਮਾਲ ਰਿਕਾਰਡ ਮਿਤੀ 18/09/2020 ਤਕ ਕੰਪਿਊਟਰ ਵਿਚ ਦਰਜ ਹੈ।

ਤਹਸੀਲਦਾਰ ਦੇ ਦਸਤਖਤ

ਜਮਾਬੰਦੀ- 2017 2018ਪੇਂਡੂ- ਪਨਿਆੜ-313imported ਹੱਦਬਸਤ ਨੰ:- 313ਤਹਿਸੀਲ- ਦੀਨਾਨਗਰ ਜ਼ਿਲਾ- ਗੁਰਦਾਸਪੁਰ

1	2	3	4	5	6	7	8
ਖੇਵਟ ਨੰ:/ ਮਾਲ/ਪੱਤੀ, ਨੰਬਰਦਾਰ	ਖਤੌਨੀ ਨੰਬਰ/ ਲਗਾਨ	ਮਾਲਕ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਕਾਸ਼ਤਕਾਰ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਸਿੰਚਾਈ ਦਾ ਸਾਧਨ	ਮੁਰੱਬਾ ਅਤੇ ਖਸਰਾ ਨੰਬਰ	ਰਕਬਾ ਅਤੇ ਭੌਂ ਦੀ ਕਿਸਮ	ਵਿਸ਼ੇਸ਼ ਕਥਨ
					50 // 6	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					50 // 7	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					50 // 11	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					50 // 12	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					50 // 13	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					50 // 18/1	6-13 (0-33-63.95) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
				ਕੁਲ	ਕਿੱਤੇ 17	119-3 (6-2-72.87)	
					119 ਕਨਾਲ 3 ਮਰਲਾ (6 ਹੈਕਟੇਅਰ 2 ਏਅਰ 72.87 ਸੈਂਟੇਅਰ) ਗੈਰਮਜਰੂਆ 119 ਕਨਾਲ 3 ਮਰਲਾ (6 ਹੈਕਟੇਅਰ 2 ਏਅਰ 72.87 ਸੈਂਟੇਅਰ) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ		

46-13

ਦਾਖਲਾ ਨੰ 9117 ਕੁੱਲ ਪੰਨੇ: 8 ਕੁੱਲ ਫੀਸ: 200 ਕਰਮਚਾਰੀ ਦਾ ਨਾਮ/ਅਹੁਦਾ: ਡਿਊਟੀ ਪਟਵਾਰੀ

ਪ੍ਰਿੰਟਿੰਗ ਮਿਤੀ : 22-09-2020 02:53:10.750ਗਲਾ ਪਟਵਾਰੀ ਵਲੋ ਮਾਲ ਰਿਕਾਰਡ ਦੇ ਨਿਕਲ 18/09/2020 ਤਕ ਕੰਪਿਊਟਰ ਵਿਚ ਦਰਜ ਹੈ।

ਕੰਪਿਊਟਰ ਮਾਲ ਰਿਕਾਰਡ ਮੁਤਾਬਿਕ ਨਕਲ ਦੁਰੁਸਤ ਹੈ।

ਕਰਮਚਾਰੀ ਦੇ ਹਸਤਾਖਰ

ਜਮਾਬੰਦੀ 2017 2018 ਪਿੰਡ – ਪਨਿਆੜ-313imported ਹੱਦਬਸਤ ਨੰ:- 313 ਤਹਸੀਲ- ਜੀਨਾਨਗਰ ਜ਼ਿਲਾ- ਗੁਰਦਾਸਪੁਰ

1	2	3	4	5	6	7	8
ਖਾਤਾ ਨੰ:/ ਖਾਨਾ/ਪੰਚੀ. ਨੰਬਰ	ਖਤੌਨੀ ਨੰਬਰ/ ਕਨਾਲ	ਮਾਲਕ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਕਾਸ਼ਤਕਾਰ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਸਿੰਚਾਈ ਦਾ ਸਾਧਨ	ਮੁਰੱਬਾ ਅਤੇ ਖਸਰਾ ਨੰਬਰ	ਰਕਬਾ ਅਤੇ ਈ ਦੀ ਕਿਸਮ	ਵਿਸ਼ੇਸ਼ ਕਥਨ
	11		ਮਕਬੂਜਾ ਖੰਡ ਮਿਲ		46 // 4	8-0 (0-40-46.86) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
				ਕੁਲ	ਕਿੱਤੇ 1	8-0 (0-40-46.86)	
					8 ਕਨਾਲ 0 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 40 ਏਅਰ 46.86 ਸੈਂਟੇਅਰ) ਗੈਰਮਜਰੂਆ 8 ਕਨਾਲ 0 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 40 ਏਅਰ 46.86 ਸੈਂਟੇਅਰ) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ		
	12		ਮਕਬੂਜਾ ਖੰਡ ਮਿਲ ਪਨਿਆੜ		34 // 23	7-11 (0-38-19.22) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					34 // 24	7-11 (0-38-19.22) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					34 // 25/2	4-9 (0-22-51.06) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
				ਕੁਲ	ਕਿੱਤੇ 3	19-11 (0-98-89.51)	
					19 ਕਨਾਲ 11 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 98 ਏਅਰ 89.51 ਸੈਂਟੇਅਰ) ਗੈਰਮਜਰੂਆ 19 ਕਨਾਲ 11 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 98 ਏਅਰ 89.51 ਸੈਂਟੇਅਰ) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ		

27-11

35-11

ਟ੍ਰਾਂਜੈਕਸ਼ਨ ਨੰ 9117 ਕੁੱਲ ਪਨੇ: 6 ਕੁੱਲ ਫੀਸ: 200 ਕਰਮਚਾਰੀ ਦਾ ਨਾਮ/ਅਹੁਦਾ: ਡਿਊਟੀ ਪਟਵਾਰੀ

ਪ੍ਰਿੰਟਿੰਗ ਮਿਤੀ : 22-09-2020 02:53:10:750 ਸ਼ਾਮ ਪਟਵਾਰੀ ਵਲੋ ਮਾਲ ਰਿਕਾਰਡ ਮਿਤੀ 13/09/2020 ਤਕ ਕੰਪਿਊਟਰ ਵਿਚ ਦਰਜ ਹੋ

ਕੰਪਿਊਟਰ ਮਾਲ ਰਿਕਾਰਡ ਮੁਤਾਬਿਕ ਨਕਲ ਦੁਰੁਸਤ ਹੈ।

ਜਮਾਂਬੰਦੀ- 2017 2018ਪੰਜਾਬ- ਪਨਿਆੜ-313imported ਹੱਦਬਸਤ ਨੰ:- 313ਤਹਿਸੀਲ- ਦੀਨਾਨਗਰ ਜ਼ਿਲਾ- ਗੁਰਦਾਸਪੁਰ

1	2	3	4	5	6	7	8
ਖੇਵਟ ਨੰ:/ ਮਾਲ/ਪੱਤੀ. ਨੰਬਰਦਾਰ	ਖਤੌਨੀ ਨੰਬਰ/ ਲੁਗਾਨ	ਮਾਲਕ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਕਾਸ਼ਤਕਾਰ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਸਿੰਚਾਈ ਦਾ ਸਾਧਨ	ਮੁਰੱਬਾ ਅਤੇ ਖਸਰਾ ਨੰਬਰ	ਰਕਬਾ ਅਤੇ ਭੋਂ ਦੀ ਕਿਸਮ	ਵਿਸ਼ੇਸ਼ ਕਥਨ
	13		ਮਕਬੂਜਾ ਖੰਡ ਉਦਯੋਗ		50 // 19/1	3-18 (0-19-72.84) ਬਰਾਨੀ ਅਵਲ	
					50 // 20/1	1-1 (0-5-31.15) ਬਰਾਨੀ ਅਵਲ	
					50 // 25/1	4-11 (0-23-1.65) ਬਰਾਨੀ ਅਵਲ	
				ਕੁਲ	ਕਿੱਤੇ 3	9-10 (0-48-5.64)	
					9 ਕਨਾਲ 10 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 48 ਏਅਰ 5.64 ਸੈਂਟੇਅਰ) ਗੈਰਮਜਰੂਆ 9 ਕਨਾਲ 10 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 48 ਏਅਰ 5.64 ਸੈਂਟੇਅਰ) ਬਰਾਨੀ ਅਵਲ		
	14		ਮਕਬੂਜਾ ਖੰਡਾ ਉਦਯੋਗ		46 // 5	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					46 // 6	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
				ਕੁਲ	ਕਿੱਤੇ 2	16-0 (0-80-93.71)	
					16 ਕਨਾਲ 0 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 80 ਏਅਰ 93.71 ਸੈਂਟੇਅਰ) ਗੈਰਮਜਰੂਆ 16 ਕਨਾਲ 0 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 80 ਏਅਰ 93.71 ਸੈਂਟੇਅਰ) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ		

ਟ੍ਰਾਂਜ਼ੈਕਸ਼ਨ ਨੰ 9117 ਕੁੱਲ ਪੰਨੇ: 8 ਕੁੱਲ ਫ਼ੀਸ: 200 ਕਰਮਚਾਰੀ ਦਾ ਨਾਮ/ਅਹੁਦਾ: ਡਿਊਟੀ ਪਟਵਾਰੀ ਕੰਪਿਊਟਰ ਮਾਲ ਰਿਕਾਰਡ ਮੁਤਾਬਿਕ ਨਕਲ ਦੁਰੁਸਤ ਹੈ।

ਪੰਨਾ 8 ਤੋਂ 4 ਪ੍ਰਿੰਟ ਮਿਤੀ 22-09-2020 02:53:10:750ਬਜੇ ਪਟਵਾਰੀ ਵਲੋਂ ਮਾਲ ਰਿਕਾਰਡ ਮਿਤੀ 18/09/2020 ਤਕ ਕੰਪਿਊਟਰ ਵਿਚ ਦਰਜ ਹੈ। ਕਰਮਚਾਰੀ ਦੇ ਹਸਤਾਖਰ

ਜਮਾਬੰਦੀ-2017 2018 ਪਿੰਡ- ਪਲਿਆੜ-313imported ਹੱਦਬਸਤ ਨੰ:- 313 ਤਹਿਸੀਲ- ਦੀਨਾਨਗਰ ਜ਼ਿਲਾ- ਗੁਰਦਾਸਪੁਰ

1	2	3	4	5	6	7	8
ਖੇਵਟ ਨੰ:/ ਮਾਲ/ਪੱਤੀ, ਨਿਸ਼ਾਨਦਾਰ	ਖਤੌਨੀ ਨੰਬਰ/ ਲਗਾਨ	ਮਾਲਕ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਕਾਸ਼ਤਕਾਰ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਸਿੰਚਾਈ ਦਾ ਸਾਧਨ	ਪੁੱਗਣਾ ਅਤੇ ਖਸਰਾ ਨੰਬਰ	ਰਕਬਾ ਅਤੇ ਭੌਂ ਦੀ ਕਿਸਮ	ਵਿਸ਼ੇਸ਼ ਕਥਨ
	15		ਮਕਬੂਜਾ ਖੰਡ ਮਿਲ		50 // 8	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					50 // 9	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					50 // 10	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					50 // 14	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					50 // 15	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					50 // 16	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
					50 // 17	8-0 (0-40-46.86) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
				ਕੁਲ	ਵਿਚ 7	56-0 (2-83-28.00)	
						56 ਕਨਾਲ 0 ਮਰਲਾ (2 ਹੈਕਟੇਅਰ 83 ਏਅਰ 28.00 ਸੈਂਟੇਅਰ) ਗੈਰਮਜਰੂਆ 56 ਕਨਾਲ 0 ਮਰਲਾ (2 ਹੈਕਟੇਅਰ 83 ਏਅਰ 28.00 ਸੈਂਟੇਅਰ) ਗੈਰਮੁਨਕਨ ਖੰਡ ਮਿਲ	
	16		ਮਕਬੂਜਾ ਉਦਯੋਗ ਵਿਭਾਗ ਪੰਜਾਬ ਚੰਡੀਗੜ		45 // 24/2	2-6 (0-11-63.47) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	

ਦਾਖਲਾਸ਼ਨ ਨੰ 9117 ਕੁੱਲ ਪੰਨੇ: 8 ਕੁੱਲ ਫੀਸ: 200 ਕਰਮਚਾਰੀ ਦਾ ਨਾਮ/ਅਹੁਦਾ: ਡਿਊਟੀ ਪਟਵਾਰੀ

ਕਾਪੀਇਟ ਮਾਲ ਰਿਕਾਰਡ ਮੁਤਾਬਿਕ ਨਕਲ ਦੁਰਸਤ ਹੈ।

ਪ੍ਰਿੰਟਿੰਗ ਮਿਤੀ : 22-09-2020 02:53:10:750ਸ਼ਾਮ ਪਟਵਾਰੀ ਵਲੋ ਮਾਲ ਰਿਕਾਰਡ ਮਿਤੀ 11/09/2020

ਜਮਾਂਬੰਦੀ- 2017 2018ਪੰਜੀ- ਪਨਿਆਰ-313imported ਹੱਦਬਸਤ ਨੰ:- 313ਤਹਿਸੀਲ- ਦੀਨਾਨਗਰ ਜ਼ਿਲਾ- ਗੁਰਦਾਸਪੁਰ

1	2	3	4	5	6	7	8
ਖੇਵਟ ਨੰ:/ ਮਾਲ/ਪੱਤੀ, ਨੰਬਰਦਾਰ	ਖਤੌਨੀ ਨੰਬਰ/ ਲਗਾਨ	ਮਾਲਕ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਕਾਸ਼ਤਕਾਰ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਸਿੰਚਾਈ ਦਾ ਸਾਧਨ	ਮੁੱਰਬਾ ਅਤੇ ਖਸਰਾ ਨੰਬਰ	ਰਕਬਾ ਅਤੇ ਭੋਂ ਦੀ ਕਿਸਮ	ਵਿਸ਼ੇਸ਼ ਕਥਨ
					46 // 3/4	0-12 (0-3-3.51) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					50 // 18/2	0-12 (0-3-3.51) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					50 // 19/2	3-4 (0-16-18.74) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
				ਟਿਊਵਵੈਲ	50 // 21	8-0 (0-40-46.86) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	50 // 22	8-0 (0-40-46.86) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	50 // 23	7-17 (0-39-70.98) ਚਾਹੀ	
					50 // 24/1	1-11 (0-7-84.08) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
					50 // 24/2	5-11 (0-28-7.51) ਗੈਰਮੁਮਕਿਨ ਖੰਡ ਮਿਲ	
				ਟਿਊਵਵੈਲ	50 // 25/2	2-11 (0-12-89.94) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	58 // 1/2	1-16 (0-9-10.54) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	58 // 3/2	7-4 (0-36-42.17) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	59 // 4/1	2-8 (0-12-14.06) ਚਾਹੀ	

ਦੀ ਸੈਕਸ਼ਨ ਨੰ 9117 ਕੁੱਲ ਪਨੇ: 8 ਕੁੱਲ ਫ਼ੀਸ: 200 ਕਰਮਚਾਰੀ ਦਾ ਨਾਮ/ਅਹੁਦਾ: ਡਿਊਟੀ ਪਟਵਾਰੀ ਕੰਪਿਊਟਰ ਮਾਲ ਰਿਕਾਰਡ ਮੁਤਾਬਿਕ ਨਕਲ ਦੁਰੁਸਤ ਹੈ।

ਫ਼ੀਸ 8 ਦਾ 0 ਰਿਪੋਰਟ ਮਿਤੀ: 22-09-2020 02:53:10.750ਸ਼ਾਮ ਪਟਵਾਰੀ ਵਲੋ ਮਾਲ ਰਿਕਾਰਡ ਮਿਤੀ 18/09/2020 ਤਕ ਕੰਪਿਊਟਰ ਵਿਚ ਦਰਜ ਹੈ। ਕਰਮਚਾਰੀ ਦੇ ਹਸਤਾਖ਼ਰ

ਜਿਮਾਂਦੰਦੀ-2017 2018 ਪਿੰਡ- ਪਨਿਆੜ-313imported ਹੱਦਬਸਤ ਨੰ:- 313 ਤਹਸੀਲ- ਦੀਨਾਨਗਰ ਜ਼ਿਲਾ- ਗੁਰਦਾਸਪੁਰ

1	2	3	4	5	6	7	8
ਖਾਤਾ ਨੰ./ ਮਾਲ/ਪੱਤੀ/ ਖੇਵਟਦਾਰ	ਖਸਰਾ ਨੰਬਰ/ ਲਗਾਨ	ਮਾਲਕ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਕਾਸ਼ਤਕਾਰ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਨਿਸ਼ਾਨੀ ਦਾ ਨਾਮ	ਪਰੌਂਵਾ ਅਤੇ ਖਸਰਾ ਨੰਬਰ	ਰਕਬਾ ਅਤੇ ਭੋਂ ਦੀ ਕਿਸਮ	ਵਿਸ਼ੇਸ਼ ਹਵਾਲੇ
				ਟਿਊਵਵੈਲ	58 // 4/2	5-12 (0-28-32.80) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	58 // 5	8-0 (0-40-46.86) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	58 // 6/1	4-4 (0-21-24.60) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	58 // 6/2	3-16 (0-19-22.26) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	58 // 7/1	5-10 (0-27-82.21) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	58 // 7/2	2-5 (0-11-38.18) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	58 // 8	7-11 (0-38-19.22) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	58 // 9	7-11 (0-38-19.22) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	58 // 10/2	5-0 (0-25-29.29) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	59 // 1	8-0 (0-40-46.86) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	59 // 2	8-0 (0-40-46.86) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	59 // 3	8-0 (0-40-46.86) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	59 // 4	8-0 (0-40-46.86) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	59 // 5	8-0 (0-40-46.86) ਚਾਹੀ	

ਟ੍ਰਾਂਜੈਕਸ਼ਨ ਨੰ 9117 ਕੁੱਲ ਪਨੇ: 8 ਕੁੱਲ ਫੀਸ: 200

ਕਰਮਚਾਰੀ ਦਾ ਨਾਮ/ਅਹੁਦਾ: ਡਿਊਟੀ ਪਟਵਾਰੀ

ਪਨਾ 8 ਦਾ 7

ਪ੍ਰਿੰਟਿਡ ਮਿਤੀ : 22-09-2020 02:53:10:750 ਸ਼ਾਮ

ਪਟਵਾਰੀ ਵਲੋ ਮਾਲ ਰਿਕਾਰਡ ਮਿਤੀ 18/05/2020 ਤਕ ਕੰਪਿਊਟਰ ਵਿਚ ਦਰਜ ਹੈ।

ਕੰਪਿਊਟਰ ਮਾਲ ਰਿਕਾਰਡ ਦੀ ਮੁਤਾਬਿਕ ਨਕਲ ਦੁਰੁਸਤ ਹੈ।

ਕਰਾਨਗੋ ਦੀ ਹਸਤਾਖਰ

ਜਮਾਬੰਦੀ- 2017 2018ਪਿੰਡ- ਪਨਿਆੜ-313imported ਹੱਦਬਸਤ ਨੰ:- 313ਤਹਿਸੀਲ- ਧੀਨਾਨਗਰ ਜ਼ਿਲਾ- ਗੁਰਦਾਸਪੁਰ

1	2	3	4	5	6	7	8
ਖੇਵਟ ਨੰ:/ ਮਾਲ/ਪੱਤੀ, ਨੰਬਰਦਾਰ	ਖਤੌਨੀ ਨੰਬਰ/ ਲਗਾਨ	ਮਾਲਕ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਕਾਸ਼ਤਕਾਰ ਦਾ ਨਾਂ ਅਤੇ ਵੇਰਵਾ	ਸਿੰਚਾਈ ਦਾ ਸਾਧਨ	ਮੁਰੱਬਾ ਅਤੇ ਖਸਰਾ ਨੰਬਰ	ਰਕਬਾ ਅਤੇ ਭੌਂ ਦੀ ਕਿਸਮ	ਵਿਸ਼ੇਸ਼ ਕਥਨ
				ਟਿਊਵਵੈਲ	59 // 9/1/1	4-16 (0-24-28.11) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	59 // 9/1/2	2-6 (0-11-63.47) ਚਾਹੀ	
				ਟਿਊਵਵੈਲ	59 // 10/2	5-4 (0-26-30.46) ਚਾਹੀ	
				ਕੁਲ	ਕਿਤੇ 30	153-7 (7-75-73.18)	
				139 ਕਨਾਲ 11 ਮਰਲਾ (7 ਹੈਕਟੇਅਰ 5 ਏਅਰ 92.35 ਸੈਟੇਅਰ) ਮ[illegible]	[illegible] 35	13 ਕਨਾਲ 16 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 69 ਏਅਰ 30.83 ਸੈਟੇਅਰ) ਗੈਰਮਜਰੂਆ	
				139 ਕਨਾਲ 11 ਮਰਲਾ (7 ਹੈਕਟੇਅਰ 5 ਏਅਰ 92.35 ਸੈਟੇਅਰ) ਚਾਹੀ	[illegible] 92.35	13 ਕਨਾਲ 16 ਮਰਲਾ (0 ਹੈਕਟੇਅਰ 69 ਏਅਰ 30.83 ਸੈਟੇਅਰ) ਗੈਰਮੁਮਕਿਨ ਖੱਡ ਮਿਲ	
ਮਿਜ਼ਾਨ ਕਿਤੇ 63	ਰਕਬਾ 361 ਕਨਾਲ 11 ਮਰਲਾ (19 ਹੈਕਟੇਅਰ 30 ਏਅਰ 9.76 ਸੈਟੇਅਰ)		ਮਜਰੂਆ 139 ਕਨਾਲ 11 ਮਰਲਾ (7 ਹੈਕਟੇਅਰ 5 ਏਅਰ 92.35	139 ਕਨਾਲ 11 ਮਰਲਾ (7 ਹੈਕਟੇਅਰ 5 ਏਅਰ 92.35 ਸੈਟੇਅਰ) ਚਾਹੀ			
ਗੈਰਮਜਰੂਆ 242 ਕਨਾਲ 0 ਮਰਲਾ (12 ਹੈਕਟੇਅਰ 24 ਏਅਰ 17.41 ਸੈਟੇਅਰ)				ਸਾਲਮ 63			

ਇਹ ਪ੍ਰਿੰਟ ਮਾਲ ਰਿਕਾਰਡ ਮੁਤਾਬਿਕ ਨਕਲ ਦੁਰਸਤ ਹੈ।

Annexure III Flow Diagram from cane preparation to sugar packing

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ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED | SIZE A3 | THIS IS A CAD FILE – DO NOT MAKE ANY CORRECTIONS MANUALLY

A
ISSUE
03.07.2020

CONTROLLED COPY | ~~UNCONTROLLED COPY~~

CUSTOMER: GURDASPUR CO-OP SUGAR MILLS LTD

PROJECT: 5000 TCD SULPHUR FREE SUGAR PLANT WITH 28.5 MW CO-GEN PLANT AND 120 KLPD DISTILLERY PLANT

AVANT-GARDE
ENGINEERS AND CONSULTANTS (P) LTD.
CHENNAI 600 116, INDIA.

	NAME	SIGN	DATE	NO OF ITEMS
DRAWN	S.PRABHU		02.07.2020	–
CHKD.	R.RAVICHANDRAN		02.07.2020	
APPD.	S.SIVAKUMAR		02.07.2020	

DEPT	GRADE OF UN'TOL DIM	SCALE	WEIGHT (Kg)	REF. ASSY. DRG. NO.	ITEM NO.
PM	C/M/F	–	–	–	–
CODE 600					

TITLE: CANE PREPARATION SYSTEM (SCHEME)

DRAWING NO. FIG.4.1

CAD DRAWING NO. 12300021

REV 0

REV. NO.	DATE	DESCRIPTION	REV. BY	CHD.	APPD.

REVISIONS

A
ISSUE
13.07.2020

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CUSTOMER: THE GURDASPUR COOPERTAIVE SUGAR MILLS LTD.

PROJECT: / SETTING UP NEW SUGAR PLANT WITH COGENERATION PLANT

AVANT-GARDE
ENGINEERS AND CONSULTANTS (P) LTD.
CHENNAI 600 116, INDIA.

	NAME	SIGN	DATE	NO OF ITEMS
DRAWN	S.PRABHU		02.07.2020	–
CHKD.	R.RAVICHANDRAN		02.07.2020	
APPD.	S.SIVAKUMAR		02.07.2020	

DEPT	GRADE OF UN'TOL DIM	SCALE	WEIGHT (Kg)	REF. ASSY. DRG. NO.	ITEM NO.
PM	C/M/F	–	–	–	–
CODE 600					

TITLE: CANE MILLING, MILL JUICE & WATER IMBIBITION SYSTEM (SCHEME)

DRAWING NO. FIG.4.2

CAD DRAWING NO. 19462012

REV 0

REV. NO.	DATE	DESCRIPTION	REV. BY	CHD.	APPD.

REVISIONS

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SIZE A3
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED

LEGEND:–

CLJH	–	CLEAR JUICE HEATER
DCH	–	DIRECT CONTACT HETAER
FFE	–	FALLING FILM EVAPORATOR
DJH	–	DEFECATED JUICE HEATER
RJH	–	RAW JUICE HEATER
JDV	–	JUICE DEFECATION VESSEL
MOL	–	MILK OF LIME

A ISSUE 11.07.2020

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CUSTOMER: THE GURDASPUR COOPERTAIVE SUGAR MILLS LTD.

PROJECT: SETTING UP NEW SUGAR PLANT WITH COGENERATION PLANT

AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD. CHENNAI 600 116, INDIA.

	NAME	SIGN	DATE	NO OF ITEMS
DRAWN	S.PRABHU		08.07.2020	–
CHKD.	V.M.MOHANRAJAN			
APPD.	S.SIVAKUMAR			

DEPT	FIRST ANGLE PROJECTION	SCALE	WEIGHT (Kg)	REF. ASSY. DRG. NO.	ITEM NO.
PM / CODE 600		–	–	–	–

TITLE: JUICE CLARIFICATION, (DEFECATION) & EVAPORATION (SCHEME) (5000 TCD)

DRAWING NO. FIG.4.3 SH 1 OF 1 — REV 0

CAD DRAWING NO. 19462013

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REV. NO.	DATE	DESCRIPTION	REV. BY	CHD. BY	APPD. BY

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REV. NO.	DATE	DESCRIPTION	REV. BY	CHD. BY	APPD. BY

REVISIONS

CUSTOMER: THE GURDASPUR COOPERTAIVE SUGAR MILLS LTD.

PROJECT: SETTING UP NEW SUGAR PLANT WITH COGENERATION PLANT

AVANT-GARDE
ENGINEERS AND CONSULTANTS (P) LTD.
CHENNAI 600 116, INDIA.

	NAME	SIGN	DATE	NO OF ITEMS
DRAWN	S.PRABHU		08.07.2020	-
CHKD.	V.M.MOHANRAJAN			
APPD.	S.SIVAKUMAR			

DEPT	FIRST ANGLE PROJECTION	SCALE	WEIGHT (Kg)	REF. ASSY. DRG. NO.	ITEM NO.
PM		-	-	-	-
CODE 600					

TITLE: RAW SUGAR PAN BOILING (SCHEME) (5000 TCD)

DRAWING NO. FIG.4.4 SH 1 OF 1

CAD DRAWING NO. 19462014

REV 0

LEGEND:–

AL MOL.	–	'A' LIGHT MOLASSES
AH MOL.	–	'A' HEAVY MOLASSES
BH MOL.	–	'B' HEAVY MOLASSES
CL MOL.	–	'C' LIGHT MOLASSES
C/F	–	CENTRIFUGAL MACHINE
XLR	–	CRYSTALLIZER

A ISSUE 13.07.2020

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CUSTOMER: THE GURDASPUR COOPERTAIVE SUGAR MILLS LTD.

PROJECT: SETTING UP NEW SUGAR PLANT WITH COGENERATION PLANT

AVANT-GARDE
ENGINEERS AND CONSULTANTS (P) LTD.
CHENNAI 600 116, INDIA.

	NAME	SIGN	DATE	NO OF ITEMS
DRAWN	S.PRABHU		08.07.2020	–
CHKD.	V.M.MOHANRAJAN			
APPD.	S.SIVAKUMAR			

DEPT PM	FIRST ANGLE PROJECTION	SCALE	WEIGHT (Kg)	REF. ASSY. DRG. NO.	ITEM NO.
CODE 600		–	–	–	–

TITLE: RAW MASSECUITE CURING, SUGAR & MELTING (SCHEME) (5000 TCD)

DRAWING NO. FIG.4.5 SH 1 OF 1

CAD DRAWING NO. 19462015

REV 0

REV. NO.	DATE	DESCRIPTION	REV. BY	CHD. BY	APPD. BY

REVISIONS

ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED | SIZE: A2 | THIS IS A CAD FILE – DO NOT MAKE ANY CORRECTIONS MANUALLY

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A
ISSUE
11.07.2020

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CUSTOMER: THE GURDASPUR COOPERTAIVE SUGAR MILLS LTD.

PROJECT: SETTING UP NEW SUGAR PLANT WITH COGENERATION PLANT

AVANT-GARDE
ENGINEERS AND CONSULTANTS (P) LTD.
CHENNAI 600 116, INDIA.

	NAME	SIGN	DATE	NO OF ITEMS
DRAWN	S.PRABHU		08.07.2020	–
CHKD.	V.M.MOHANRAJAN			
APPD.	S.SIVAKUMAR			

DEPT PM	FIRST ANGLE PROJECTION	SCALE	WEIGHT (Kg)	REF. ASSY. DRG. NO.	ITEM NO.
CODE 600		–	–	–	–

TITLE: MELT CLARIFICATION, DEEP BED FILTERS & REFINED SUGAR PAN BOILING (SCHEME) (5000 TCD)

DRAWING NO. FIG.4.6 SH 1 OF 1 | REV 0

CAD DRAWING NO. 19462016

ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED | SIZE: A2 | THIS IS A CAD FILE – DO NOT MAKE ANY CORRECTIONS MANUALLY

REV. NO.	DATE	DESCRIPTION	REV. BY	CHD. BY	APPD. BY

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Annexure IV Environment Policy

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ECC AAAA T 0586 HXM 001
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The Gurdaspur Co-operative Sugar Mills Ltd.

PANIAR, P.BOX NO. 27, GURDASPUR

Ref No. GCSM/G/..712

Dated 25/03/2022

ENVIRONMENTAL, HEALTH & SAFETY POLICY

It is intention of the management of that all relevant statuary requirements under the Factory Act in force pertaining to the health and safety of its employees and to the Environment be complied with best of our ability. We understand the environmental aspects and associated impacts of our project activities and are committed to implement effective environment management plan to mitigate any impact on environmental parameters.

The management stands committed to the task and will not undertake manufacturing of substances known to be carcinogenic to human beings. Health and safety shall not be compromised for economic or any other consideration.

Poor judgment or carelessness on the part of subordinates holds responsible supervisors for the subordinate action. Each employee has an individual responsibility to follow safe practice, to detect and report hazardous conditions and behavior to their supervisors.

Submitted please

General Manager

Annexure V Description of equipments for various process

Sugar Plant Machineries for 5,000 TCD

(JUICE EXTRACTION SECTION)		
S.No	**Description**	**Equipment Proposed for 5,000 TCD**
1.0 Weighing Equipments		
1.1	Cane Weighment	One numbers (50T) pit less load cell based platform type with platform length min.14mtr each. One number of 60T shall be refurbished with digitized software.
1.2	Product Weighment	One number 60 T pit less load cell based platform type with platform length not less than 16 Mtrs.
2.0 Cane Handling, Feeding & Conveying equipments		
2.1	Cane Un-loaders	Four Numbers, three motion, hydraulic operated cane unloading grabs each 5.0T SWL with 10 mtr HOL working in the span of 24mtr x50mtr.
2.2	Hydraulic Tippler	One number, 40T capacity, fixed type hydraulic tippler table suitable for billeted cane loaded tractor trolley and trucks.
2.3	Auxiliary Cane Carrier	One number, Chain and slat apron type carrier • Location – Right angle to main cane carrier. • Width – 2300 mm • Horizontal loading length – Minimum 3.5 m • Total length – Minimum 18.5 Mtrs. • Vertical loading depth – suitable for ultimate capacity • Nos. of chain strands – 3 • Chain – 200 mm pitch, link chain. • Breaking strength of chain – 60 T • Drive arrangement – 37 kW with ACVFD motor with foot mounted planetary gearbox. • Surface speed of cane carrier – 3 to 10 m/min. • No of sprocket teeth – 16 • Rotary distributor of uniform distribution.
2.4	Cane Carrier	One number, Chain and slat apron type cane carrier • Width – 2040 mm • Horizontal loading length – 57.0 m • Inclined portion length – 24 mtr approx. Vertical loading depth – suitable for ultimate capacity • Nos. of chain strands – 3 • Chain – 200 mm pitch, link chain. • Breaking strength of chain – 80 T • Drive arrangement – 55kW with ACVFD motor with foot mounted planetary gearbox. • Surface speed of cane carrier – 3 to 10 m/min. • No of sprocket teeth – 16
2.5	Fiberized Cane Rake Elevator	One number, Trough and rake type elevator. • Chain – Forged block type • Width –2040mm • Angle of inclination – less than 45° • Total horizontal length – around 14.0 m to suit layout • Chain pitch – 229 mm • Breaking strength of chain – 80T • Drive arrangement – 45 kW with ACVFD motor with foot mounted planetary gearbox. • Surface speed of rake elevator – 10 to 30 m/min. • No of sprocket teeth – 14

2.6	Fiberized Cane Belt Conveyor	One number, Trough type belt conveyor • Effective width – 2.00 mtrs. • Drive – 30 kW, ACVFD motor & foot mounted planetary gearbox. • Surface speed of belt conveyor – 6 to 60 m/min. • Length – Min. 24 mtrs.
2.7	Tramp Iron Separator & Prepared Cane Equalizer	• Prepared cane equalizer with 7.5 kW foot mounted planetary gearbox with drive motor. • One band type air cooled continuous tramp iron separator 25kg lifting capacity. • Working depth Min. 400 mm. • Magnet rating Min.10.5 kW.
3.0 Cane Preparatory Equipments		
3.1	Cane Chopper	One fixed knives chopper shall be installed at horizontal portion of cane carrier. • Numbers of knives – 42. • Swing over dia. At the tip of the knives – 1600 mm. • Knives tip to carrier top clearance – Suitable • Drive arrangement – 1x 250 kW, 600 rpm slip ring motor with gear box. • Speed of the chopper – 300 rpm, suitably coupled to motor through gearbox. • Direction of rotation – Opposite to cane flow in the cane carrier.
3.2	Cane Leveler	One fixed knife leveler will be installed after chopper with drive arrangement. • Numbers of knives – 60 • Swing over dia. At the tip of the knives – 1600 mm • Drive arrangement – 1x400 kW 600 rpm slip ring motor • Speed of the leveler – 600 rpm. • Direction of rotation – Inline to cane flow in the cane carrier
3.3	Heavy Duty Fibrizer	Heavy duty swing type fibrizer shall be installed at head end of cane carrier. • No. of hammers – 152 • Swing over dia. – 2200 mm. • Pocketed type anvil plate wrap angle – Min. 160° • Drive – 1 X 1800 kW, 750 rpm Slip ring CACA motor. • Weight of each hammer w/o tip – Min,22 Kg.
4.0 Cane Milling Equipments		
4.1	Mills	Four (4) numbers of three roller mills with Toothed under feed roller. • Mill roller nominal dia./length of rollers – 1020 mm/2040 mm • Mill roller sq. end – 425 mm. • Under feed roller dia./length of rollers – 100% of top roller/2040 mm • Mill centre distance –12.0 m • Mill center distance for first and future zero mill – 14 mtrs • Minimum Journal dia./length – 500 mm/660 mm • All mills are provided with Donnelly chutes • Mill drives – 525 kW ACVFD motor with foot mounted planetary gearbox and rope coupling • Final speed of mill – 4.5 rpm • Apex angle – less than 74.6 deg. • Head stock center distance – Min. 3100 mm • Crown pinion – 17 teeth, 550 width

4.2	Inter Rake Carriers	Three numbers inter rake carriers shall be installed between mills. • Effective width – 2040 mm • Chain – Forged block type • Pitch – 229 mm • Breaking strength – 80 T • Drive arrangement – 30 kW motor with foot mounted planetary gearbox. • Surface speed – 10 to 33 m/min • No of sprocket teeth – 14
4.3	Juice Screening	Single stage rotary juice screening system 0.45 mm slit opening with hot water washing and CIP system. Screening area shall be greater than 22 sq. mtr.
4.4	Screened Juice Tank & Pumps	Tank holding volume 20 m^3. Two numbers pumps (one working and one standby) • Capacity –300m^3/hr,70.0 m head • Drive – minimum 110kW ACVFD
4.5	Imbibition Juice pumps	Each one for third & fourth mill. • Capacity – 130 m^3/hr; • Head – 12.0 m • Drive - minimum 15kW
4.6	Mixed Juice pumps	Primary and secondary juice collected in common tank and two pumps (one working and one standby) to pump the mixed juice to rotary juice screening system. • Capacity – 300 m^3/hr; • Head – 12.0 m • Drive - minimum 45kW
4.7	Imbibition hot water pumps	Two pumps (one working and one standby) with one 12 m^3 holding volume hot water tank. Capacity – 120 m^3/hr; Head – 50.0 m Drive – minimum 30kW One magnetic flow meter of capacity 0 to 220 m^3/hr for hot water flow measurement.
4.8	Mill Lubrication system	One centralized grease lubrication system for mill and under feed roller.
4.9	Mill Hydraulic system	One complete system with 8+1 numbers hydro pneumatic cylinder of 54 liters capacity with oil reservoir, hydraulic pumps and field instrument.
4.10	Mill Automation	DCS based automation for auto cane feed control, individual mill control, screened juice flow control, hot water flow, temp & level control and rotary screen wash water tank level control
4.11	Juice extraction plant EOT crane	30T SWL EOT crane with 5 T SWL auxiliary electrically operated crane Span & length of crane gantry – 24 m and – 98 m (approx.) Lifting height – 12.5 m
4.12	Waste water handling system	One number RCC UG sump capacity not less than 10 Cu.m with 2 numbers chock less, positive head pumps.
4.13	Mill Roller Lathe	One number 30’ long, 36” width, 30” height lathe machine suitable for mill roller maintenance.
4.14	Bagacillo Handling System	One Number Direct coupled bagacillo blower of capacity not less than 11500 Cu.m/hr. shall be installed to collect bagacillo and blow to vacuum filter station. One set of Bagacillo screen area not less than 0.065% on cane of sliding type with a provision for ultimate capacity
5.0 Steam Generators & Turbo Alternators		
5.1	Steam Generators & Turbo Alternators	One no new steam generator with capacity of 145 TPH With 28 MW Condensing cum extraction turbine shall be installed.
5.2	Bagasse Handling	New bagasse handling system shall be installed As follows. One No 1800 width bagasse elevator inclination angle not more than 45

	Equipments	deg to transmit bagasse from last mill discharge to main bagasse carrier of 100 TPH capacity & 45kW. C45 head shaft dia. 200/160mm (C/J) & C45 tail shaft dia. 180/140mm (C/J). One No Main bagasse carrier 1800 width to transmit mill bagasse & back feeding bagasse from RBC to steam generators of 100 TPH capacity & 55 kW. It also transmits excess bagasse to RBC. Two numbers Return bagasse belt conveyors to back feed bagasse from bagasse yard of suitable capacity. Approximate length of carriers shall be 150 & 26 mtrs suitable to layout. Suitable uniform back feeding arrangement at horizontal portion of the carrier shall be provided. One number Surplus bagasse belt conveyor min 1500 width & 150 mtr long approx. suitable to layout to transmit surplus bagasse from main bagasse carrier to bagasse yard of suitable capacity. Suitable plough distributors to discharge bagasse from surplus bagasse belt conveyor top horizontal portion shall be provided. All bagasse carriers are of rake type driven by 200 mm pitch double strand roller chains. One set of approach path way on both sides of the bagasse carriers. Additional belt conveyors for fuel handling suitable for layout
(JUICE PROCESSING SECTION)		
6 .0 Juice Clarification Machinery		
6.1	Screened Juice Measurement	One Mass Flow Meter – 0 to 400 TPH range. One no Phosphoric Acid tank – 2 m^3 capacity. Two nos of Phosphoric Acid dosing pumps (500 LPH Capacity each (one working and one standby) installed near screened juice tank in mill house
6.2	Raw Juice Heating	Two nos Vapour line juice heaters – 400 m^2 HS each for Raw juice 1st heating (one working and one standby) One no. Plate type heater – Condensate heater for Raw juice 2nd stage heating One no. Vertical tubular heater – 400 m^2 HS for Raw Juice 3rd stage heating.
6.3	Defecated Juice Heating	Two nos. Vertical tubular heaters – 400 m^2 HS each (including one common standby for Raw Juice 3rd stage and Defecated juice 1st stage heating) Two nos. Direct Contact Juice heaters for Defecated juice 2nd and 3rd heating.
6.4	Clear Juice heating	Two nos. Direct Contact Juice heaters for clear juice 1st and 2nd stage heating.
6.5	Milk of Preparation unit	One no. Lime Elevator – 1500 kgs/ hour capacity One no. Lime Slacker – 1200 kgs/hour capacity One no. Rake type Lime classifier for grit removal. (15 m^3/hour MOL handling capacity) Two nos. of Vibro Screens (One working and one standby) Two nos. of Milk of lime storage tanks – 30 m^3 capacity each. Two nos. of Milk of lime pumps – each 12m3/hour capacity 20 m head. (One working and one standby)
6.6	Juice Defecation Vessel	One no. continuous Juice defecation vessel – 40 m^3 capacity One no. Defecated juice receiving tank – 40 m^3 capacity. Two nos. of Defecated juice pumps – 300 m 3/hour capacity. 70 m head. (One working and one standby)
6.7	Juice Clarifier	One no. 444 Type Juice clarifier – 40 ft. Size (12200 mm diameter) with all accessories. One no. of clear juice tank – 40 m^3 capacity. Two nos. of Clear juice pumps each of 300 m^3/hour capacity. 40 m head. (One working and one standby) Two nos. of Mud liquidating pumps – 80 m^3/hour capacity 20 m head (One working and one standby)
6.8	Rotary Vacuum Filters	Two nos. of Rotary vacuum filters each of 14 ft x 28 ft drum size (4.27 m diameter x 8.53 m length) with 114 m^2 screening area each with all accessories.
7.0 Juice Evaporation		
7.1	Evaporators	Four nos. of Falling Film Evaporators (FFE) each of 3600 m^2 HS with all

		accessories (One each as 1st effect, 2nd effect and 3rd effect and one as common standby for 1st , 2nd and 3rd effects). Four nos. of Falling Film Evaporators (FFE) each of 3600 m^2 HS with all accessories (One each as 1st effect, 2nd effect and 3rd effect and one as common standby for 1st , 2nd and 3rd effects). Two nos. of Roberts Evaporators each of 800 m2 HS as 5th effect evaporators (One working and one Standby) Four nos. of syrup extraction pumps for 5th body evaporator (Two pumps each for each 5th body evaporator- One working and one standby) – each of 80 m3/hour capacity 30 m head.
7.2	Flash vapour Recovery system	One no of SS 304 construction flash vapours recovery system (Cigar) for evaporator and pan condensates with flash tanks and two condensate pumps of suitable capacity and head(One working and one standby)
7.3	Chemical cleaning facility (CIP)	One no. acidic chemical storage tank (Rubber lined MS tank) of 25 m3 capacity One no. Caustic chemical storage tank (MS tank) of 25 m3 capacity. Three nos. of Chemical pumps each of 100 m^3/hour capacity - One for acidic chemical pumping, one for caustic chemicals pumping and one common standby for both.
8.0 Raw Sugar Crystallisation		
8.1	Pan Supply Tanks	Eleven nos. of Pan supply tanks each of 35 m 3 holding volume for storage of Syrup, melt, molasses and reject molasses from Refinery
8.2	Molasses Conditioners	Four nos. Direct Contact type of molasses conditioners working on 2nd effect vapours One no. 40 TPH capacity for 'A' Heavy Molasses, One no.20 TPH Capacity for 'B' Heavy Molasses, One no.10 TPH capacity for 'C' Light Molasses, One no.30 TPH capacity for Refinery Reject molasses.
8.3	Batch Pans	One no. 60 T batch pan with mechanical circulator for A Footing. One no. 60 T batch pan with mechanical circulator for B Footing/ Graining One no. 60 T batch pan with mechanical circulator for C Graining. One no. 80 T batch pan with mechanical circulator as common standby for all A, B & C continuous pans (To work whenever any of the continuous pan is under cleaning or water boiling)
8.4	Continuous Pans	One no. Vertical tube Horizontal continuous pan of 65 TPH capacity for 'A' Massecuite boiling with all accessories and automation One no. Vertical tube Horizontal continuous pan of 30 TPH capacity for 'B' Massecuite boiling with all accessories and automation. One no. Vertical tube Horizontal continuous pan of 20 TPH capacity for 'C' Massecuite boiling with all accessories, automation and mechanical circulator in the tightening zone
8.5	Sweet Water Tank	One no sweet water tank of 75 m3 capacity to receive and hold water boiled materials from Continuous pans. Two nos. of sweet water pumps each of 30 m 3/hour capacity 30 m head – One working and one standby.
8.6	Vacuum Crystallisers(Grain / Footing crystallisers)	Three nos. of horizontal cylindrical vacuum crystallizer each of 70 T Capacity – one each for storing 'A' footing, 'B' Footing/ grain and 'C' Grain. Two nos. of Grain feeding pumps with ACVFD Motors (one working and one standby)of suitable capacity for each vacuum crystallizer to feed grain to continuous pans.
8.7	Seed Crystallisers	Two nos of Open 'U' Shaped air cooled seed crystallisers each of 70 T Capacity – one each for 'B' Seed and 'C' Seed.
8.8	Sealing Crystallisers and Massecuite pumps	One no. of horizontal cylindrical sealing crystallizer of 65 T capacity for 'A' Massecuite. Two nos. of 'A' Massecuite pumps each of 70 TPH Capacity (One working and one standby) One no. of horizontal cylindrical sealing crystallizer of 65 T capacity for 'B' Massecuite. Two nos. of 'B' Massecuite pumps each of 35 TPH Capacity (One working and one standby)

		One no. of horizontal cylindrical sealing crystallizer of 45 T capacity for ‘ C’ Massecuite. Two nos. of ‘C’ Massecuite pumps each of 30 TPH Capacity (One working and one standby)
8.9	Receiving Crystallisers	One no. open air cooled ‘U’ Shaped receiving crystallizer of 85 T Capacity for ‘A’ Massecuite. One no. open air cooled ‘U’ Shaped receiving crystallizer of 85 T capacity common for ‘B’ and ‘C’ Massecuite
8.10	Vertical Crystallisers	One no. of Water cooled vertical crystallizer of 250 T Capacity for cooling ‘B’ massecuite. Two nos. of Water cooled vertical crystallizer each of 250 T Capacity for cooling ‘C’ massecuite. One no of cooling tower of 80 m3/hour capacity to cool and recirculate cooling water for vertical crystallisers. Two pumps- 80 m^3/hour capacity (one working and one standby) for circulation of cooling water through coils. Three nos of massecuite liquidation pumps – one each for each vertical crystallizer – each of 30 TPH capacity with 30 m head.
8.11	Condensers and Ejectors	Two nos. of Multi jet single entry condensers of SS 304 Construction – one each for each last vessel evaporators. Four nos. of Multi jet single entry condensers of SS 304 Construction – one each for each batch pan. Three nos. of Multi jet single entry condensers of SS 304 Construction – one each for each continuous pan. Two nos. of Ejectors of SS 304 Construction – common for both raw sugar plant and refinery
8.12	Injection water pumps	Three nos. of high efficiency vertical mixed flow injection water pumps – each of 2500 m^3/hour capacity 28 m head (Two working and one standby). These injection water pumps are common for both raw and refinery plants.
8.13	Cooling Towers (for Injection water)	Two nos. of Induced draft mixed flow two cell cooling towers each cell of 3000 m^3/hour capacity. No cooling tower pumps as hot injection water from condensers flows by gravity to the top of cooling tower through a suitable size header pipe.
8.14	Surplus Condensate Cooling towers	Two stage cooling towers each stage of 70 m^3/hour capacity to cool hot condensate to 30 to 32°C. with required pumps and accessories for cooling and recycling surplus condensate.
9.0 Raw Sugar Centrifugal		
9.1	Batch Centrifugal	Four nos. of flat bottom plough discharge centrifugal machines each of 1750 kg/ charge capacity with ACVFD drive motors to cure Raw ‘A’ Massecuite (Three working and one Standby) One no. super-heated wash water system with PHE and water pumps (Two pumps – One working and one standby)
9.2	Continuous centrifugal	In total, Seven nos. of 1500 mm basket dia. Continuous centrifugal machines for curing ‘B’ & ‘C’ Massecuite as follows: Three nos. for ‘ C’ Massecuite curing (Two working and one standby) with one transient heater for each machine. Two nos. for ‘B’ Massecuite curing. One no. for C Fore magma curing. One no. as common standby for ‘B’ and ’C’ Fore magma curing. All centrifugal are provided with automated massecuite feeding valves.
9.3	Molasses run off tanks and pumps	Five nos. of molasses run off tanks each of 3 m 3 capacity – One each for ‘A’ Heavy. ‘A’ Light, ‘B’ Heavy, ‘C’ Light and Final molasses. Ten nos. of pumps of suitable capacity – Two pumps each for ‘A’ Heavy. ‘A’ Light, ‘B’ Heavy, ‘C’ Light and Final molasses pumping (One working and one standby – Progressive cavity pumps)
9.4	Magma Minglers and Magma pumps	Two nos. of magma minglers for ‘C’ Fore sugar. Two nos. of ‘ C’ Fore magma pumps each of 25 TPH Capacity with 22 m head for each mingler (One working and one standby) One no of magma mingler for ‘ C’ Seed, Two nos. of ‘C’ seed magma pumps each of 25 TPH Capacity with 22 m Head (One working and one

		standby) One no of magma mingler for ‘ B’ Seed, Two nos. of ‘B’ Seed magma pumps each of 25 TPH Capacity with 22 m Head (One working and one standby)
9.5	Seed and Sugar Melter	One no. Horizontal sugar and seed melter of 30 TPH capacity for melting excess ‘B’ seed and ‘C’ seed. Two nos. of Melt pumps (One working and one standby) each of 40 m3/hour capacity 30 m head for pumping melt to Pan supply tanks.
9.6	Final Molasses – Flow Measurement and cooling.	One no. flow meter of 0 to 15 m3/hour capacity for final molasses (‘C’ Molasses) One no. shell and tube type molasses cooler of suitable capacity to cool the final molasses before storage.
9.7	Molasses storage tanks	Existing three nos. of molasses storage tanks each of 4000 T Capacity in Sugar plant shall be used for molasses storage.
10.0 Raw Sugar Melt clarification		
10.1	Raw Sugar Mingler	One no. Belt conveyor of suitable width and capacity to transfer raw sugar from centrifugals to Mingler. One no. of Raw sugar mingler of 30 TPH raw sugar magmising capacity with hot water and rori melt.
10.2	Raw Sugar Melter and screening	One no. Horizontal melter of 30 TPH capacity with 20 m3 working volume working on second effect vapours. Two nos. of Melt pumps of 40 m^3/hour capacity 30 m head (One working and one standby) Three nos. of Vibro screens each of 30 m^3/hour capacity (Two working and one standby) One no. Screened Melt buffer tank of 25 m^3 capacity. Two nos. of Screened melt pumps each of 40 m 3/hour capacity 30 m head (One working and one standby) with VFD Motors. One no. Colour precipitant dosing tank of suitable capacity. Two nos. Colour precipitant dosing pumps of suitable capacity and head.(One working and one standby)
10.3	Raw Melt Heater	One no. Direct Contact type heater of 40 m^3/hour capacity of SS 304 MOC.
10.4	Floatation Melt Clarifier	One no. Reaction cum aeration tank of suitable capacity. One no. Floatation type melt clarifier of 25 m^3 working volume. One no. scum buffer tank of 5 m^3 capacity. Two nos. of Scum pumps (One working and one standby) One no. Clear melt tank of 25 m3 capacity. Two nos. of clear melt pumps each of 40 m 3/hour capacity 40 m head with VFD motors(One working and one standby) One no. each preparation tank for Lime scurate , Flocculant and Phosphoric acid. One no. each dosing tanks for Lime Sucrate and Flocculant. Each Two nos. of dosing pumps (One working and one standby) for Lime sucrate, Phosphoric Acid and Flocculant. One set of preparation tank and dosing pumps for Starch treatment enzyme and Dextran treatment enzyme of suitable capacity. (One set for each enzyme)
11. Filtration of Clear Melt and Concentration		
11.1	Deep Bed Filters (Multimedia filter)	Two nos. of Deep Bed Filters each of 35 m 3/hour capacity. One no of Filtered Melt tank of 25 m^3 capacity (MOC : SS 409) Two nos. of filtered melt pumps each of 40 m^3/hour 40 m head (One working and one standby) One no. of Back wash tank of 25 m^3 capacity. Two nos. of back wash pumps each of 40m3/hour capacity 40 m head (One working and one standby) One no back wash screening tank (1.5 m^3 capacity) Two nos. of air blowers each 3.5 m^3 / minute capacity. Two nos. pre check filter set (one working and one standby)on the delivery line of filtered melt pumps to Melt concentrator
11.2	Melt	One no. Plate type filtered melt pre- heater of suitable capacity.

	Concentrators	Two nos. of Plate type falling film evaporators each of 250 m2 HS. Two nos. of Thick liquor pumps each of 50 m 3/hour capacity with 30 m head (One working and one standby) All wetted parts of Melt concentrator – SS 409 and melt pre heater – SS 304.
12.0 Refinery Pan Boiling and Crystallization		
12.1	Refinery Pan supply tanks	Four nos. of vertical cylindrical sealed tanks each of 50 m3 holding capacity – Two for Thick liquor, one each for 'R' Heavy molasses and 'R' Light molasses.
12.2	Molasses Conditioners	One no. of DCH type Molasses conditioner for 'R' Heavy molasses – 30 TPH Capacity. One no. of DCH type Molasses conditioner for 'R' Light molasses – 20 TPH Capacity. Both the molasses conditioners are SS 304 MOC.
12.3	Refinery pans	Three nos. of batch pans with mechanical circulators each pan of 60 T Strike capacity. MOC of all refinery batch pans – SS 409.
12.4	Seed Crystalliser	One no 'O' Shaped Seed crystallizer (Dry seed) of 60 T Capacity with all wetted parts of SS 409 MOC.
12.5	Vacuum Crystalliser	One no 'O' Shaped vacuum crystallizer of 65 T Capacity with all wetted parts of SS 409 MOC
12.6	Crystallisers (Strike receivers)	Three nos. of 'O' shaped cylindrical crystallizer each of 65 T capacity. MOC : SS 409.
12.7	Condensers	Four nos. of Multijet single entry condensers (Three for refinery batch pans and one for Melt concentrator second vessel.)
13.0 Refined Sugar – Curing , Grading and packing		
13.1	Refinery Centrifugals	Three nos. of flat bottom plough discharge batch centrifugal machines each of 1750 kg/ charge capacity with ACVFD drive motors to cure refinery Massecuite. One no. super heated wash water system with PHE and water pumps (Two pumps – One working and one standby)
13.2	Molasses Run off tanks	Two nos. of run off tanks each of 3 m^3 capacity of SS 409 MOC. - One run off tank each for 'R' Heavy molasses and 'R' Light Molasses. One no of run off tank of 3 m^3 capacity for Reject molasses. Six nos. of molasses pumps – Two each for 'R' Heavy , 'R' Light and Reject molasses (One working and one standby)
13.3	Sugar Hoppers	Two nos. of stainless steel sugar hoppers each of 12 m length, 2 metre width and 300 m depth. -One no plain hopper placed below Refinery centrifugal to receive cured sugar from Centrifugal. - One no. Melt Deck hopper placed after Fluidized bed dryer with rori separator. One no. grill type rare earth magnet at the discharge end of second hopper before elevators. One set of food grade belt conveyors to carry rori and lumps sugar from second hopper to Rori melter.
13.4	Fluidized Bed Sugar Dryer cum cooler	One no 35 TPH Capacity Sugar dryer cum cooler with hot air blower, cold air blower , dust collection system and other accessory units. All sugar and air contact parts – SS 304.
13.5	Sugar Elevators	Two nos. of Bucket type belt elevators each of 30 TPH Capacity to carry sugar from hoppers to graders. MOC of Buckets: SS 304
13.6	Sugar Graders	Two nos. of 6 deck sugar sizers, for sieving of sugar, each of 30 TPH capacity. All sugar wetted parts – SS 304
13.7	Dry Seed Conveyor	One set of Food grade Belt conveyors each of 600 mm width to carry dry seed from Sugar graders to Dry seed crystallizer in refinery pan station.
13.8	Rori Melter	One no Rori and powder sugar melter of 10 TPH Capacity. Two nos. of Rori melt pumps each of 20 m 3/hour capacity 30 m head (one working and one standby)
13.9	Sugar Bins (Silos)	Three nos. of vertical cylindrical sugar bins with conical bottom of SS 409 MOC. One no of 150 T Storage Capacity for 'M' Grade sugar.

		One no of 50 T Storage Capacity for 'S' Grade sugar. One no of 50 T Storage Capacity for 'L' Grade sugar.
13.10	Sugar weighing machines & bags stitching machines	Four nos. of automatic load cell based sugar weighing machines. Two nos. for 150 T capacity 'M' Sugar bin. One each for each 50 T Capacity 'L' and ' S' sugar bins. Four nos. of double head, automatic bag stitching machines – Two nos for 'M' Grade sugar bagging and one each for ' L' and 'S' grade sugar bagging
13.11	Sugar bags handling system	One set of overhead conveyors, stackers, portable belt conveyors etc to transfer sugar bags from bagging station to sugar ware house
13.12	Sugar ware House	One new ware house of 20000 T of sugar bags storage Capacity Existing four nos. of 6000 T Capacity warehouses shall also be used for sugar bags storage as well as for Retail sugar packing and storage.
13.13	Sugar packing machines for retail sale	Two nos. of load cell based auto sugar packing machines (1 kg, 2 kg and 5 kg pouches) with all accessories. Both the machines shall have provision for both 1 kg, 2 kg and 5 kg pouches packing.
13.14	Sugar Cubes making machine (For retail market sale)	One set of Sugar Cubes making machinery and equipments of 100 to 120 kgs/hour capacity with all accessories.
14.0 Juice Processing plant accessories		
14.1	Hot and Cold water overhead tanks	Three nos. of cylindrical tanks each of 40 m^3 capacity. -One tank for Hot water (Condensate) -Two tanks for Cold water.(Raw water / Cooled condensate)
14.2	Service Water pumps	Two nos. of 200 m3/hour capacity pumps (One working and one standby). Existing bore well pumps shall also be used to meet the water requirement of the plant.
14.3	Cold water UGR	One no Cold water underground reservoir of RCC Construction of 500 m^3 capacity Two nos. of Cold water UGR pumps each of 150 m^3/hour capacity 50 m head. (One working and one standby)
14.4	Hot water UGR	One no Hot water underground reservoir of RCC Construction of 350 m^3 capacity. Two nos. of Hot water UGR pumps each of 200 m^3/hour capacity 50 m head. (One working and one standby)
14.5	Effluent Treatment plant	One set of Effluent treatment system to treat the entire effluent generated from sugar and cogeneration plant to meet the norms of state and central pollution control boards.
14.6	Automation	The process house automation in the boiling house including batch and continuous pans shall be achieved through DCS

Annexure VI FLY ASH HANDLING

LEGEND:-

	GATE VALVE	PP	PNEUMATIC PANEL
	GLOBE VALVE	ADT	AUTO DRAIN TRAP (TIMER)
	BALL VALVE	PS	PRESSURE SWITCH
	SAFETY VALVE	PI	PRESSURE INDICATOR
	NON-RETURN VALVE	BV	BLOW VALVE
A	ACTUATOR OPTD. BUTTER FLY VALVE		

A
ISSUE
09.07.2020

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CUSTOMER: THE GURDASPUR COOPERTAIVE SUGAR MILLS LTD

PROJECT: MODERNIZATION BY SETTING UP NEW SUGAR PLANT WITH COGENERATION PLANT

AVANT-GARDE
ENGINEERS AND CONSULTANTS (P) LTD.
CHENNAI 600 116, INDIA.

	NAME	SIGN	DATE	NO OF
DRAWN	S.PRABHU		08.07.2020	–
CHKD.	S.R.SAIPRASAD			
APPD.	S.SIVAKUMAR			

DEPT	GRADE OF UN'TOL DIM	SCALE	WEIGHT (Kg)	REF. ASSY. DRG. NO.	ITEM NO.
PM	C/M/F	NTS	–	–	–
CODE 600					

TITLE: SCHEME OF ASH HANDLING SYSTEM

DRAWING NO. 3-19462-600-0019

CAD DRAWING NO. 19462019

REV 0

REV. NO.	DATE	DESCRIPTION	REV. BY	CHD.	APPD.

REVISIONS

CAUTION : THE INFORMATION IN THIS DOCUMENT IS THE PROPERTY OF AVANT-GARDE ENGINEERS AND CONSULTANTS (P) LTD.
IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY
THIS IS A CAD FILE – DO NOT MAKE ANY CORRECTIONS MANUALLY
SIZE A3
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED

Annexure VII MSDS

Phosphoric Acid,ACS

SECTION 1 : Identification of the substance/mixture and of the supplier

Product name : **Phosphoric Acid,ACS**

Manufacturer/Supplier Trade name:

Manufacturer/Supplier Article number: **S25470B**

Recommended uses of the product and uses restrictions on use:

Manufacturer Details:

AquaPhoenix Scientific
9 Barnhart Drive, Hanover, PA 17331

Supplier Details:

Fisher Science Education
15 Jet View Drive, Rochester, NY 14624

Emergency telephone number:

Fisher Science Education Emergency Telephone No.: 800-535-5053

SECTION 2 : Hazards identification

Classification of the substance or mixture:

Corrosive
Skin corrosion, category 1B
Corrosive to metals, category 1

Corrosive to Metals 1
Skin Corrosion 1B

Signal word :Danger

Hazard statements:
May be corrosive to metals
Causes severe skin burns and eye damage
Precautionary statements:
If medical advice is needed, have product container or label at hand
Keep out of reach of children
Read label before use
Do not breathe dust/fume/gas/mist/vapours/spray
Wash ... thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Keep only in original container
Do not eat, drink or smoke when using this product
Immediately call a POISON CENTER or doctor/physician
Specific treatment (see ... on this label)
Wash contaminated clothing before reuse
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing

Store locked up
Store in a corrosive resistant/... container with a resistant inner liner
Dispose of contents/container to ...

Conc 10% to <25%:
Eye Irritation 2, Skin Irritation 2
Conc <10%:
Not classified for physical or health hazards under GHS.

Other Non-GHS Classification:

WHMIS

E

NFPA/HMIS

NFPA SCALE (0-4)

HMIS RATINGS (0-4)

SECTION 3 : Composition/information on ingredients

Ingredients:		
CAS 7664-38-2	Phosphoric Acid	>85 %
CAS 7732-18-5	Deionized Water	<15 %
		Percentages are by weight

SECTION 4 : First aid measures

Description of first aid measures

After inhalation: Seek medical attention immediately. Move exposed individual to fresh air. Loosen clothing as necessary and position individual in a comfortable position.

After skin contact: Remove contaminated clothing and wash before reuse or discard. Rinse skin with for 30 minutes with deluge of water or under a shower. Seek immediate medical attention.Wash affected area with soap and water.

After eye contact: Rinse immediately with plenty of water, also under the eyelids, for at least 30 minutes. Remove contact lens(es) if able to do so during rinsing. Seek medical attention immediately.Protect unexposed eye.

After swallowing: Seek medical attention immediately. Rinse mouth thoroughly. Do not induce vomiting. Have exposed individual drink sips of water.

Most important symptoms and effects, both acute and delayed:

Irritation, Nausea,Headache, Shortness of breath.May cause severe burns and ulcerations. May cause severe burn and irreversible eye injury. May cause gastrointestinal tract burns, corrosion and permanent tissue damage of the digestive tract and esophagus;

Indication of any immediate medical attention and special treatment needed:

If seeking medical attention, provide SDS document to physician.Wipe off contact areas with a dry cloth if possible, before flushing with water. Dispose of cloth by soaking in water. Neutralize the soaking solution with sodium hydroxide solution.

SECTION 5 : Firefighting measures

Extinguishing media

Suitable extinguishing agents: If in laboratory setting, follow laboratory fire suppression procedures. Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition

For safety reasons unsuitable extinguishing agents:

Special hazards arising from the substance or mixture:

Hydrogen gas is released in contact with most metals. Combustion products may include carbon oxides or other toxic vapors.Combustion products may include phosphine, oxides of phosphorus, and hydrogen gas.

Advice for firefighters:

Protective equipment: Wear protective equipment Use respiratory protective device against the effects of fumes/dust/aerosol/vapor . Use NIOSH-approved respiratory protection/breathing apparatus.

Additional information (precautions): Move product containers away from fire or keep cool with water spray as a protective measure, where feasible.

SECTION 6 : Accidental release measures

Personal precautions, protective equipment and emergency procedures:

Wear protective equipment. Avoid contact with eyes, skin, and clothing. Use respiratory protective device against the effects of fumes/dust/aerosol. Keep unprotected persons away. Ensure adequate ventilation.Keep away from ignition sources. Protect from heat.Stop the spill, if possible. Contain spilled material by diking or using inert absorbent. Transfer to a disposal or recovery container.

Environmental precautions:

Prevent from reaching drains, sewer or waterway. Collect contaminated soil for characterization per Section 13

Methods and material for containment and cleaning up:

Absorb spillage to prevent material damage due to corrosiveness to metal. If in a laboratory setting, follow Chemical Hygiene Plan procedures.Place into properly labeled containers for recovery or disposal. If necessary, use trained response staff/contractor.Collect liquids using inert absorbent material.

Reference to other sections:

SECTION 7 : Handling and storage

Precautions for safe handling:

Wash hands after handling. Do not mix with bases. Use in a chemical fume hood.Follow good hygiene procedures when handling chemical materials. Do not eat, drink, smoke, or use personal products when handling chemical substances. If in a laboratory setting, follow Chemical Hygiene Plan.Use only in well ventilated areas.Prevent contact with eyes, skin, and clothing

Conditions for safe storage, including any incompatibilities:

Store away from oxidizing agents.Store in cool, dry conditions in well sealed containers. Keep container tightly sealed.Do not store under direct sun light. Do not pile up the containers. Do not store at temperatures close to freezing point.Container materials should be made of stainless steel 316-L, high-density polyethylene, or

glass.Provide ventilation for containers. Avoid storage near extreme heat, ignition sources or open flame. Store away from foodstuffs.

SECTION 8 : Exposure controls/personal protection

Control Parameters: 7664-38-2, Phosphoric Acid, ACGIH TLV: 1 mg/m³ as TWA
7664-38-2, Phosphoric Acid, ACGIH TLV 3 mg/m³ as STEL
7664-38-2, Phosphoric Acid, OSHA PEL†: TWA 1 mg/m3 (See 29 CFR 1910.1000 Appendix G)
7664-38-2, Phosphoric Acid, NIOSH REL: TWA 1 mg/m3
7664-38-2, Phosphoric Acid, NIOSH REL ST: 3 mg/m3
7664-38-2, Phosphoric Acid, NIOSH IDLH: 1000 mg/m3

Appropriate Engineering controls: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use/handling.Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor or dusts (total/respirable) below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above.

Respiratory protection: Use suitable respiratory protective device when high concentrations are present. Use suitable respiratory protective device when aerosol or mist is formed. For spills, respiratory protection may be advisable.

Protection of skin: The glove material has to be impermeable and resistant to the product/ the substance/ the preparation being used/handled.Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.

Eye protection: Safety glasses with side shields or goggles.

General hygienic measures: The usual precautionary measures are to be adhered to when handling chemicals. Keep away from food, beverages and feed sources. Immediately remove all soiled and contaminated clothing. Wash hands before breaks and at the end of work. Do not inhale gases/fumes/dust/mist/vapor/aerosols. Avoid contact with the eyes and skin.

SECTION 9 : Physical and chemical properties

Appearance (physical state,color):	Clear, colorless liquid	**Explosion limit lower**: **Explosion limit upper**:	Not determined Not determined
Odor:	Odorless	**Vapor pressure**:	Not determined
Odor threshold:	Not determined	**Vapor density**:	3.4
pH-value:	Not determined	**Relative density**:	1.680
Melting/Freezing point:	21°C	**Solubilities**:	Soluble in water
Boiling point/Boiling range:	158°C	**Partition coefficient (n-octanol/water)**:	Not determined
Flash point (closed cup):	Not determined	**Auto/Self-ignition temperature**:	Not determined

Evaporation rate:	Not determined	**Decomposition temperature**:	300°C
Flammability (solid,gaseous):	Not applicable	**Viscosity**:	a. Kinematic:Not determined b. Dynamic: Not determined
Density: Not determined **Additional property::**Hygroscopic. **Specific Gravity:**1.680 **Molecular Weight: :**98.00 g/mol			

SECTION 10 : Stability and reactivity

Reactivity:
Chemical stability: This hygroscopic substance pulls moisture from air. No decomposition if used and stored according to specifications.
Possible hazardous reactions:
Conditions to avoid: Metals. Exposure to moist air or water. Incompatible materials. Excess heat. Store away from oxidizing agents, strong acids or bases.
Incompatible materials: Metals. Bases . Alcohols. Amines. Halogenated agents. Organic peroxides. Amides. Azo. Diazo. Hydrazines. Chlorates. Carbamates. Esters. Fluorides. Phenols. Cresols . Organophosphates. Phosphothioates. Epoxides. Combustible and flammable materials. Explosives. Alkalines. Nitromethane. Sodium tetrahydroborate. Mercaptans. Aldehydes. Ketones. Glycols. Cyanides. Sulfides. Caustics. Strong acids.Carbides. Strong bases.Fulminates. Reducing agents. Nitrates. Acetic acid. Oxidizing agents
Hazardous decomposition products: Phosophine. Oxides of phosphorus. Hydrogen gas is released in contact with most metals.

SECTION 11 : Toxicological information

Acute Toxicity:		
Oral:	2600 mg/kg bw	LD50 for a 10% solution of 75.4% thermal phosphoric acid (rat)
Oral:	1530 mg/m3	LD50 oral-rat: (7764-38-2)
Inhalation:	>850mg/m3	LC50 inhalation-rat (1h) (7664-38-2)
Chronic Toxicity: No additional information.		
Corrosion Irritation:		
Dermal:	Section 2	Classified as a skin corrosion
Ocular:	Section 2 (eye damage is presumed with Skin 1 classification)	Eye Damage
Dermal:		May cause severe burns and ulcerations.
Ocular:		May cause severe burn and irreversible eye damage
Sensitization:		No additional information.
Single Target Organ (STOT):		No additional information.
Numerical Measures:		No additional information.

Carcinogenicity:	IARC: Not listed NTP: Not listed
Mutagenicity:	No additional information.
Reproductive Toxicity:	No additional information.

SECTION 12 : Ecological information

Ecotoxicity

Do not release to water: May release phosphates which will result in algae growth, increased turbidity, and depleted oxygen in the marine environment; at extremely high concentrations and/or quantities, this may be hazardous to fish or other marine organisms.

LpH50 (median lethal pH) (96h) phosphoric acid (bluegill sunfish): 3-3.25

Adult brook trout survived 5 months exposure to pH levels of 5.0 and above. Total egg production was not affected, but viability was significantly less at pH 5.0. Hatchability was significantly less at levels below pH 6.5. Growth and survival of alevins was reduced at the lower pH levels. : The data indicate that continuous exposure to pH levels below 6.5 result in significant reductions in egg hatchability and growth.

Algae: NOEC (EC50 >100 mg/l, the upper limit of toxic range) D. subspicatus : 100 mg/l

Persistence and degradability: Readily degradable in the environment.
Bioaccumulative potential: The phosphorus element is an essential nutrient for flora and fauna
Mobility in soil:
Other adverse effects:

SECTION 13 : Disposal considerations

Waste disposal recommendations:

Product/containers must not be disposed together with household garbage. Do not allow product to reach sewage system or open water.It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11). Consult federal state/ provincial and local regulations regarding the proper disposal of waste material that may incorporate some amount of this product.

SECTION 14 : Transport information

UN-Number

1805

UN proper shipping name

Phosphoric Acid Solution

Transport hazard class(es)

Class:
8 Corrosive substances

Packing group:III
Environmental hazard:Not listed as a Marine Polllutant
Transport in bulk:
Special precautions for user:

SECTION 15 : Regulatory information

United States (USA)

SARA Section 311/312 (Specific toxic chemical listings):

Acute

SARA Section 313 (Specific toxic chemical listings):

None of the ingredients is listed

RCRA (hazardous waste code):

None of the ingredients is listed

TSCA (Toxic Substances Control Act):

All ingredients are listed.

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):

7664-38-2 Phosphoric acid 5000

Proposition 65 (California):

Chemicals known to cause cancer:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for females:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for males:

None of the ingredients is listed

Chemicals known to cause developmental toxicity:

None of the ingredients is listed

Canada

Canadian Domestic Substances List (DSL):

All ingredients are listed.

Canadian NPRI Ingredient Disclosure list (limit 0.1%):

None of the ingredients is listed

Canadian NPRI Ingredient Disclosure list (limit 1%):

7664-38-2 Phosphoric acid

SECTION 16 : Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.Note:. The responsibility to provide a safe workplace remains with the user.The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment.The information contained herein is, to the best of our knowledge and belief, accurate.However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material.It is the responsibility of the user to comply with all applicable laws and regulations applicable to this material.

GHS Full Text Phrases:

Abbreviations and acronyms:

IMDG: International Maritime Code for Dangerous Goods
PNEC: Predicted No-Effect Concentration (REACH)

CFR: Code of Federal Regulations (USA)
SARA: Superfund Amendments and Reauthorization Act (USA)
RCRA: Resource Conservation and Recovery Act (USA)
TSCA: Toxic Substances Control Act (USA)
NPRI: National Pollutant Release Inventory (Canada)
DOT: US Department of Transportation
IATA: International Air Transport Association
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
ACGIH: American Conference of Governmental Industrial Hygienists
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
DNEL: Derived No-Effect Level (REACH)

Effective date : 12.07.2014
Last updated : 03.23.2015

Hydrochloric Acid MSDS

Effective Date: December 03, 2012
24 Hour Emergency Contact:
ChemTel: (800)255-3924
www.pioneerforensics.com

1. PRODUCT AND COMPANY IDENTIFICATION

Product:	**Hydrochloric Acid**
Product Number(s):	PF021, PF022
CAS#:	7647-01-0
Synonyms:	Muriatic acid; Hydrogen chloride, aqueous; Chlorohydric acid
Manufacturer:	Pioneer Forensics, LLC 804 E. Eisenhauer Blvd. Loveland, CO 80537 Ph: (970) 292-8487
Emergency Number:	(800) 255-3924 (CHEM-TEL)
Customer Service:	(970) 292-8487

2. HAZARDS IDENTIFICATION

Emergency Overview: DANGER! Corrosive. Causes severe skin, eye, and digestive tract burns. Harmful if swallowed. Mist or vapor extremely irritating to eyes and respiratory tract.

Safety Ratings:	Health: 3, Severe	Reactivity: 1, Slight
	Flammability: 0, None	Contact: 4, Extreme

OSHA Regulatory Status: This product is considered a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Potential Acute Health Effects:

Routes of Exposure: Inhalation, ingestion, skin contact, eye contact

Inhalation: Corrosive. May cause damage to mucous membranes in nose, throat, lungs and bronchial system.

Ingestion: Corrosive. Harmful if swallowed. May produce burns to the lips, oral cavity, upper airway, esophagus and digestive tract.

Skin Contact: Corrosive. Causes severe burns.

Eye Contact: Corrosive. Causes severe burns. Vapor or spray may cause eye damage, impaired sight or blindness.

Target Organs: Skin, respiratory system, eyes, lungs

Chronic Health Effects: Corrosive. Prolonged contact causes serious tissue damage.

Aggravation of: Repeated or prolonged exposure to the substance can produce target organs damage.

Medical Conditions: Persons with pre-existing skin disorders or eye problems may be more susceptible to the effects of the substance.

Potential Environmental Effects: May affect the acidity (pH) in water with risk of harmful effects to aquatic organisms.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS#	Chemical Formula	Formula Weight	Hazardous	% by Weight
Hydrochloric Acid	7647-01-0	HCl	36.46	Yes	36.5 - 38.0
Water	7732-18-5	H_2O	18.02	No	62.0 - 63.5

4. FIRST AID MEASURES

First Aid Procedures:

Inhalation: Remove to fresh air. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Get medical attention immediately.

Ingestion: Do not induce vomiting. If vomiting occurs, keep head low so that vomit does not enter lungs. Never give anything by mouth to an unconscious person. GET MEDICAL ATTENTION IMMEDIATELY.

Skin Contact: Flush affected area with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Get medical attention immediately.

Eye Contact: Check for and remove contact lenses. Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

General Advice: In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

Notes to Physician: Treat symptomatically. Keep victim under observation.

5. FIRE FIGHTING MEASURES

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 1

Flammable Properties: The material is not flammable.

Flash Point: Not applicable

Auto-ignition Temp: Not applicable

Flammable Limits in Air (% by volume): Not applicable

Suitable Extinguishing Media: Water, dry powder, foam, carbon dioxide

Unsuitable Extinguishing Media: No information found

Hazardous Combustion Products: Hydrogen chloride. Chlorine. May decompose upon heating to produce corrosive and/or toxic fumes.

Specific Hazards: Fire may produce irritating, corrosive, and/or toxic gases.

Special Protective Equipment For Firefighters: As in any fire, wear MSHA/NIOSH approved (or equivalent) self-contained positive pressure or pressure-demand breathing apparatus and full protective gear.

Specific Methods: Use water spray to cool unopened containers. Cool containers exposed to flames with flooding quantities of water until well after the fire is out. In the event of fire and/or explosion do not breathe fumes.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: Ventilate area of leak or spill. Isolate hazard area and keep unnecessary and unprotected personnel away from the area of the leak or spill. Keep upwind. Keep out of low areas. Wear appropriate personal protective equipment as specified in the Exposure Control and Personal Protection Section 8. Avoid contact with eyes, skin, and clothing.

Environmental Precautions: Prevent further leakage or spillage if safe to do so. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground. In case of large spill, dike if needed.

Methods for Containment: Stop the flow of material, if this is without risk. Prevent entry into waterways, sewer, basements or confined areas. Dike the spilled material, where this is possible.

Methods for Cleaning Up: Absorb spill with an inert material (e.g. vermiculite, dry sand, earth, cloth, fleece), and place in a suitable non-combustible container for reclamation or disposal. Do not use combustible materials, such as sawdust. Clean contaminated surface thoroughly. Neutralize spill area and washings with soda ash or lime. Never return spills in original containers for re-use. Clean up in accordance with all applicable regulations.

7. HANDLING AND STORAGE

Handling: Wear personal protective equipment (see section 8). Use only in well-ventilated areas. Provide sufficient air exchange and/or exhaust in work rooms. Avoid contact with skin, eyes and clothing. Do not breathe vapors or spray mist. Do not ingest. When using, do not eat, smoke, or drink. Keep away from incompatible materials. Handle in accordance with good industrial hygiene and safety practice. Wash thoroughly after handling. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquids). Observe all warnings and precautions listed for the product Use caution when combining with water. DO NOT add water to acid. ALWAYS add acid to water while stirring to prevent release of heat, steam, and fumes.

Storage: Store in a cool, dry, ventilated area away from incompatible materials. Store in original container. Keep containers tightly closed and upright. Keep away from food, drink and animal feedingstuffs. Keep out of the reach of children.

8. EXPOSURE CONTROL AND PERSONAL PROTECTION

Exposure Limits:

ACGIH:	Ceiling:	2 ppm
OSHA:	Ceiling:	5 ppm
		7 mg/m^3

Engineering Controls: Ensure adequate ventilation. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls

to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Explosion proof exhaust ventilation should be used.

Personal Protective Equipment:

Eye/Face Protection: Wear safety glasses with side shields or goggles and a face shield.

Skin Protection: Wear appropriate chemical resistant clothing (with long sleeves) and appropriate chemical resistant gloves.

Respiratory Protection: If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Respirator type: Chemical respirator with acid gas cartridge. Use a positive-pressure air-supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air-purifying respirators may not provide adequate protection.

General Hygiene Considerations: Avoid contact with skin, eyes and clothing. When using, do not eat, drink or smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Provide eyewash station and safety shower.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Appearance:	Transparent
Color:	Colorless
Odor:	Pungent, irritating
Molecular Formula:	HCl
Molecular Weight:	36.46
pH:	0.1 (1.0 N Solution)
Specific Gravity:	1.18
Freezing/Melting Point:	-25 °C (-13 °F)
Boiling Point:	50.5 °C (123 °F)
Flash Point:	Not applicable
Auto Ignition Temperature:	Not applicable
Flammable Limits in Air (% by Volume):	
Upper:	Not applicable
Lower:	
Solubility:	Miscible with water
Vapor Pressure:	25 kPa at 25°C (estimate)
Vapor Density:	1.3 (estimate)
Odor threshold (ppm):	0.25-10 ppm
Evaporation Rate:	No information found
Partition Coefficient (n-octanol/water):	No information found

10. STABILITY AND REACTIVITY

Stability: Stable under normal conditions.

Conditions to Avoid: Incompatibles

Incompatible Materials: Bases, metals, oxidizing agents, acids, amines, reducing agents, organic materials

Hazardous Decomposition Products:	Hydrogen chloride, chlorine. May decompose upon heating to product corrosive and/or toxic fumes.
Possibility of Hazardous Reactions:	Can react vigorously, violently or explosively with incompatible materials listed above.
Hazardous Polymerization:	Will not occur.

11. TOXICOLOGICAL INFORMATION

Toxicological Data:	Oral Rat LD50:	240 mg/kg (estimate)
	Oral Rabbit LD50:	900 mg/kg
	Inhalation Rat LC50:	3124 mg/L 1 H
Acute Effects:	Strongly corrosive. May cause deep tissue damage. Harmful if swallowed.	
Local Effects:	Causes severe burns. Mist or vapor extremely irritating to eyes and respiratory tract.	
Sensitization:	Not a skin sensitizer.	
Chronic Effects:	Corrosive. Prolonged or repeated skin contact causes serious tissue damage.	
Carcinogenic Effects:	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.	
	ACGIH:	A4 – Not classifiable as a human carcinogen
	IARC:	3 – Not classifiable as to carcinogenicity of humans
Skin Corrosion/Irritation:	Corrosive to skin and eyes.	
Epidemiology:	No epidemiological data is available for this product.	
Mutagenicity:	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.	
Neurological Effects:	No information found.	
Reproductive Effects:	Contains no ingredient listed as toxic to reproduction.	
Teratogenic Effects:	No data available to indicate product or any components present at greater than 0.1% may cause birth defects.	
Target Organs and Symptoms:	Corrosive effects. Mucus membranes, skin, eyes, kidneys, liver, respiratory tract	

12. ECOLOGICAL INFORMATION

Ecotoxicological Data:	LC50 Western mosquitofish (Gambusia affinis):	282 mg/L 96 H
Ecotoxicity:	This product may affect the acidity (pH) in water with risk of harmful effects to aquatic organisms.	
Environmental Effects:	An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.	
Persistence and Degradability:	Expected to be readily biodegradable.	

Partition Coefficient (n-octanol/water): No information found.

13. DISPOSAL INFORMATION

Disposal Instructions: Dispose of this material and its container to hazardous or special waste collection point. Incinerate the material under controlled conditions in an approved incinerator. All wastes must be handled in accordance with local, state and federal regulations.

Contaminated Packaging: Since emptied containers retain product residue, follow label warnings even after container is emptied. Offer rinsed packaging material to local recycling facilities.

Waste Codes: D002: Waste corrosive material (pH ≤ 2 or pH ≥12.5, or corrosive to steel)

14. TRANSPORT INFORMATION

DOT:

UN Number: UN1789

Proper Shipping Name: Hydrochloric Acid

Hazard Class: 8

Packaging Group: II

ERG Number: 157

15. REGULATORY INFORMATION

U.S. Federal Regulations:

OSHA: This product is considered a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Inventory: Hydrochloric Acid; Water

U.S. EPCRA (SARA Title III):

Sections 311/312:

Hazard Categories	List (Yes/No)
Section 311 – Hazardous Chemical	Yes
Immediate Hazard	Yes
Delayed Hazard	No
Fire Hazard	No
Pressure Hazard	No
Reactivity Hazard	No

Section 302:

Extremely Hazardous Substance:	Hydrochloric Acid
Reportable Quantity:	5000 lbs
Threshold Planning Quantity:	500 lbs

Section 313: Toxic chemical or category: Hydrochloric Acid

	De minimis concentration:	1.0%
CERCLA:	Hydrochloric Acid:	5000 lbs

International Inventories:

Country(s) or Region	Inventory Name	On Inventory (Yes/No)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes

*A "Yes" indicates that the listed component(s) of this product comply with the inventory requirements administered by the governing country(s)

16. OTHER INFORMATION

Product Use: Laboratory and/or field reagent

Disclaimer: Pioneer Forensics LLC provides the information in this Material Safety Data Sheet in the belief that it is reliable but assumes no responsibility for its completeness or accuracy. The physical properties reported in this MSDS are obtained from the literature and do not constitute product specifications. Pioneer Forensics LLC makes and gives no representations or warranties with respect to the information contained herein or the product to which it refers, whether express, implied, or statutory, including without limitation, warranties of accuracy, completeness, merchantability, non-infringement, performance, safety, suitability, stability, and fitness for a particular purpose. No warranty against infringement of any patent, copyright or trademark is made or implied. This MSDS is intended only as a guide to the appropriate handling of the material by a properly trained person. It shall be the user's responsibility to develop proper methods of handling and personal protection based on the actual conditions of use. Accordingly, Pioneer Forensics LLC assumes no liability whatsoever for the use of or reliance upon this information including results obtained, incidental or consequential damages, or lost profits.

Issue Date: 12/03/2012

Reason for Revision: Not applicable

Sodium Hydroxide

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 07/06/1998 Revision date: 02/21/2018 Supersedes: 10/14/2013 Version: 1.1

SECTION 1: Identification

1.1. Identification

Product form	:	Substance
Substance name	:	Sodium Hydroxide
CAS-No.	:	1310-73-2
Product code	:	LC23900
Formula	:	NaOH
Synonyms	:	anhydrous caustic soda / caustic alkali / caustic flake / caustic soda, solid / caustic white / caustic, flaked / hydrate of soda / hydroxide of soda / LEWIS red devil lye / soda lye / sodium hydrate / sodium hydroxide, pellets

1.2. Recommended use and restrictions on use

Use of the substance/mixture	:	Industrial use
Recommended use	:	Laboratory chemicals
Restrictions on use	:	Not for food, drug or household use

1.3. Supplier

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number	:	CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Skin corrosion/irritation, Category 1A	H314	Causes severe skin burns and eye damage.
Serious eye damage/eye irritation, Category 1	H318	Causes serious eye damage.
Hazardous to the aquatic environment — Acute Hazard, Category 3	H402	Harmful to aquatic life

Full text of H statements : see section 16

2.2. GHS Label elements, including precautionary statements

GHS-US labelling

Hazard pictograms (GHS-US) :

GHS05

Signal word (GHS-US)	:	Danger
Hazard statements (GHS-US)	:	H314 - Causes severe skin burns and eye damage. H402 - Harmful to aquatic life
Precautionary statements (GHS-US)	:	P260 - Do not breathe dust, vapours. P264 - Wash exposed skin thoroughly after handling. P273 - Avoid release to the environment. P280 - Wear eye protection, face protection, protective clothing, protective gloves. P301+P330+P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting. P303+P361+P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing. P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P310 - Immediately call a POISON CENTER/doctor

P363 - Wash contaminated clothing before reuse.
P405 - Store locked up.
P501 - Dispose of contents/container to Comply with applicable regulations

2.3. Other hazards which do not result in classification

Other hazards not contributing to the classification : None under normal conditions.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substances

Substance type : Mono-constituent

Name	Product identifier	%	GHS-US classification
Sodium Hydroxide (Main constituent)	(CAS-No.) 1310-73-2	100	Skin Corr. 1A, H314 Eye Dam. 1, H318 Aquatic Acute 3, H402

Full text of hazard classes and H-statements : see section 16

3.2. Mixtures

Not applicable

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures general : Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with laboured breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital.

First-aid measures after inhalation : Remove the victim into fresh air. Respiratory problems: consult a doctor/medical service.

First-aid measures after skin contact : Wipe off dry product from skin. Remove clothing before washing. Wash immediately with lots of water (15 minutes)/shower. Do not apply (chemical) neutralizing agents. Do not remove clothing if it sticks to the skin. Cover wounds with sterile bandage. Consult a doctor/medical service. If burned surface > 10%: take victim to hospital.

First-aid measures after eye contact : Rinse immediately with plenty of water for 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Do not apply neutralizing agents. Take victim to an ophthalmologist.

First-aid measures after ingestion : Rinse mouth with water. Immediately after ingestion: give lots of water to drink. Do not induce vomiting. Do not give activated charcoal. Do not give chemical antidote. Immediately consult a doctor/medical service. Call Poison Information Centre (www.big.be/antigif.htm). Ingestion of large quantities: immediately to hospital. Take the container/vomit to the doctor/hospital.

4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects after inhalation : WHEN PROCESSED: Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. ON CONTINUOUS EXPOSURE/CONTACT: Respiratory difficulties. FOLLOWING SYMPTOMS MAY APPEAR LATER: Possible oedema of the upper respiratory tract. Possible laryngeal spasm/oedema. Risk of lung oedema.

Symptoms/effects after skin contact : Blisters. Caustic burns/corrosion of the skin. Slow-healing wounds.

Symptoms/effects after eye contact : Corrosion of the eye tissue. Permanent eye damage.

Symptoms/effects after ingestion : Dry/sore throat. Nausea. Abdominal pain. Blood in vomit. Difficulty in swallowing. Possible esophageal perforation. Burns to the gastric/intestinal mucosa. Bleeding of the gastrointestinal tract. Shock.

Chronic symptoms : ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Dry skin. Skin rash/inflammation. Possible inflammation of the respiratory tract. Gastrointestinal complaints.

4.3. Immediate medical attention and special treatment, if necessary

Obtain medical assistance.

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media : Adapt extinguishing media to the environment for surrounding fires.

5.2. Specific hazards arising from the chemical

Fire hazard	:	DIRECT FIRE HAZARD: Non combustible. INDIRECT FIRE HAZARD: Reactions involving a fire hazard: see "Reactivity Hazard".
Explosion hazard	:	INDIRECT EXPLOSION HAZARD: Reactions with explosion hazards: see "Reactivity Hazard".
Reactivity	:	May be corrosive to metals. Absorbs the atmospheric CO2. Violent to explosive reaction with (some) acids. Reacts violently with many compounds: heat release resulting in increased fire or explosion risk. Violent exothermic reaction with water (moisture): release of corrosive mist. Reacts exothermically on exposure to water (moisture) with combustible materials: risk of spontaneous ignition.

5.3. Special protective equipment and precautions for fire-fighters

Precautionary measures fire	:	Exposure to fire/heat: keep upwind. Exposure to fire/heat: consider evacuation. Exposure to fire/heat: have neighbourhood close doors and windows.
Firefighting instructions	:	Cool tanks/drums with water spray/remove them into safety. When cooling/extinguishing: no water in the substance. Take account of toxic fire-fighting water. Use water moderately and if possible collect or contain it.
Protection during firefighting	:	Heat/fire exposure: compressed air/oxygen apparatus.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures	:	Absorb spillage to prevent material damage. Dike and contain spill.

6.1.1. For non-emergency personnel

Protective equipment	:	Gloves. Face-shield. Corrosion-proof suit. Dust cloud production: compressed air/oxygen apparatus. Contact with moisture/water: compressed air/oxygen apparatus. Contact with moisture/water: gas-tight suit.
Emergency procedures	:	Mark the danger area. Prevent dust cloud formation. Corrosion-proof appliances. Keep containers closed. Avoid ingress of water in the containers. Wash contaminated clothes. On contact with moisture/water: keep upwind. On contact with moisture/water: consider evacuation. In case of hazardous reactions: keep upwind. In case of reactivity hazard: consider evacuation.
Measures in case of dust release	:	In case of dust production: keep upwind. Dust production: have neighbourhood close doors and windows.

6.1.2. For emergency responders

Protective equipment	:	Equip cleanup crew with proper protection. Do not breathe dust.
Emergency procedures	:	Stop release.

6.2. Environmental precautions

Prevent soil and water pollution. Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up

For containment	:	Contain released product, pump into suitable containers. Plug the leak, cut off the supply. Dam up the solid spill. Hazardous reaction: measure explosive gas-air mixture. Reaction: dilute combustible gas/vapour with water curtain.
Methods for cleaning up	:	Collect the spill only if it is in a dry state. Wetted substance: cover with powdered limestone or dry sand, earth, vermiculite. Scoop solid spill into closing containers. Under controlled conditions: neutralize leftovers with dilute acid solution. Possible violent reaction if you neutralize. Carefully collect the spill/leftovers. Clean contaminated surfaces with an excess of water. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Avoid raising dust. Avoid contact of substance with water. Measure the concentration in the air regularly. Carry operations in the open/under local exhaust/ventilation or with respiratory protection. Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Keep the substance free from contamination. Use corrosionproof equipment. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain.

Hygiene measures	:	Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Wash contaminated clothing before reuse. Separate working clothes from town clothes. Launder separately.

7.2. Conditions for safe storage, including any incompatibilities

Incompatible products	:	combustible materials. metals. Strong acids. Strong oxidizers. Protect from moisture.
Incompatible materials	:	incompatible materials. Moisture. Heat sources.
Storage temperature	:	20 °C
Heat and ignition sources	:	KEEP SUBSTANCE AWAY FROM: heat sources.
Prohibitions on mixed storage	:	KEEP SUBSTANCE AWAY FROM: combustible materials. oxidizing agents. (strong) acids. metals. organic materials. water/moisture.
Storage area	:	Store in a dry area. Keep container in a well-ventilated place. Keep locked up. Unauthorized persons are not admitted. Store at ambient temperature. Keep only in the original container. Meet the legal requirements.
Special rules on packaging	:	SPECIAL REQUIREMENTS: hermetical. watertight. corrosion-proof. dry. clean. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.
Packaging materials	:	SUITABLE MATERIAL: stainless steel. nickel. polyethylene. paper. MATERIAL TO AVOID: lead. aluminium. copper. tin. zinc. bronze. textile.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Sodium Hydroxide (1310-73-2)		
ACGIH	ACGIH Ceiling (mg/m³)	2 mg/m³
OSHA	OSHA PEL (TWA) (mg/m³)	2 mg/m³
IDLH	US IDLH (mg/m³)	10 mg/m³
NIOSH	NIOSH REL (ceiling) (mg/m³)	2 mg/m³

8.2. Appropriate engineering controls

Appropriate engineering controls	:	Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Provide adequate general and local exhaust ventilation.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:

Safety glasses. Protective clothing. Gloves. Dust/aerosol mask with filter type P3.

Materials for protective clothing:

GIVE GOOD RESISTANCE: natural rubber. neoprene. nitrile rubber. GIVE LESS RESISTANCE: butyl rubber. polyethylene. PVA. GIVE POOR RESISTANCE: natural fibres

Hand protection:

Gloves

Eye protection:

Face shield. In case of dust production: protective goggles

Skin and body protection:

Corrosion-proof clothing. In case of dust production: head/neck protection

Respiratory protection:

Dust production: dust mask with filter type P3.
High dust production: self-contained breathing apparatus

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Solid
Appearance	:	Crystalline solid. Crystalline powder. Little spheres. Lumps. Needles. Scales. Flakes.
Colour	:	White
Odour	:	Odourless
Odour threshold	:	No data available
pH	:	14 (5 %)
Melting point	:	323 °C
Freezing point	:	No data available
Boiling point	:	1388 °C (1013.25 hPa)
Flash point	:	Not applicable
Relative evaporation rate (butylacetate=1)	:	No data available
Flammability (solid, gas)	:	No data available
Vapour pressure	:	< 0.1 hPa (20 °C)
Relative vapour density at 20 °C	:	No data available
Relative density	:	2.13 (20 °C)
Density	:	2130 kg/m³
Molecular mass	:	40 g/mol
Solubility	:	Exothermically soluble in water. Soluble in ethanol. Soluble in methanol. Soluble in glycerol. Water: 100 g/100ml (25 °C) Ethanol: soluble
Log Pow	:	No data available
Auto-ignition temperature	:	Not applicable
Decomposition temperature	:	No data available
Viscosity, kinematic	:	0.53 mm²/s (25 °C, 1 mol/l)
Viscosity, dynamic	:	0.997 mPa.s (25 °C, Test data)
Explosive limits	:	No data available
Explosive properties	:	Not applicable.
Oxidising properties	:	None.

9.2. Other information

Minimum ignition energy	:	Not applicable
Saturation concentration	:	671 g/m³
VOC content	:	Not applicable (inorganic)
Other properties	:	Translucent. Hygroscopic. Substance has basic reaction.

SECTION 10: Stability and reactivity

10.1. Reactivity

May be corrosive to metals. Absorbs the atmospheric CO2. Violent to explosive reaction with (some) acids. Reacts violently with many compounds: heat release resulting in increased fire or explosion risk. Violent exothermic reaction with water (moisture): release of corrosive mist. Reacts exothermically on exposure to water (moisture) with combustible materials: risk of spontaneous ignition.

10.2. Chemical stability

Hygroscopic. Unstable on exposure to air.

10.3. Possibility of hazardous reactions

Reacts violently with acids. Reacts violently with water.

10.4. Conditions to avoid

Moisture. Incompatible materials.

10.5. Incompatible materials

Water. Strong oxidizers. Strong acids. metals. combustible materials.

10.6. Hazardous decomposition products

Sodium oxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Likely routes of exposure	:	Skin and eyes contact
Acute toxicity	:	Not classified
Skin corrosion/irritation	:	Causes severe skin burns and eye damage. pH: 14 (5 %)
Serious eye damage/irritation	:	Causes serious eye damage. pH: 14 (5 %)
Respiratory or skin sensitisation	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified (Based on available data, the classification criteria are not met)
Reproductive toxicity	:	Not classified
Specific target organ toxicity (single exposure)	:	Not classified
Specific target organ toxicity (repeated exposure)	:	Not classified
Aspiration hazard	:	Not classified
Potential adverse human health effects and symptoms	:	Causes severe skin burns. Causes serious eye damage.
Symptoms/effects after inhalation	:	WHEN PROCESSED: Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. ON CONTINUOUS EXPOSURE/CONTACT: Respiratory difficulties. FOLLOWING SYMPTOMS MAY APPEAR LATER: Possible oedema of the upper respiratory tract. Possible laryngeal spasm/oedema. Risk of lung oedema.
Symptoms/effects after skin contact	:	Blisters. Caustic burns/corrosion of the skin. Slow-healing wounds.
Symptoms/effects after eye contact	:	Corrosion of the eye tissue. Permanent eye damage.
Symptoms/effects after ingestion	:	Dry/sore throat. Nausea. Abdominal pain. Blood in vomit. Difficulty in swallowing. Possible esophageal perforation. Burns to the gastric/intestinal mucosa. Bleeding of the gastrointestinal tract. Shock.
Chronic symptoms	:	ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Dry skin. Skin rash/inflammation. Possible inflammation of the respiratory tract. Gastrointestinal complaints.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general	:	Not classified as dangerous for the environment according to the criteria of Regulation (EC) No 1272/2008.
Ecology - air	:	Not included in the list of fluorinated greenhouse gases (Regulation (EU) No 517/2014). Not classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009).
Ecology - water	:	Harmful to crustacea. Harmful to fishes. Groundwater pollutant. pH shift.

Sodium Hydroxide (1310-73-2)	
LC50 fish 1	45.4 mg/l (Other, 96 h, Salmo gairdneri, Static system, Fresh water, Experimental value)
EC50 Daphnia 1	40.4 mg/l (Other, 48 h, Ceriodaphnia sp., Experimental value)

12.2. Persistence and degradability

Sodium Hydroxide (1310-73-2)	
Persistence and degradability	Biodegradability: not applicable.
Biochemical oxygen demand (BOD)	Not applicable (inorganic)
Chemical oxygen demand (COD)	Not applicable (inorganic)
ThOD	Not applicable (inorganic)

12.3. Bioaccumulative potential

Sodium Hydroxide (1310-73-2)	
Bioaccumulative potential	Not bioaccumulative.

12.4. Mobility in soil

Sodium Hydroxide (1310-73-2)	
Ecology - soil	No (test)data on mobility of the substance available.

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Disposal methods

Waste disposal recommendations : Do not discharge into drains or the environment. Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Should not be landfilled with household waste. Recycle/reuse. Dilute. Neutralize.

Additional information : Hazardous waste according to Directive 2008/98/EC, as amended by Regulation (EU) No 1357/2014 and Regulation (EU) No 2017/997.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN1823 Sodium hydroxide, solid, 8, II

UN-No.(DOT) : UN1823

Proper Shipping Name (DOT) : Sodium hydroxide, solid

Transport hazard class(es) (DOT) : 8 - Class 8 - Corrosive material 49 CFR 173.136

Packing group (DOT) : II - Medium Danger

Hazard labels (DOT) : 8 - Corrosive

DOT Packaging Non Bulk (49 CFR 173.xxx) : 212

DOT Packaging Bulk (49 CFR 173.xxx) : 240

DOT Special Provisions (49 CFR 172.102) : IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2).
IP2 - When IBCs other than metal or rigid plastics IBCs are used, they must be offered for transportation in a closed freight container or a closed transport vehicle.
IP4 - Flexible, fiberboard or wooden IBCs must be sift-proof and water-resistant or be fitted with a sift-proof and water-resistant liner.
T3 - 2.65 178.274(d)(2) Normal..... 178.275(d)(2)
TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.

DOT Packaging Exceptions (49 CFR 173.xxx) : 154

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 15 kg

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 50 kg

DOT Vessel Stowage Location	:	A - The material may be stowed ‘‘on deck’’ or ‘‘under deck’’ on a cargo vessel and on a passenger vessel.
DOT Vessel Stowage Other	:	52 - Stow ‘‘separated from’’ acids
Other information	:	No supplementary information available.

SECTION 15: Regulatory information

15.1. US Federal regulations

Sodium Hydroxide (1310-73-2)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Not subject to reporting requirements of the United States SARA Section 313	
RQ (Reportable quantity, section 304 of EPA's List of Lists)	1000 lb
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

15.2. International regulations

CANADA

Sodium Hydroxide (1310-73-2)
Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations
No additional information available

National regulations
No additional information available

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

Revision date : 02/21/2018

Full text of H-statements: see section 16:

H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H402	Harmful to aquatic life

NFPA health hazard	:	3 - Materials that, under emergency conditions, can cause serious or permanent injury.
NFPA fire hazard	:	0 - Materials that will not burn under typical dire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.
NFPA reactivity	:	1 - Materials that in themselves are normally stable but can become unstable at elevated temperatures and pressures.

Hazard Rating

Health	:	3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given
Flammability	:	0 Minimal Hazard - Materials that will not burn
Physical	:	1 Slight Hazard - Materials that are normally stable but can become unstable (self-react) at high temperatures and pressures. Materials may react non-violently with water or undergo hazardous polymerization in the absence of inhibitors.
Personal protection	:	F F - Safety glasses, Gloves, Synthetic apron, Dust respirator

SDS US LabChem

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.

Health	3
Fire	0
Reactivity	2
Personal Protection	

Material Safety Data Sheet
Sulphuric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sulphuric acid

Catalog Codes: 11760, 21760

CAS#: 7664-93-9

RTECS: WS5600000

TSCA: TSCA 8(b) inventory: Sulphuric acid

CI#: Not applicable.

Synonym: Oil of Vitriol; Sulphuric Acid

Chemical Name: Hydrogen sulphate

Chemical Formula: H2-SO4

Contact Information:

Finar Limited
184-186/P, Chacharwadi Vasna,
Sarkhej-Bavla Highway,
Ta.: Sanand, Dist.: Ahmedabad,
Email: info@finarchemicals.com
Web: www.finarchemicals.com

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sulphuric acid	7664-93-9	95 - 98

Toxicological Data on Ingredients: Sulphuric acid: ORAL (LD50): Acute: 2140 mg/kg [Rat.]. VAPOR (LC50): Acute: 510 mg/m 2 hours [Rat]. 320 mg/m 2 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged

contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion:
Products of combustion are not available since material is non-flammable. However, products of decompostion include fumes of oxides of sulfur. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas. Reacts with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.

Fire Hazards in Presence of Various Substances: Combustible materials

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of oxidizing materials.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Metal acetylides (Monocesium and Monorubidium), and carbides ignite with concentrated sulfuric acid. White Phosphorous + boiling Sulfuric acid or its vapor ignites on contact. May ignite other combustible materials. May cause fire when sulfuric acid is mixed with Cyclopentadiene, cyclopentanone oxime, nitroaryl amines, hexalithium disilicide, phorphorous (III) oxide, and oxidizing agents such as chlorates, halogens, permanganates.

Special Remarks on Explosion Hazards:
Mixtures of sulfuric acid and any of the following can explode: p-nitrotoluene, pentasilver trihydroxydiaminophosphate, perchlorates, alcohols with strong hydrogen peroxide, ammonium tetraperoxychromate, mercuric nitrite, potassium chlorate, potassium permanganate with potassium chloride, carbides, nitro compounds, nitrates, carbides, phosphorous, iodides, picratres, fulminats, dienes, alcohols (when heated) Nitramide decomposes explosively on contact with concentrated sulfuric acid. 1,3,5-Trinitrosohexahydro-1,3,5-triazine + sulfuric acid causes explosive decompositon.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. 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, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:
Hygroscopic. Reacts. violently with water. Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 STEL: 3 (mg/m3) [Australia] Inhalation TWA: 1 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 1 STEL: 3 (mg/m3) from ACGIH (TLV) [United States] [1999] Inhalation TWA: 1 (mg/m3) from NIOSH [United States] Inhalation TWA: 1 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Thick oily liquid.)

Odor: Odorless, but has a choking odor when hot.

Taste: Marked acid taste. (Strong.)

Molecular Weight: 98.08 g/mole

Color: Colorless.

pH (1% soln/water): Acidic.

Boiling Point:
270°C (518°F) - 340 deg. C Decomposes at 340 deg. C

Melting Point: -35°C (-31°F) to 10.36 deg. C (93% to 100% purity)

Critical Temperature: Not available.

Specific Gravity: 1.84 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 3.4 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:
Easily soluble in cold water. Sulfuric is soluble in water with liberation of much heat. Soluble in ethyl alcohol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability:
Conditions to Avoid: Incompatible materials, excess heat, combustible material materials, organic materials, exposure to moist air or water, oxidizers, amines, bases. Always add the acid to water, never the reverse.

Incompatibility with various substances:
Reactive with oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(316). Highly corrosive in presence of stainless steel(304). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Hygroscopic. Strong oxidizer. Reacts violently with water and alcohol especially when water is added to the product. Incompatible (can react explosively or dangerously) with the following: ACETIC ACID, ACRYLIC ACID, AMMONIUM HYDROXIDE, CRESOL, CUMENE, DICHLOROETHYL ETHER, ETHYLENE CYANOHYDRIN, ETHYLENEIMINE, NITRIC ACID, 2-NITROPROPANE, PROPYLENE OXIDE, SULFOLANE, VINYLIDENE CHLORIDE, DIETHYLENE GLYCOL MONOMETHYL ETHER, ETHYL ACETATE, ETHYLENE CYANOHYDRIN, ETHYLENE GLYCOL MONOETHYL ETHER ACETATE, GLYOXAL, METHYL ETHYL KETONE, dehydrating agents, organic materials, moisture (water), Acetic anhydride, Acetone, cyanohydrin, Acetone+nitric acid, Acetone + potassium dichromate, Acetonitrile, Acrolein, Acrylonitrile, Acrylonitrile +water, Alcohols + hydrogen peroxide, ally compounds such as Allyl alcohol, and Allyl Chloride, 2-Aminoethanol, Ammonium hydroxide, Ammonium triperchromate, Aniline, Bromate + metals, Bromine pentafluoride, n-Butyraldehyde, Carbides, Cesium acetylene carbide, Chlorates, Cyclopentanone oxime, chlorinates, Chlorates + metals, Chlorine trifluoride, Chlorosulfonic acid, 2-cyano-4-nitrobenzenediazonium hydrogen sulfate, Cuprous nitride, p-chloronitrobenzene, 1,5-Dinitronaphthlene +

sulfur, Diisobutylene, p-dimethylaminobenzaldehyde, 1,3-Diazidobenzene, Dimethylbenzylcarbinol + hydrogen peroxide, Epichlorohydrin, Ethyl alcohol + hydrogen peroxide, Ethylene diamine, Ethylene glycol and other glycols, , Ethylenimine, Fulminates, hydrogen peroxide, Hydrochloric acid, Hydrofluoric acid, Iodine heptafluoride, Indane + nitric acid, Iron, Isoprene, Lithium silicide, Mercuric nitride, Mesityl oxide, Mercury nitride, Metals (powdered), Nitromethane, Nitric acid + glycerides, p-Nitrotoluene, Pentasilver trihydroxydiaminophosphate, Perchlorates, Perchloric acid, Permanganates + benzene, 1-Phenyl-2-methylpropyl alcohol + hydrogen peroxide, Phosphorus, Phosphorus isocyanate, Picrates, Potassium tert-butoxide, Potassium chlorate, Potassium Permanganate and other permanganates, halogens, amines, Potassium Permanganate + Potassium chloride, Potassium Permanganate + water, Propiolactone (beta)-, Pyridine, Rubidium aceteylene carbide, Silver permanganate, Sodium, Sodium carbonate, sodium hydroxide, Steel, styrene monomer, toluene + nitric acid, Vinyl acetate, Thalium (I) azidodithiocarbonate, Zinc chlorate, Zinc Iodide, azides, carbonates, cyanides, sulfides, sulfites, alkali hydrides, carboxylic acid anhydrides, nitriles, olefinic organics, aqueous acids, cyclopentadiene, cyano-alcohols, metal acetylides, Hydrogen gas is generated by the action of the acid on most metals (i.e. lead, copper, tin, zinc, aluminum, etc.). Concentrated sulfuric acid oxidizes, dehydrates, or sulfonates most organic compounds.

Special Remarks on Corrosivity:
Non-corrosive to lead and mild steel, but dillute acid attacks most metals. Attacks many metals releasing hydrogen. Minor corrosive effect on bronze. No corrosion data on brass or zinc.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2140 mg/kg [Rat.]. Acute toxicity of the vapor (LC50): 320 mg/m3 2 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH. May cause damage to the following organs: kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth.

Other Toxic Effects on Humans:
Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
Mutagenicity: Cytogenetic Analysis: Hamster, ovary = 4mmol/L Reproductive effects: May cause adverse reproductive effects based on animal data. Developmental abnormalities (musculoskeletal) in rabbits at a dose of 20 mg/m3 for 7 hrs.(RTECS) Teratogenecity: neither embryotoxic, fetoxic, nor teratogenetic in mice or rabbits at inhaled doses producing some maternal toxicity

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes severe skin irritation and burns. Continued contact can cause tissue necrosis. Eye: Causes severe eye irritation and burns. May cause irreversible eye injury. Ingestion: Harmful if swallowed. May cause permanent damage to the digestive tract. Causes gastrointestial tract burns. May cause perforation of the stomach, GI bleeding, edema of the glottis, necrosis and scarring, and sudden circulatory collapse(similar to acute inhalation). It may also cause systemic toxicity with acidosis. Inhalation: May cause severe irritation of the respiratory tract and mucous membranes with sore throat, coughing, shortness of breath, and delayed lung edema. Causes chemical burns to the repiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Cause corrosive action on mucous membranes. May affect cardiovascular system (hypotension, depressed cardiac output, bradycardia). Circulatory collapse with clammy skin, weak and rapid pulse, shallow respiration, and scanty urine may follow. Circulatory shock is often the immediate cause of death. May also affect teeth(changes in teeth and supporting structures - erosion, discoloration). Chronic Potential Health Effects: Inhalation: Prolonged or repeated inhalation may affect behavior (muscle contraction or spasticity), urinary system (kidney damage), and cardiovascular system, heart (ischemic heart leisons), and respiratory system/lungs(pulmonary edema, lung damage), teeth (dental discoloration, erosion). Skin: Prolonged or repeated skin contact may cause dermatitis, an allergic skin reaction.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 49 mg/l 48 hours [bluegill/sunfish].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Sulfuric acid may be placed in sealed container or absorbed in vermiculite, dry sand, earth, or a similar material. It may also be diluted and neutralized. Be sure to consult with local or regional authorities (waste regulators) prior to any disposal. Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Sulfuric acid UNNA: 1830 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Illinois toxic substances disclosure to employee act: Sulfuric acid New York release reporting list: Sulfuric acid Rhode Island RTK hazardous substances: Sulfuric acid Pennsylvania RTK: Sulfuric acid Minnesota: Sulfuric acid Massachusetts RTK: Sulfuric acid New Jersey: Sulfuric acid California Director's List of Hazardous Substances (8 CCR 339): Sulfuric acid Tennessee RTK: Sulfuric acid TSCA 8(b) inventory: Sulfuric acid SARA 302/304/311/312 extremely hazardous substances: Sulfuric acid SARA 313 toxic chemical notification and release reporting: Sulfuric acid CERCLA: Hazardous substances.: Sulfuric acid: 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R35- Causes severe burns. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S30- Never add water to this product. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 2

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References:
-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.

Other Special Considerations: Not available.

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Last Updated: 30/11/2012

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Nitric Acid, 3M

SECTION 1 : Identification of the substance/mixture and of the supplier

Product name : **Nitric Acid, 3M**

Manufacturer/Supplier Trade name:

Manufacturer/Supplier Article number: **S25860**

Recommended uses of the product and uses restrictions on use:

Manufacturer Details:

AquaPhoenix Scientific
9 Barnhart Drive, Hanover, PA 17331

Supplier Details:

Fisher Science Education
15 Jet View Drive, Rochester, NY 14624

Emergency telephone number:

Fisher Science Education Emergency Telephone No.: 800-535-5053

SECTION 2 : Hazards identification

Classification of the substance or mixture:

Oxidizing
Oxidizing liquids, category 3

Corrosive
Serious eye damage, category 1
Skin corrosion, category 1B

Ox. liq. 3
Skin corrosion/irritation - Skin Corr. 1B
Eye Damage 1

Signal word :Danger

Hazard statements:
May intensify fire; oxidizer
Causes severe skin burns and eye damage
Causes serious eye damage
Precautionary statements:
If medical advice is needed, have product container or label at hand
Keep out of reach of children
Read label before use
Keep away from heat/sparks/open flames/hot surfaces. No smoking
Wear protective gloves/protective clothing/eye protection/face protection
Do not breathe dust/fume/gas/mist/vapours/spray
Do not eat, drink or smoke when using this product
Take any precaution to avoid mixing with combustibles
Keep/Store away from clothing/combustible materials
Wash skin thoroughly after handling
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing
Immediately call a POISON CENTER or doctor/physician
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
Specific treatment (see supplemental first aid instructions on this label)
In case of fire: Use agents recommended in section 5 for extinction
Store locked up
Dispose of contents/container to ...

Other Non-GHS Classification:

WHMIS

C

E

NFPA/HMIS

NFPA SCALE (0-4)

HMIS RATINGS (0-4)

SECTION 3 : Composition/information on ingredients

Ingredients:		
CAS 7697-37-2	Nitric Acid	26.03 %
CAS 7732-18-5	Deionized Water	73.97 %
		Percentages are by weight

SECTION 4 : First aid measures

Description of first aid measures

After inhalation: Move exposed individual to fresh air. Loosen clothing as necessary and position individual in a comfortable position.Seek medical advice if discomfort or irritation persists.

After skin contact: Wash affected area with soap and water. Rinse or flush skin/hair gently with water for at least 30 minutes.Seek immediate medical attention

After eye contact: Protect unexposed eye. Remove contact lens(es) if able to do so during rinsing. Rinse or flush eye gently with water for at least 30 minutes, lifting upper and lower lids.Seek immediate medical attention (ophthalmologist)

After swallowing: Rinse mouth thoroughly. Do not induce vomiting. Have exposed individual drink sips of water. Seek medical attention if irritation, discomfort or vomiting persists.

Most important symptoms and effects, both acute and delayed:

Headache, Shortness of breath.Irritation/burns, all routes of exposure.May cause severe burns, blindness and/or permanent damage. May cause burns, deep penetrating ulcerations of the skin, delayed tissue destruction, redness, pain. May cause gastrointestinal irritation with nausea, vomiting and diarrhea;

Indication of any immediate medical attention and special treatment needed:

If seeking medical attention, provide SDS document to physician.

SECTION 5 : Firefighting measures

Extinguishing media

Suitable extinguishing agents: Does not burn. Use extinguishing media appropriate for surrounding fire.If in laboratory setting, follow laboratory fire suppression procedures. Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition

For safety reasons unsuitable extinguishing agents:

Special hazards arising from the substance or mixture:

Combustion products may include carbon oxides or other toxic vapors.Nitrogen oxides (NOx)

Advice for firefighters:

Protective equipment:

Additional information (precautions): Move product containers away from fire or keep cool with water spray as a protective measure, where feasible.

SECTION 6 : Accidental release measures

Personal precautions, protective equipment and emergency procedures:

Wear protective equipment. Use respiratory protective device against the effects of fumes/dust/aerosol. Keep unprotected persons away. Ensure adequate ventilation.Keep away from ignition sources. Protect from heat.Stop the spill, if possible. Contain spilled material by diking or using inert absorbent. Transfer to a disposal or recovery container.

Environmental precautions:

Prevent from reaching drains, sewer or waterway. Collect contaminated soil for characterization per Section 13

Methods and material for containment and cleaning up:

If in a laboratory setting, follow Chemical Hygiene Plan procedures.Collect liquids using vacuum or by use of absorbents. Place into properly labeled containers for recovery or disposal. If necessary, use trained response staff/contractor.

Reference to other sections:

SECTION 7 : Handling and storage

Precautions for safe handling:

Prevent formation of aerosols. Follow good hygiene procedures when handling chemical materials. Do not eat, drink, smoke, or use personal products when handling chemical substances. If in a laboratory setting, follow Chemical Hygiene Plan.Use only in well ventilated areas.Avoid splashes or spray in enclosed areas.No smoking.Keep away from heat and sources of ignition.

Conditions for safe storage, including any incompatibilities:

Store in a cool location. Provide ventilation for containers. Avoid storage near extreme heat, ignition sources or open flame. Store away from foodstuffs. Store away from oxidizing agents.Store in cool, dry conditions in well sealed containers. Keep container tightly sealed.Store with like hazards. Storage class (TRGS 510): Oxidizing

hazardous materials

SECTION 8 : Exposure controls/personal protection

Control Parameters: 7697-37-2, Nitric Acid, NIOSH 4 ppm STEL; 10 mg/m3 STEL
7697-37-2, Nitric Acid , NIOSH 2 ppm TWA; 5 mg/m3 TWA
7697-37-2 , Nitric Acid , ACGIH 4 ppm STEL
7697-37-2, Nitric Acid , ACGIH 2 ppm TWA

Appropriate Engineering controls: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use/handling.Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor or mists below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above.

Respiratory protection: Not required under normal conditions of use. Use suitable respiratory protective device when high concentrations are present. Use suitable respiratory protective device when aerosol or mist is formed. For spills, respiratory protection may be advisable.

Protection of skin: The glove material has to be impermeable and resistant to the product/ the substance/ the preparation being used/handled.Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.

Eye protection: Safety glasses with side shields or goggles.

General hygienic measures: The usual precautionary measures are to be adhered to when handling chemicals. Keep away from food, beverages and feed sources. Immediately remove all soiled and contaminated clothing. Wash hands before breaks and at the end of work. Do not inhale gases/fumes/dust/mist/vapor/aerosols. Avoid contact with the eyes and skin.

SECTION 9 : Physical and chemical properties

Appearance (physical state,color):	colorless liquid	**Explosion limit lower**: **Explosion limit upper**:	Not Determined Not Determined
Odor:	strong acrid	**Vapor pressure**:	49 hPa (37 mmHg) at 50 °C (122 °F)
Odor threshold:	0.29 ppm	**Vapor density**:	2.5 (Air = 1)
pH-value:	<1.0	**Relative density**:	1.413 g/cm3 at 20 °C (68 °F)
Melting/Freezing point:	-41.6°C (-42.9°F)	**Solubilities**:	Soluble
Boiling point/Boiling range:	120.5 °C (248.9 °F)	**Partition coefficient (n-octanol/water)**:	Not Determined
Flash point (closed cup):	Not Determined	**Auto/Self-ignition temperature**:	Not Determined

Nitric Acid, 3M

Evaporation rate:	Not Determined	**Decomposition temperature**:	Not Determined
Flammability (solid,gaseous):	Not Determined	**Viscosity**:	a. Kinematic:Not Determined b. Dynamic: Not Determined
Density: Not Determined			

SECTION 10 : Stability and reactivity

Reactivity: Oxidizer.Reacts violently with alcohol, organic material, turpene, charcoal. Violent reaction with Nitric acid + Acetone and Sulfuric acid. Nitric Acid will react with water or steam to produce heat and toxic, corrosive and flammable vapors. (Nitric acid, fuming)
Chemical stability: No decomposition if used and stored according to specifications.
Possible hazardous reactions: Oxidizer: Contact with combustible/organic material may cause fire
Conditions to avoid:excess heat.combustible materials.Incompatible Materials.
Incompatible materials: Highly reactive with alkalis.Reactive with reducing agents. combustible materials. organic materials,metals. Acids.Reducing agents.aldehydes.
Hazardous decomposition products: Nitrogen oxides (NOx)

SECTION 11 : Toxicological information

Acute Toxicity:		
Inhalation:	67 ppm 4 h	Inhalation LC50 Rat
Chronic Toxicity: No additional information.		
Corrosion Irritation:		
Dermal:		Rabbit: Corrosive
Ocular:		Rabbit: Corrosive to eyes
Dermal:	Section 2	Classified as causing severe skin burns and eye damage.
Ocular:	Section 2	Classified as causing serious eye damage
Sensitization:		No additional information.
Single Target Organ (STOT):		No additional information.
Numerical Measures:		No additional information.
Carcinogenicity:		No additional information.
Mutagenicity:		No additional information.
Reproductive Toxicity:		Experiments have shown reproductive toxicity effects on laboratory animals.

SECTION 12 : Ecological information

Ecotoxicity Persistence and degradability: Readily degradable in the environment.
Bioaccumulative potential:
Mobility in soil: Aqueous solution has high mobility in soil.

Other adverse effects:

SECTION 13 : Disposal considerations

Waste disposal recommendations:

Product/containers must not be disposed together with household garbage. Do not allow product to reach sewage system or open water.It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11). Consult federal state/ provincial and local regulations regarding the proper disposal of waste material that may incorporate some amount of this product.

SECTION 14 : Transport information

UN-Number

2031

UN proper shipping name

Nitric Acid

Transport hazard class(es)

Class:
8 Corrosive substances

Packing group:II
Environmental hazard:
Transport in bulk:
Special precautions for user:

SECTION 15 : Regulatory information

United States (USA)

SARA Section 311/312 (Specific toxic chemical listings):

Acute, Chronic

SARA Section 313 (Specific toxic chemical listings):

7697-37-2 Nitric Acid

RCRA (hazardous waste code):

None of the ingredients is listed

TSCA (Toxic Substances Control Act):

All ingredients are listed.

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):

7697-37-2 Nitric acid 1000 lbs

Proposition 65 (California):

Chemicals known to cause cancer:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for females:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for males:

None of the ingredients is listed

Chemicals known to cause developmental toxicity:

None of the ingredients is listed

Canada

Canadian Domestic Substances List (DSL):

All ingredients are listed.

Canadian NPRI Ingredient Disclosure list (limit 0.1%):

None of the ingredients is listed

Canadian NPRI Ingredient Disclosure list (limit 1%):

7697-37-2 Nitric Acid

SECTION 16 : Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.Note:. The responsibility to provide a safe workplace remains with the user.The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment.The information contained herein is, to the best of our knowledge and belief, accurate.However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material.It is the responsibility of the user to comply with all applicable laws and regulations applicable to this material.

GHS Full Text Phrases:

Abbreviations and acronyms:

IMDG: International Maritime Code for Dangerous Goods
PNEC: Predicted No-Effect Concentration (REACH)
CFR: Code of Federal Regulations (USA)
SARA: Superfund Amendments and Reauthorization Act (USA)
RCRA: Resource Conservation and Recovery Act (USA)
TSCA: Toxic Substances Control Act (USA)
NPRI: National Pollutant Release Inventory (Canada)
DOT: US Department of Transportation
IATA: International Air Transport Association
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
ACGIH: American Conference of Governmental Industrial Hygienists
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
DNEL: Derived No-Effect Level (REACH)

Effective date : 12.29.2014
Last updated : 03.23.2015

Section 1 - Product and Company Identification

Product Name: Sodium Metabisulfite
Chemical Formula: $Na_2S_2O_5$
CAS Number: 007681-57-4
Other Designations: Sodium Pyrosulfite, Disodium Pyrosulfite, Pyrosulfurous Acid, Disodium Salt, Sodium Disulphite.
General Use: Food preservative, pharmaceutical manufacture, water dechlorination agent, lab reagent and other chemical process applications.
Manufacturer: INEOS Calabrian Corporation
5500 Hwy. 366
Port Neches, Texas77651

Telephone: 409-727-1471
Fax: 409-727-5803
Emergency Contact: CHEMTREC 800-424-9300

Section 2 - Hazards Identification

Emergency Overview
Target Organs: Respiratory system, eyes, skin
GHS Classification: Acute Toxicity, Oral (Category 4)
Acute Toxicity, Dermal (Category 5)
Serious Eye Irritant (Category 2A)

GHS Label Elements: Signal Word – Warning

Pictogram

Corrosive

Irritant

Hazard Statements: H302 – Harmful if swallowed
H313 – May be harmful to skin
H319 – Causes serious eye irritation

Precautionary Statements: P281 – Wear protective equipment for hands, eyes, face and respiratory tract
P305, P351 and P338 – IF IN EYES: Rinse with water for several minutes. Remove contact lenses if present and continue rinsing.
Other Hazards: Contact with acids or water liberates toxic sulfur dioxide gas.

HMIS Classification:

Health Hazard	2
Flammability	0
Physical	0

NFPA Rating:	Health Hazard	2
	Fire	0
	Reactivity	0

Potential Health Effects:	Inhalation:	Irritant to respiratory tract
	Eye:	Irritant
	Skin:	Irritant
	Ingestion:	Harmful if swallowed
	Aggravated Medical Condition:	Capable of provoking bronchospasm in sulfite sensitive individuals with asthma.

Section 3 - Composition / Information on Ingredients

Composition	CAS Number	% wt *or* vol
Sodium Metabisulfite	007681-57-4	98 %(wt)
Sodium Sulfite	007757-83-7	1 %(wt)
Sodium Sulfate	007757-82-6	1 %(wt)

Section 4 - First Aid Measures

Exposure Route	Symptom	Treatment
Inhalation:	Sore throat, shortness of breath coughing, and congestion.	Remove from exposure to fresh air. Seek medical attention in severe cases or if recovery is not rapid.
Eye Contact:	Irritation to eyes and mucous membranes.	Irrigate with water until no evidence of chemical remains. Obtain medical attention.
Skin Contact:	Irritation, itching, dermatitis	Wash with soap and drench with water. Remove contaminated clothing and wash before reuse.
Ingestion:	Irritation to mucous membranes.	Give large quantities of water or milk immediately. Obtain medical attention.

Seek appropriate medical attention *and provide this SDS to attending doctor*

Note to physician: **Exposure may aggravate acute or chronic asthma, emphysema and bronchitis.**

Section 5 - Fire-Fighting Measures

Flammability:	Not Flammable or combustible
Extinguishing Media:	Dry Powder is recommended
Hazardous Products:	May release hazardous gas with fire or water.
Fire-Fighting Instructions:	Do not release runoff from fire control methods to sewers or waterways.

Fire-Fighting Equipment: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full face piece operated in pressure-demand or positive-pressure mode.

Section 6 - Accidental Release Measures

Spill / Leak Procedures: Wear appropriate PPE - See Section 8.

Small Spills / Leaks: Spills can be neutralized with an alkaline material such as caustic soda. Leaks may be located by spraying the area with ammonium hydroxide solution which forms a white fume in the presence of sulfur dioxide.

Large Spills / Leaks: Large spills should be handled according to a predetermined plan.

Containment: For large spills, dike far ahead of contaminated runoff for later disposal

Section 7 - Handling and Storage

Handling Precautions: Avoid contact with product. Do not breathe dust or vapor.

Storage Requirements: Store in areas, away from heat and moisture and protect from *physical* damage. Segregate from acids and oxidizers.

Section 8 - Exposure Controls / Personal Protection:

Components	CAS Number	TWA	STEL	IDLH
Sodium Metabisulfite	007681-57-4	5 mg/m^3	*	*
Sodium Sulfite	007757-83-7	*	*	*
Sodium Sulfate	007757-82-6	*	*	*

* None established.

TWA – Time Weighted Average based on 8 hour exposure days and a 40 hour week.
STEL – Short Time Exposure Limit
IDLH - Immediately Dangerous to Life or Health

Ventilation: Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA limits (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at the source.

Respiratory Protection: Follow OSHA respirator regulations (29 CFR 1910.134) and if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or on-routine operations (cleaning spills, reactor vessels, or storage tanks), wear a SCBA. ***Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.***

Protective Clothing / Equipment:	Wear protective gloves, boots, and clothing when necessary to prevent excessive skin contact. Wear protective eyeglasses or goggles, per OSHA eye and face protection regulations (29CFR 1910.133).
Safety Stations:	Make emergency eyewash stations, showers, and washing facilities available in the work area.
Contaminated Equipment:	Remove this material from personal protective equipment as needed.
Comments:	Do not eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before food or beverage consumption

Section 9 - Physical and Chemical Properties

Physical State:	Solid crystal	**Water Solubility:**	45 % @ 20 ^{o} C
Appearance:	White	**Other Solubility:**	NA
Odor Threshold:	pungent SO_2 odor	**Boiling Point:**	
Vapor Pressure:		**Freezing Point:**	
Vapor Density (Air=1):		**Melting Point:**	150 ^{o}C / 302 ^{o}F
Formula Weight:	190.11	**Evaporation Rate:**	Normal.
Density:	NA	**pH:**	4.0 – 4.5 (10 % Soln.)
Specific Gravity (H_2O=1):	1.5	**% Volatile:**	NA

Section 10 - Stability & Reactivity

Stability:	Stable under normal conditions.
Polymerization:	Hazardous polymerization will not occur.
Chemical Incompatibilities:	In the presence of water, or acid, Sodium Metabisulfite (and solutions) may release toxic and hazardous fumes of sulfur oxides, including sulfur dioxide. Acute poisoning from sulfur dioxide is rare because the gas is easily detected. It is so irritating that contact cannot be tolerated. Symptoms include coughing, hoarseness, sneezing, tearing, and breathing difficulty. However, workers who cannot escape high accidental exposure may suffer severe pulmonary damage which can be fatal. Contact with powdered potassium, sodium metals, alkali, and oxidizing agents produce violent reactions. Reacts with water and steam to form corrosive sulfurous acid. Reacts with chlorates to form unstable chlorine dioxide.
Conditions to Avoid:	Avoid excessive heat, open flame, and moisture.
Hazardous Decomposition:	May release hazardous sulfur dioxide gas.

Section 11 - Toxicological Information

Eye Effects (rabbit):	Not available.
Skin Effects (rabbit):	Non-corrosive.
Acute Inhalation Effects (rat):	Not available.
Acute Oral Effects (rat):	LD50 = 1131 mg/kg
Acute Dermal Effects (rat):	LD50 = > 2000 mg/kg
Carcinogenicity:	IARC, NTP, and OSHA do not list Sodium Metabisulfite as a carcinogen.

Chronic Effects: Prolonged or repeated exposure may cause dermatitis, and sensitization reactions. Exposure to asthmatic, atopic and sulfite sensitive individuals can result in expiratory volume. Decomposition of sodium metabisulfite and solutions may release toxic and hazardous fumes of sulfur oxides, including sulfur dioxide, which may cause permanent pulmonary impairments from acute and chronic exposure. The Immediately Dangerous to Life or Health (IDLH) level for SO2 is 100 ppm.

Skin: Contact with skin may result in irritation. Sulfite sensitive individuals may show signs of allergic contact dermatitis from repeated or prolonged skin exposure.

Eyes: Exposure to dust may cause severe eye irritation with possible permanent damage.

Inhalation: Inhalation of dust may result in respiratory tract irritation. May cause asthma-like symptoms in sensitive individuals.

Ingestion: Swallowing can result in nausea, vomiting, diarrhea and abdominal pain. May also cause allergic reactions in sulfite sensitive individuals

Section 12 - Ecological Information

Ecotoxicity: Sodium Metabisulfite is a non hazardous solid commonly used as a waste water dechlorination agent. High concentrations will contribute to elevated chemical oxygen demand in aquatic environments.

96 hour LC50 (fish):	150-220 mg/L
48 hour IC50 (algae):	48 mg/L
24 hour EC50 (water flea):	89 mg/L

Environmental Transport: Soluble in water.
Environmental Degradation: Rapid biological decomposition.
Soil Absorption/Mobility: Slight.

Section 13 - Disposal Considerations

Disposal: Waste determinations typically consider Sodium Metabisulfite contaminated materials to be non-hazardous.
Disposal Regulatory Requirements: Follow applicable Federal, state and local regulations.
Container Cleaning and Disposal: Follow applicable Federal, state and local regulations.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101)

Shipping Name: Sodium Metabisulfite, non-regulated material
Shipping Symbols: NA

Hazard Class:	NA
Subsidiary Hazard:	NA
ID No.:	NA (No Placard Required)
Packing Group:	NA
Label:	GHS label
Special Provisions:	NA

Section 15 - Regulatory Information

EPA Regulations:

RCRA Hazardous Waste Classification (40 CFR 261):	Not listed.
CERCLA Hazardous Substance (40 CFR 302.4):	Not listed
CERCLA Reportable Quantity (RQ):	NA
SARA Title III: Section 302:	Not listed.
Section 313:	Not listed.
FIFRA:	Not regulated.
TSCA:	Inventory listed chemical; PAIR Reportable Not listed in Toxic Substances Chemical Index

Other Regulations:

FDA (GRAS)	Regulated when used as a food preservative
California Prop 65	Not Listed
IARC, NTP and OSHA Carcinogenicity:	Not Listed
WHMIS Classification (Canada):	D2B

Other Foreign Chemical Control Inventory Listing:

Canada DSL, Australia AICS, Chinese IECSC, European Union EINEC, Japanese MITI, Korean KECL and Philippines PICCS

Section 16 - Other Information

This product is NSF certified to NSF/ANSI Standard 60 and is subject to a maximum use limit (MUL) of 15 mg/L for potable water dechlorination applications.

Previous SDS issue date:	January, 2015
Current SDS issue date:	September, 2016
Reason for current revision:	Company name change

The information herein is believed to be reliable. However, no warranty, expressed or implied, is made as to its accuracy or completeness and none is made as to the fitness of this material for any purpose. The manufacturer shall not be liable for damages to person or property resulting from its use. Nothing herein shall be construed as a recommendation for use in violation of any patent.

ALLIED UNIVERSAL CORPORATION

Headquarters: 3901 NW 115th Avenue, Miami, Florida 33178 Phone: (305) 888 - 2623

MATERIAL SAFETY DATA SHEET

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR § 1910.1200.

TODAY'S DATE: 09/06/07 MSDS NUMBER: 0001

24 HOUR EMERGENCY CHEMICAL SPILL OR RELEASE PHONE NUMBERS:

Allied Universal Corp. *at* ***1-305-483-7732*** *(Digital Beeper) and/or* ***CHEMTREC*** *at* ***1-800-424-9300***

SECTION 1 CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Sodium Hypochlorite

Product Names: Aqua Guard Chlorinating Sanitizer, Aqua Guard Bleach, Liquid Chlorine Solution, Liquid Bleach, Hypochlorite, Hypo and Chlorine Bleach.

Listed Strengths: 10.5%, 12.5% and 15% **CAS Number:** 7681-52-9

Date MSDS Revised: August 2007 (previous revision 11/04)

Product Use: Disinfectant and sanitizer, see product label for all approved uses & instructions.

NSF Approval: Yes. Certified to NSF/ANSI Standard 60. Maximum use in Potable Water is 84 mg/L for 12.5% bleach and 100 mg/L for 10.5% bleach.

NSF Non-Food Compounds Approval: Yes

SECTION 2 HAZARD INGREDIENTS/IDENTITY INFORMATION

Hazardous Ingredient(s): % (w/w) as Sodium Hypochlorite : 10.5-16%

Exposure Standards: None established for Sodium Hypochlorite, as Chlorine exposure standards are:

PEL (OSHA):	1 ppm as Cl_2	**STEL (OSHA):**	3 ppm as Cl_2
TLV (ACGIH):	0.5 ppm as Cl_2	**TWA (ACGIH):**	0.5 ppm as Cl_2
WEEL (AIHA):	2 mg/m3, 15 minute TWA as Cl_2	**STEL (ACGIH):**	1 ppm as Cl_2

Emergency Overview: May cause burns to the eyes, skin and mucous membranes.

SECTION 3 PHYSICAL/CHEMICAL CHARACTERISTICS

Alternate Name(s):	Bleach
Chemical Name:	Sodium Hypochlorite
Chemical Family:	Oxidizing Agent
Molecular Formula:	Na-O-Cl
Form:	Liquid
Appearance:	Water clear to a slight greenish-yellow, or light yellow aqueous solution
Odor:	Chlorine odor
pH:	11-14, dependent upon % weight as Sodium Hypochlorite
Vapor Pressure:	Not available
Vapor Density (Air=1):	Not available
Boiling Point:	Approximately 230º F (110º C)
Freezing Point:	14 F(8% w/w Cl_2 solution), 7 F(10% w/w Cl_2 solution), -3 F (12% w/w Cl_2 solution)
Solubility (Water):	Completely Soluble
Solubility (Other):	Reacts with Many Organic Solvents
Density:	Appx. 10 lbs. per gallon
Evaporation Rate:	Not Available
Specific Gravity:	1.126 (8% w/w Cl_2 solution), 1.163 (10% w/w Cl_2 solution), 1.202 (12% w/w Cl_2 solution), 1.25 (15% w/w Cl_2 solution)
Molecular Weight:	74.5

SECTION 4 STABILITY & REACTIVITY DATA

Chemical Stability	**Stable** __X__	**Unstable** _____

Incompatibility (Conditions to Avoid): Stability decreases with heat and light exposure.

Incompatibility (Materials to Avoid): May react violently with strong acids. Other incompatibles include strong caustics, ammonia, urea, reducing agents, organics, ether and oxidizable materials. Reaction with metals (nickel, iron, cobalt and copper) may produce oxygen gas, which supports combustion. May react with organohalogen compounds to

form spontaneously combustible compounds. May react explosively with nitro- and chloro-organic compounds as well as acids and reducing agents. Acidification liberates chlorine gas.		
Hazardous Decomposition or Byproducts: Chlorine gas. Decomposes with heat and reacts with acids. Hazardous gases/vapors produced are hypochlorous acid, chlorine and hydrochloric acid. Composition depends upon temperature and decrease in pH. Additional decomposition products, which depend on pH, temperature and time, are sodium chloride and chlorate, and oxygen.		
No Mechanical Shock or Impact	**No Static Discharge**	**Oxidizer: No if <12% by weight, Yes if > than 12% by weight**
Hazardous Polymerization	**May Occur _____**	**Will Not Occur __X__**

Note: Sodium Hypochlorite reacts violently with amines and ammonium salts. Solutions are reactive with common cleaning products such as toilet bowl cleaners, rust removers, vinegar, acids, organics and ammonia products to produce hazardous gases such as chlorine and other chlorinated species.

SECTION 5 POTENTIAL HEALTH EFFECTS AND FIRST AID INFORMATION

GENERAL: May cause immediate pain. Exposure to the skin may cause sensitization or other allergic responses. If the eye is not irrigated immediately after it has been exposed permanent eye damage may occur. Strict adherence to first aid measures following any exposure is essential. SPEED IS ESSENTIAL!

ROUTE(S) OF ENTRY AND POTENTIAL HEALTH EFFECTS	***EMERGENCY & FIRST AIDE PROCEDURES***
INHALATION: Strong irritating to mucous membranes in the nose, throat and respiratory tract. Prolonged contact can cause chronic irritation, pulmonary edema and central nervous system depression. Repeated inhalation exposure may cause impairment of lung function and permanent lung damage.	**If inhaled,** move expose person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. If breathing is difficult, have trained person administer oxygen. Call a poison control center or medical physician for further treatment advice. Have the product label or MSDS with you when calling or going for medical treatment.
SKIN CONTACT: Prolonged and repeated exposure to dilute solutions often causes irritation, redness, pain and drying and cracking of the skin. Human evidence has indicated that an ingredient in this product can cause skin sensitization. Depending upon the concentration and how soon after exposure the skin is washed with water, skin contact may cause burns and tissue destruction.	**If on skin or clothing,** take off all contaminated clothing and rinse skin immediately with plenty of water for 15-20 minutes. If irritation persists, repeat flushing. Do not transport victim unless the recommended irrigation period is completed unless flushing can be continued during transport. Call a poison control center or medical physician for treatment advice. Have the product label or MSDS with you when calling or going for medical treatment.
EYE CONTACT: Strongly irritating to eyes. Exposure to vapor can cause tearing, conjunctivitis and burning of the eyes. Eye contact may cause a corneal injury. The severity of the effects depend on the concentration and how soon after exposure the eyes are washed with water. In severe exposure cases, glaucoma, cataracts and permanent blindness may occur.	**If in eyes,** hold eye open and rinse slowly and gently with plenty of water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye for 10-15 minutes. Do not transport victim until the recommended flushing period is completed unless irrigation can be continued during transport. Call a poison control center or medical physician for further treatment advice. Have the product label and/or MSDS with you when calling or going to medical treatment.
INGESTION: Corrosive. Can cause severe corrosion of and damage to the gastrointestinal tract (including mouth, throat, and esophagus). Exposure is characterized by nausea, vomiting, abdominal pain, diarrhea, bleeding, and/or tissue ulceration.	**If swallowed,** call poison control center or medical physician immediately for treatment advice. Have the product label or MSDS with you when calling or going for medical treatment. Have exposed person sip a glass of water if able to swallow, and dilute immediately by giving milk, melted ice cream, starch paste or antacids such as milk of magnesia. Avoid sodium bicarbonate because of carbon dioxide release. DO NOT INDUCE VOMITING, LAVAGE OR ACIDIC ANTIDOTES unless told to do so by poison control center or medical physician. DO NOT give anything by mouth to an unconscious person. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water.

NOTE TO PHYSICIAN(S): Pre-existing medical conditions may be aggravated by exposures affecting target organs. There are no known chronic effects. Probable mucosal damage may contraindicate the use of gastric lavage. In addition to the alkalinity of this product, the continued generation of chlorine gas after ingestion can damage further the stomach mucous, depending on the amount ingested. Consideration may be given to removal of the product from the stomach, taking care to avoid perforation of esophagus or stomach. An ounce of 1% sodium thiosulfate or milk of magnesia is helpful.

SECTION 6 TOXICOLOGICAL DATA

ANIMAL DATA: Inhalation 0.25-hour LC50 - 10.5 mg/L in rats; Acute Dermal LD50 - 10,000 mg/kg in rabbits; Acute Oral LD50 - 8910 mg/kg in rats

SUMMARY: The concentrated solution is corrosive to skin, and a 5% solution is a severe eye irritant. Solutions containing more than 5% available chlorine are classified by DOT corrosive (please see section 10 of this MSDS). Toxicity described in animals from single exposures by ingestion include muscular weakness, and hypoactivity. Repeated ingestion exposure in animals caused an increase in the relative weight of adrenal glands in one study, but no pathological changes were observed in two other studies. Long-term administration of compound in drinking water of rats caused depression of the immune system. No adverse changes were observed in an eight week dermal study of a 1% solution in guinea pigs. Tests in animals demonstrate no carcinogenic activity by either the oral or dermal routes. Tests in bacterial and mammalian cell cultures demonstrate mutagenic activity.

CARCINOGENICITY: None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as carcinogen.

MUTAGENICITY: Sodium Hypochlorite has been shown to produce damage to genetic material when tested in vitro. Studies in vivo have shown no evidence of mutagenic potential for this material. It is judged that the risk of genetic damage is insignificant for sodium hypochlorite because of its biological activity, lack of mutagenicity in vivo, and failure to produce carcinogenic response.

SECTION 7 FIRE AND EXPLOSION HAZARD DATA

Flash Point: This product does not flash	**Flammable Limits (Lower):** Not Applicable	
Flammable Limits (Upper): Not Applicable	**Auto Ignition Temperature:** Not Applicable	
Decomposition Temperature: Not Applicable	**Rate of Burning:** Not Available	
Explosive Power: Not Available	**Sensitivity to Mechanical Impact:** Not expected to be sensitive to mechanical impact	**Sensitivity to Static Discharge:** Not expected to be sensitive to static discharge
Fire and Explosion Hazards: This material is non-flammable but is decomposed by heat and light, causing a pressure build-up which could result in an explosion. When heated, it may release chlorine gas or hydrochloric acid. Vigorous reaction with oxidizable or organic materials may result in fire.	**Extinguishing Media:** Use agents appropriate for surrounding fire. Foam, dry chemical, carbon dioxide, water fog or spray. If leak or spill has not ignited, use water spray to disperse the vapors and to protect persons attempting to stop the leak.	
Fire Fighting Procedures: Water spray should be used to cool containers and may be used to knock down escaping vapor. Remove storage vessels from the fire zone.	**Fire Fighting Protective Equipment:** Full protective clothing, including a NIOSH approved self-contained breathing apparatus, must be worn in a fire involving this material. Toxic gas vapors are produced upon decomposition.	

SECTION 8 ECOLOGICAL INFORMATION

The toxicity and corrosivity of this product is a function of concentration and the concentration's pH.

ECOTOXICOLOGICAL INFORMATION: Toxic to aquatic life. 96-hour LC50: fathead minnows: 0.090-5.9 mg/L, bluegill sunfish: 0.10-2.48 mg/L, shore crab: 1.418 mg/L, grass shrimp: 52.0 mg/L, scud: 0.145-4.0 mg/L, water flea: 2.1 mg/L.

ENVIRONMENTAL EFFECTS: Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers. May be an aesthetic nuisance due to color. Mammals and birds, exposed wildlife would be subject to skin irritation and burns due to the corrosive nature of this material.

SECTION 9 DISPOSAL CONSIDERATIONS

Treatment, storage, transportation, and disposal must be in accordance with applicable Federal, State, and Local regulations. Do not burn. Do not flush to surface water or sanitary sewer system. If pH of material is equal to or greater than a 12.5, the material is a RCRA Hazardous Waste D002, corrosive.

SECTION 10 TRANSPORT INFORMATION

U.S. DOT Basic Shipping Description: Hypochlorite Solutions, 8, UN1791, III

U.S. DOT Hazardous Substance: Yes, RQ 100 pounds (Sodium Hypochlorite)

U.S. DOT Marine Pollutant: No

U.S. DOT Required Label: Corrosive (see column 6, 49 CFR §172.101)

U.S. DOT Packaging Exception: Yes, if package meets the criteria of a limited quantity or consumer commodity as defined by 49 CFR §171.8, §173.144 and .154, and §172.312 and .316

N. AMERICAN EMERGENCY GUIDE PAGE NUMBER: 154

Transportation Emergency Phone Numbers: *CHEMTREC 1-800-424-9300*

SECTION 11 PRECAUTIONS FOR SAFE HANDLING AND STORAGE

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Take all precautions to avoid personal contact. Keep container closed except when transferring material. Locate safety shower and eyewash station close to chemical handling area. Use normal good industrial hygiene and housekeeping practices, wash thoroughly after handling. Store in a cool, dry, well-ventilated area, away from incompatibles (minimum distance of 20-25 feet per NFPA Code 1) and direct sunlight. Keep container properly labeled at all times. Vented containers must be used and must be kept closed when not

being used. Long-term storage is impossible without decomposition. Only use containers made from tinted glass, polyethylene & FRP. Keep out of reach of children.

PROCESS HAZARDS: Not Available

STORAGE TEMPERATURE: Store containers below 29°C and above freezing point. Do not expose sealed containers above 40°C. Try to store in the dark at the lowest possible temperature, but keep from freezing, to slow-down decomposition.

SECTION 12 EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Full handling precautions should be taken at all times. Provide good room ventilation plus local exhaust at points of emission and low level floor exhaust in immediate handling area. Where engineering controls are not feasible, use adequate local exhaust ventilation wherever mist, spray or vapor may be generated.

PERSONAL PROTECTIVE EQUIPMENT:

Eye: Use chemical safety goggles when there is potential for contact (splashing), faceshield recommended – ANSI Z87.1

Skin: Gloves and protective clothing (apron, boots, and bodysuits) made from rubber, vinyl, neoprene or PVC. Standard work clothing closed at the neck and wrist while wearing impervious equipment.

Respiratory (*Specify Type*): A NIOSH/MSHA approved air purifying respirator with an acid gas cartridge or canister may be permissible under circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air purifying respirators is limited. Use a positive pressure air supplied respirator if there is potential for uncontrolled releases, exposure levels are not known, or other circumstances where air purifying respirators may not provide adequate protection.

Other: Eyewash, shower station (ANSI Z358.1) must be provided within the immediate work area.

SECTION 13 ACCIDENTAL RELEASE MEASURES

Ventilate enclosed area. Collect product for recovery or disposal. For release to land, contain discharge by constructing dikes or applying inert absorbent; for release to water, utilize damming and/or water diversion to reduce the spread of contamination; and, for release to air, vapors may be suppressed by the use of a water fog. All run-off water must be captured for treatment and disposal. Collect contaminated soil and water, and absorbent for disposal. Notify applicable government authority if release is reportable or could adversely affect the environment. Please follow all Local, State and Federal Laws for clean-up and disposal of all contaminated material. **Deactivating Chemicals:** Sodium Sulfite, Sodium Thiosulfate and Sodium Bisulfite.

SECTION 14 REGULATORY INFORMATION

OSHA CLASSIFICATION, 29 CFR §1900-1910:

Physical Hazards: Reactivity **Health Hazards**: Acute - Skin Sensitizer, Corrosive

CERCLA AND SARA REGULATIONS, 40 CFR §300-373:

Reportable Quantity = 100 lb. **CERCLA Hazardous Material:** Yes

Title III Hazard Classifications: Acute - yes, Chronic - no, Fire - yes, Reactivity - yes & Sudden Release of Pressure - No. This product may be reportable under the requirements of 40 CFR §370.

SARA Extremely Hazardous Substance: No **SARA Toxic Chemical:** No **CA Prop 65:** No

FDA 21 CFR 178.1010: Yes, Approved as Sanitizer

NSF Whitebook (former USDA Approval) Listing: Aqua Guard Chlorinating Sanitizer 10.5% - 3D, B1, B2, D1, D2, G4, G7, GX, Q4, **Aqua Guard Bleach 12.5% -** 3D, B1, B2, D1, D2, G4, GX, Q4

EPA "CLEAN AIR ACT": This product does not contain nor is it manufactured with ozone depleting substances. It is not defined as a Hazardous Air Pollutant per 40 CFR 112.

EPA Pesticide: The 10.5% and 12.5% sodium hypochlorite products are registered with the U.S. EPA as a pesticide, as required under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). It is a violation of Federal law to use this product for pesticidal applications in a manner inconsistent with the FIFRA labeling.

NPCA-HMIS RATING: HEALTH: 3 FLAMMABILITY: 0 REACTIVITY: 2

NFPA RATING:NONE AT THIS TIME

SECTION 15 REFERENCES

Suppliers' Material Safety Data Sheets and EPA Labeling Requirements
Olin and OxyChem Sodium Hypochlorite Handbook
Chlorine Institute Sodium Hypochlorite Pamphlet #96
Chlorine Institute Product Stewardship Bulletins for Sodium Hypochlorite

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SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Substance name	:	Fusel oil
IUPAC name	:	Fusel Oil
EC-No.	:	232-395-2
CAS-No.	:	8013-75-0
REACH registration No	:	01-2119970173-39-xxxx
Formula	:	C5H12O

1.2. Relevant identified uses of the substance or mixture and uses advised against

1.2.1. Relevant identified uses

Main use category	:	Industrial use,Professional use
Use of the substance/mixture	:	Fuel additives Fuels Solvents Fusel oils are included in some spirits as desired flavor components, eg brandy, whiskey, fruit brandy, red wine et al.

1.2.2. Uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

Sasma
Willem Dreeslaan 301
2729 NE Zoetermeer - Netherlands
T +31 79 363 30 64
sales@sasmabv.com - www.sasmabv.com

1.4. Emergency telephone number

Emergency number	:	Worldwide: For Hazardous Materials (or Dangerous Goods) Incident, Spill, Leak, Exposure, or Acident – Call NCEC Day or Night(24/7) +441865407333 - SASMA29003-NCEC

Country	Organisation/Company	Address	Emergency number	Comment
United Kingdom	Guy's & St Thomas' Poisons Unit Medical Toxicology Unit, Guy's & St Thomas' Hospital Trust	Avonley Road SE14 5ER London	+44 20 7188 7188	

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Flammable liquids, Category 3	H226
Acute toxicity (oral), Category 4	H302
Skin corrosion/irritation, Category 2	H315
Serious eye damage/eye irritation, Category 1	H318
Specific target organ toxicity — Single exposure, Category 3, Narcosis	H336
Specific target organ toxicity — Single exposure, Category 3, Respiratory tract irritation	H335

Full text of H statements : see section 16

Adverse physicochemical, human health and environmental effects

Flammable liquid and vapour. May cause drowsiness or dizziness. Harmful if swallowed. May cause respiratory irritation. Causes skin irritation. Causes serious eye damage.

2.2. Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP]

Hazard pictograms (CLP) :

GHS02 GHS05 GHS07

Signal word (CLP) : Danger

Hazard statements (CLP) : H226 - Flammable liquid and vapour.
H302 - Harmful if swallowed.
H315 - Causes skin irritation.
H318 - Causes serious eye damage.
H335 - May cause respiratory irritation.
H336 - May cause drowsiness or dizziness.

Precautionary statements (CLP) : P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P240 - Ground and bond container and receiving equipment.
P261 - Avoid breathing dust, fume, gas, mist, spray.
P280 - Wear eye protection, protective clothing, protective gloves.
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338+P310 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a doctor, a POISON CENTER.
P312 - Call doctor, a POISON CENTER if you feel unwell.

2.3. Other hazards

This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII
This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Fusel oil	(CAS-No.) 8013-75-0 (EC-No.) 232-395-2 (REACH-no) 01-2119970173-39-xxxx	≤ 100	Flam. Liq. 3, H226 Acute Tox. 4 (Oral), H302 Skin Irrit. 2, H315 Eye Dam. 1, H318 STOT SE 3, H336 STOT SE 3, H335

Full text of H-statements: see section 16

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Call a poison center or a doctor if you feel unwell. Victim conscious with laboured breathing: half-seated. If medical advice is needed, have product container or label at hand. Keep watching the victim. Check the vital functions. Never give anything by mouth to an unconscious person. Prevent cooling by covering the victim (no warming up).

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. Call a poison center or a doctor if you feel unwell. Give oxygen or artificial respiration if necessary.

First-aid measures after skin contact	:	Rinse skin with water/shower. Take off immediately all contaminated clothing. If skin irritation occurs: Get medical advice/attention.
First-aid measures after eye contact	:	If eye irritation persists: Get medical advice/attention. Rinse immediately with plenty of water for 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
First-aid measures after ingestion	:	Rinse mouth. Do not induce vomiting. Immediately consult a doctor/medical service. Do NOT induce vomiting.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/effects	:	May cause drowsiness or dizziness.
Symptoms/effects after inhalation	:	May cause respiratory irritation.
Symptoms/effects after skin contact	:	Irritation.
Symptoms/effects after eye contact	:	Serious damage to eyes.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media	:	Water spray. Dry powder. Foam. Carbon dioxide.
Unsuitable extinguishing media	:	Solid water jet ineffective as extinguishing medium. Do not use a heavy water stream.

5.2. Special hazards arising from the substance or mixture

Fire hazard	:	Flammable liquid and vapour.
Hazardous decomposition products in case of fire	:	Toxic fumes may be released. Upon combustion: CO and CO2 are formed.

5.3. Advice for firefighters

Precautionary measures fire	:	Eliminate all ignition sources if safe to do so. This product is not to be used under conditions of poor ventilation. Keep container tightly closed and away from heat, sparks and flame. Keep cool. Protect from sunlight.
Firefighting instructions	:	Eliminate all ignition sources if safe to do so. Use water spray or fog for cooling exposed containers. Take account of environmentally hazardous firefighting water. Contain the extinguishing fluids by bunding.
Protection during firefighting	:	Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures	:	If leakage cannot be stopped, evacuate the area. Ensure adequate ventilation. Avoid breathing vapors / spray and contact with skin and eyes. Not spilled material touch or walk in. Eliminate all sources of ignition. Keep away from heat, sparks and open fire. Wear protective clothing as described in Section 8 of this Safety Data Sheet.

6.1.1. For non-emergency personnel

Protective equipment	:	Wear recommended personal protective equipment.
Emergency procedures	:	Ventilate spillage area. No open flames, no sparks, and no smoking. Avoid breathing vapours, gas, mist, fume, spray. Avoid contact with skin and eyes.

6.1.2. For emergency responders

Protective equipment	:	Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment. Do not allow to enter drains or water courses. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment : Heating: dilute combustible gas/vapour with water curtain. Cover spill with non combustible material, e.g.: sand, earth, vermiculite. Do not touch or walk on the spilled product. Try to reduce evaporation. Provide adequate ventilation.

Methods for cleaning up : Take up liquid spill into absorbent material. Notify authorities if product enters sewers or public waters.

Other information : Dispose of materials or solid residues at an authorized site.

6.4. Reference to other sections

For further information refer to section 13. For further information refer to section 8: "Exposure controls/personal protection".

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Additional hazards when processed : In use, may form flammable vapour-air mixture. Handle empty containers with care because residual vapours are flammable. Flammable vapours may accumulate in the container. Do not spray on an open flame or other ignition source. Protect from direct sunlight. Do not pierce or burn, even after use. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Precautions for safe handling : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Ground/bond container and receiving equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Flammable vapours may accumulate in the container. Use explosion-proof equipment. Wear personal protective equipment. Use only outdoors or in a well-ventilated area. Avoid breathing vapours, gas, mist, fume, spray. Avoid contact with skin and eyes.

Hygiene measures : Wash contaminated clothing before reuse. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Ground/bond container and receiving equipment.

Storage conditions : Store in a well-ventilated place. Keep cool. Keep container tightly closed. Store locked up.

Incompatible products : Oxidizing agent.

Incompatible materials : Sources of ignition. Direct sunlight. Heat sources.

Heat and ignition sources : KEEP SUBSTANCE AWAY FROM: ignition sources. heat sources.

Information on mixed storage : KEEP SUBSTANCE AWAY FROM: oxidizing agents. ignition sources.

Storage area : Keep out of direct sunlight. Store away from heat. Fireproof storeroom. Store in a well-ventilated place. Store in a cool area.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Fusel oil (8013-75-0)	
PNEC (Water)	
PNEC aqua (freshwater)	0.053 mg/l
PNEC aqua (marine water)	0.005 mg/l
PNEC (Sediment)	
PNEC sediment (freshwater)	0.219 mg/kg dwt
PNEC sediment (marine water)	0.022 mg/kg dwt
PNEC (Soil)	
PNEC soil	0.013 mg/kg dwt

PNEC (STP)	
PNEC sewage treatment plant	100 mg/l

8.2. Exposure controls

Appropriate engineering controls:
Ensure good ventilation of the work station.

Materials for protective clothing:
Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task.

Hand protection:					
Protective gloves					
Type	**Material**	**Permeation**	**Thickness (mm)**	**Penetration**	**Standard**
Reusable gloves	Butyl rubber	6 (> 480 minutes)	0.7		EN ISO 374

Eye protection:
Safety glasses

Skin and body protection:
Wear fire/flame resistant/retardant clothing. Chemical resistant safety shoes

Respiratory protection:			
In case of insufficient ventilation, wear suitable respiratory equipment			
Device	**Filter type**	**Condition**	**Standard**
Gas mask	ABEK		EN 14387

Personal protective equipment symbol(s):

Environmental exposure controls:
Avoid release to the environment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Liquid
Appearance	:	Clear liquid.
Colour	:	Colourless to light yellow.
Odour	:	Irritating. Disagreeable.
Odour threshold	:	No data available
pH	:	No data available
Relative evaporation rate (butylacetate=1)	:	No data available
Melting point	:	< -20 °C
Freezing point	:	No data available
Boiling point	:	60 – 143
Flash point	:	26 °C
Auto-ignition temperature	:	300 °C

Decomposition temperature	:	No data available
Flammability (solid, gas)	:	Not applicable
Vapour pressure	:	No data available
Relative vapour density at 20 °C	:	No data available
Relative density	:	No data available
Density	:	0.84 g/cm³ @ 15 °C
Solubility	:	Material nearly insoluble in water.
Partition coefficient n-octanol/water (Log Pow)	:	-1.26 – -0.14
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	3.64 – 3.88 mPa·s @ 20 °C
Explosive properties	:	the study does not need to be conducted because there are no chemical groups present in the molecule which are associated with explosive properties.
Oxidising properties	:	The substance is incapable of reacting exothermically with combustible materials on the basis of the chemical structure (the substance contains oxygen atoms but these are not chemically bonded to nitrogen or oxygen).
Explosive limits	:	No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

Flammable liquid and vapour.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

No dangerous reactions known under normal conditions of use.

10.4. Conditions to avoid

Avoid contact with hot surfaces. Heat. No flames, no sparks. Eliminate all sources of ignition.

10.5. Incompatible materials

Oxidizing agent.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity (oral)	:	Harmful if swallowed.
Acute toxicity (dermal)	:	Not classified
Acute toxicity (inhalation)	:	Not classified

Fusel oil (8013-75-0)	
LD50 oral rat	4172 mg/kg
LD50 dermal rabbit	3216 mg/kg
LC50 Inhalation - Rat (Vapours)	12.8 – 16.6 mg/l/4h

Skin corrosion/irritation	:	Causes skin irritation.
Serious eye damage/irritation	:	Causes serious eye damage.
Respiratory or skin sensitisation	:	Not classified

Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified
Reproductive toxicity	:	Not classified
STOT-single exposure	:	May cause drowsiness or dizziness. May cause respiratory irritation.
STOT-repeated exposure	:	Not classified
Aspiration hazard	:	Not classified

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general	:	The product is not considered harmful to aquatic organisms nor to cause long-term adverse effects in the environment.
Hazardous to the aquatic environment, short-term (acute)	:	Not classified
Hazardous to the aquatic environment, long-term (chronic)	:	Not classified

Fusel oil (8013-75-0)	
LC50 fish 1	120 mg/l
EC50 Daphnia 1	173 mg/l
EC50 72h algae (1)	275 mg/l

12.2. Persistence and degradability

Fusel oil (8013-75-0)	
Persistence and degradability	Readily biodegradable in water.
Biodegradation	70 – 80 % in 28 days

12.3. Bioaccumulative potential

Fusel oil (8013-75-0)	
Partition coefficient n-octanol/water (Log Pow)	-1.26 – -0.14
Bioaccumulative potential	Low potential for bioaccumulation (Log Kow < 4).

12.4. Mobility in soil

No additional information available

12.5. Results of PBT and vPvB assessment

Fusel oil (8013-75-0)
This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII
This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

12.6. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Regional legislation (waste)	:	Disposal must be done according to official regulations.

Waste treatment methods	:	Dispose of contents/container in accordance with licensed collector's sorting instructions.
Additional information	:	Flammable vapours may accumulate in the container.

SECTION 14: Transport information

In accordance with ADR / RID / IMDG / IATA / ADN

ADR	IMDG	IATA	ADN	RID
14.1. UN number				
UN 1201	UN 1201	UN 1201	UN 1201	UN 1201
14.2. UN proper shipping name				
FUSEL OIL	FUSEL OIL	Fusel oil	FUSEL OIL	FUSEL OIL
Transport document description				
UN 1201 FUSEL OIL, 3, III, (D/E)	UN 1201 FUSEL OIL, 3, III	UN 1201 Fusel oil, 3, III	UN 1201 FUSEL OIL, 3, III	UN 1201 FUSEL OIL, 3, III
14.3. Transport hazard class(es)				
3	3	3	3	3
14.4. Packing group				
III	III	III	III	III
14.5. Environmental hazards				
Dangerous for the environment : No	Dangerous for the environment : No Marine pollutant : No	Dangerous for the environment : No	Dangerous for the environment : No	Dangerous for the environment : No
No supplementary information available				

14.6. Special precautions for user

Overland transport

Classification code (ADR)	:	F1
Limited quantities (ADR)	:	5l
Excepted quantities (ADR)	:	E1
Packing instructions (ADR)	:	P001, IBC03, LP01, R001
Mixed packing provisions (ADR)	:	MP19
Portable tank and bulk container instructions (ADR)	:	T2
Portable tank and bulk container special provisions (ADR)	:	TP1
Tank code (ADR)	:	LGBF
Vehicle for tank carriage	:	FL
Transport category (ADR)	:	3
Special provisions for carriage - Packages (ADR)	:	V12
Special provisions for carriage - Operation (ADR)	:	S2
Hazard identification number (Kemler No.)	:	30
Orange plates	:	
Tunnel restriction code (ADR)	:	D/E
EAC code	:	•2YE

Transport by sea

Special provisions (IMDG)	:	223, 955

Limited quantities (IMDG)	:	5 L
Excepted quantities (IMDG)	:	E1
Packing instructions (IMDG)	:	P001, LP01
IBC packing instructions (IMDG)	:	IBC03
Tank instructions (IMDG)	:	T2
Tank special provisions (IMDG)	:	TP1
EmS-No. (Fire)	:	F-E
EmS-No. (Spillage)	:	S-D
Stowage category (IMDG)	:	A
Properties and observations (IMDG)	:	Colourless, oily liquid with a disagreeable odour. A mixture consisting of amyl alcohols. Immiscible with water.

Air transport

PCA Excepted quantities (IATA)	:	E1
PCA Limited quantities (IATA)	:	Y344
PCA limited quantity max net quantity (IATA)	:	10L
PCA packing instructions (IATA)	:	355
PCA max net quantity (IATA)	:	60L
CAO packing instructions (IATA)	:	366
CAO max net quantity (IATA)	:	220L
Special provisions (IATA)	:	A3
ERG code (IATA)	:	3L

Inland waterway transport

Classification code (ADN)	:	F1
Limited quantities (ADN)	:	5 L
Excepted quantities (ADN)	:	E1
Equipment required (ADN)	:	PP, EX, A
Ventilation (ADN)	:	VE01
Number of blue cones/lights (ADN)	:	0

Rail transport

Classification code (RID)	:	F1
Limited quantities (RID)	:	5L
Excepted quantities (RID)	:	E1
Packing instructions (RID)	:	P001, IBC03, LP01, R001
Mixed packing provisions (RID)	:	MP19
Portable tank and bulk container instructions (RID)	:	T2
Portable tank and bulk container special provisions (RID)	:	TP1
Tank codes for RID tanks (RID)	:	LGBF
Transport category (RID)	:	3
Special provisions for carriage – Packages (RID)	:	W12
Colis express (express parcels) (RID)	:	CE4
Hazard identification number (RID)	:	30

14.7. Transport in bulk according to Annex II of Marpol and the IBC Code

Not applicable

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

15.1.1. EU-Regulations

The following restrictions are applicable according to Annex XVII of the REACH Regulation (EC) No 1907/2006:	
Reference code	Applicable on
3(a)	Fusel oil
3(b)	Fusel oil
40.	Fusel oil

Fusel oil is not on the REACH Candidate List
Fusel oil is not subject to Regulation (EU) No 649/2012 of the European Parliament and of the Council of 4 july 2012 concerning the export and import of hazardous chemicals.

Fusel oil is not subject to Regulation (EU) No 2019/1021 of the European Parliament and of the Council of 20 June 2019 on persistent organic pollutants

15.1.2. National regulations

No additional information available

15.2. Chemical safety assessment

No chemical safety assessment has been carried out

SECTION 16: Other information

Abbreviations and acronyms:	
CAS-No.	Chemical Abstract Service number
ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
ATE	Acute Toxicity Estimate
BCF	Bioconcentration factor
BLV	Biological limit value
BOD	Biochemical oxygen demand (BOD)
CLP	Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008
COD	Chemical oxygen demand (COD)
DMEL	Derived Minimal Effect level
DNEL	Derived-No Effect Level
EC50	Median effective concentration
EC-No.	European Community number
EN	European Standard
IARC	International Agency for Research on Cancer
IATA	International Air Transport Association
IMDG	International Maritime Dangerous Goods
IOELV	Indicative Occupational Exposure Limit Value
LC50	Median lethal concentration
LD50	Median lethal dose
LOAEL	Lowest Observed Adverse Effect Level
N.O.S.	Not Otherwise Specified
NOAEC	No-Observed Adverse Effect Concentration
NOAEL	No-Observed Adverse Effect Level
NOEC	No-Observed Effect Concentration
OECD	Organisation for Economic Co-operation and Development
OEL	Occupational Exposure Limit
PBT	Persistent Bioaccumulative Toxic
PNEC	Predicted No-Effect Concentration
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail

STP	Sewage treatment plant
ThOD	Theoretical oxygen demand (ThOD)
TLM	Median Tolerance Limit
TRGS	Technical Rules for Hazardous Substances
SDS	Safety Data Sheet
VOC	Volatile Organic Compounds
WGK	Water Hazard Class
vPvB	Very Persistent and Very Bioaccumulative

Training advice : Normal use of this product shall imply use in accordance with the instructions on the packaging.

Full text of H- and EUH-statements:	
Acute Tox. 4 (Oral)	Acute toxicity (oral), Category 4
Eye Dam. 1	Serious eye damage/eye irritation, Category 1
Flam. Liq. 3	Flammable liquids, Category 3
Skin Irrit. 2	Skin corrosion/irritation, Category 2
STOT SE 3	Specific target organ toxicity — Single exposure, Category 3, Narcosis
STOT SE 3	Specific target organ toxicity — Single exposure, Category 3, Respiratory tract irritation
H226	Flammable liquid and vapour.
H302	Harmful if swallowed.
H315	Causes skin irritation.
H318	Causes serious eye damage.
H335	May cause respiratory irritation.
H336	May cause drowsiness or dizziness.

SDS EU (REACH Annex II)

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

Version 6.8
Revision Date 29.07.2021
Print Date 19.03.2022
GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Ethyl alcohol, Pure

Product Number : 459836
Brand : Sigma-Aldrich
Index-No. : 603-002-00-5
REACH No. : 01-2119457610-43-XXXX
CAS-No. : 64-17-5

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Chemical Pvt Limited
Industrial Area, Anekal Taluka
Plot No 12,
12 Bommasandra - Jigani Link Road
560100 BANGALORE
INDIA

1.4 Emergency telephone

Emergency Phone # : +91 98802 05043

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008
Flammable liquids (Category 2), H225
Eye irritation (Category 2), H319

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 Label elements

Labelling according Regulation (EC) No 1272/2008
Pictogram

Signal word Danger

The life science business of Merck operates as MilliporeSigma in the US and Canada

Hazard statement(s)	
H225	Highly flammable liquid and vapor.
H319	Causes serious eye irritation.
Precautionary statement(s)	
P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233	Keep container tightly closed.
P240	Ground and bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use non-sparking tools.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Supplemental Hazard Statements	none

Reduced Labeling (<= 125 ml)

Pictogram	
Signal word	Danger
Hazard statement(s)	none
Precautionary statement(s)	none
Supplemental Hazard Statements	none

2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Absolute alcohol
Formula	:	C_2H_6O
Molecular weight	:	46,07 g/mol
CAS-No.	:	64-17-5
EC-No.	:	200-578-6
Index-No.	:	603-002-00-5

Component		Classification	Concentration
ethanol			
CAS-No. EC-No. Index-No.	64-17-5 200-578-6 603-002-00-5	Flam. Liq. 2; Eye Irrit. 2; H225, H319 Concentration limits: >= 50 %: Eye Irrit. 2A, H319;	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

The life science business of Merck operates as MilliporeSigma in the US and Canada

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Combustible.
Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters
In the event of fire, wear self-contained breathing apparatus.

5.4 Further information
Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

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SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Change contaminated clothing. Wash hands after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Hygroscopic.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

8.2 Exposure controls

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other

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substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact
Material: butyl-rubber
Minimum layer thickness: 0,7 mm
Break through time: 480 min
Material tested:Butoject® (KCL 898)

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0,4 mm
Break through time: 120 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
Recommended Filter type: Filter A (acc. to DIN 3181) for vapours of organic compounds

The entrepeneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Color: colorless
b)	Odor	pungent
c)	Odor Threshold	0,1 ppm
d)	pH	7,0 at 10 g/l at 20 °C
e)	Melting point/freezing point	Melting point/range: -114 °C
f)	Initial boiling point and boiling range	78 °C
g)	Flash point	13 °C - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available

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j)	Upper/lower flammability or explosive limits	Upper explosion limit: 13,5 %(V) Lower explosion limit: 2,5 %(V)
k)	Vapor pressure	0,57 hPa at 19,6 °C
l)	Vapor density	1,6
m)	Density	0,789 g/mL at 25 °C
	Relative density	No data available
n)	Water solubility	1.000 g/l at 20 °C - completely miscible
o)	Partition coefficient: n-octanol/water	log Pow: -0,35 at 24 °C - Bioaccumulation is not expected.
p)	Autoignition temperature	455 °C at 1.013 hPa - DIN 51794
q)	Decomposition temperature	Distillable in an undecomposed state at normal pressure.
r)	Viscosity	Viscosity, kinematic: No data available Viscosity, dynamic: 1,2 mPa.s at 20 °C0,54 - 0,59 mPa.s at 25 °C
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Conductivity	< 1 µS/cm
Surface tension	72,75 mN/m at 20 °C
Relative vapor density	1,6

SECTION 10: Stability and reactivity

10.1 Reactivity

Vapors may form explosive mixture with air.

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

Risk of explosion/exothermic reaction with:
hydrogen peroxide
perchlorates
perchloric acid
Nitric acid
mercury(II) nitrate
permanganic acid
Nitriles
peroxi compounds
Strong oxidizing agents
nitrosyl compounds
Peroxides
sodium

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Potassium
halogen oxides
calcium hypochlorite
nitrogen dioxide
metallic oxides
uranium hexafluoride
iodides
Chlorine
Alkali metals
Alkaline earth metals
alkali oxides
Ethylene oxide
silver
with
Nitric acid
silver compounds
with
Ammonia
potassium permanganate
with
conc. sulfuric acid
Risk of ignition or formation of inflammable gases or vapours with:
halogen-halogen compounds
chromium(VI) oxide
chromyl chloride
Fluorine
hydrides
Oxides of phosphorus
platinum
Nitric acid
with
potassium permanganate

10.4 Conditions to avoid

Warming.
Warming.

10.5 Incompatible materials

rubber, various plastics

10.6 Hazardous decomposition products

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - 10.470 mg/kg
(OECD Test Guideline 401)
LC50 Inhalation - Rat - male and female - 4 h - 124,7 mg/l
(OECD Test Guideline 403)
Dermal: No data available

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Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation - 24 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Causes serious eye irritation.
(OECD Test Guideline 405)

Respiratory or skin sensitization
Maximization Test - Guinea pig
Result: negative
(OECD Test Guideline 406)
Remarks: (in analogy to similar products)
The value is given in analogy to the following substances: Methanol

Germ cell mutagenicity
Test Type: Ames test
Test system: Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Test Type: In vitro mammalian cell gene mutation test
Test system: mouse lymphoma cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative

Test Type: dominant lethal test
Species: Mouse

Application Route: Oral
Method: OECD Test Guideline 478
Result: Positive results were obtained in some in vivo tests.

Carcinogenicity
No data available

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

Repeated dose toxicity - Rat - male - Oral - NOAEL (No observed adverse effect level) - 1.730 mg/kg - LOAEL (Lowest observed adverse effect level) - 3.200 mg/kg

RTECS: KQ6300000
irritant effects, respiratory paralysis, Dizziness, narcosis, inebriation, euphoria, Nausea, Vomiting

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To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Pimephales promelas (fathead minnow) - 15.300 mg/l - 96 h (US-EPA)
Toxicity to daphnia and other aquatic invertebrates	static test LC50 - Ceriodaphnia dubia (water flea) - 5.012 mg/l - 48 h Remarks: (ECHA)
Toxicity to algae	static test ErC50 - Chlorella vulgaris (Fresh water algae) - 275 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria	static test IC50 - activated sludge - > 1.000 mg/l - 3 h (OECD Test Guideline 209)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 15 d Result: ca.95 % - Readily biodegradable. (OECD Test Guideline 301E)
Biochemical Oxygen Demand (BOD)	930 - 1.670 mg/g Remarks: (Lit.)
Theoretical oxygen demand	2.100 mg/g Remarks: (Lit.)

12.3 Bioaccumulative potential

Due to the distribution coefficient n-octanol/water, accumulation in organisms is not expected.

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Other adverse effects

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

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SECTION 14: Transport information

14.1 UN number

ADR/RID: 1170 IMDG: 1170 IATA: 1170

14.2 UN proper shipping name

ADR/RID: ETHANOL
IMDG: ETHANOL
IATA: Ethanol

14.3 Transport hazard class(es)

ADR/RID: 3 IMDG: 3 IATA: 3

14.4 Packaging group

ADR/RID: II IMDG: II IATA: II

14.5 Environmental hazards

ADR/RID: no IMDG Marine pollutant: no IATA: no

14.6 Special precautions for user

No data available

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This material safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006.

National legislation

Seveso III: Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances. : FLAMMABLE LIQUIDS

Other regulations

Take note of Dir 94/33/EC on the protection of young people at work.

15.2 Chemical Safety Assessment

For this product a chemical safety assessment was not carried out

SECTION 16: Other information

Full text of H-Statements referred to under sections 2 and 3.

H225	Highly flammable liquid and vapor.
H319	Causes serious eye irritation.

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Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **Urea** PRODUCT NUMBER: EC-605

CHEMICAL NAMES/ DESCRIPTION: Carbamide resin; Isourea; Carbony diamide; Carbonyldiamine

2. COMPOSITION / INFORMATION ON INGREDIENTS

Component	% Comp	CAS #	EINECS #	TLV (units)
Urea	100	57-13-6	200-315-5	10mg/m3, 8 hr TWA

3. HAZARDS IDENTIFICATION

APPEARANCE AND ODOR: White crystals or white powder.

EMERGENCY OVERVIEW - IMMEDIATE HAZARD CAUSES IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT. UREA IS HARMFUL IF SWALLOWED OR INHALED.
EMERGENCY OVERVIEW - CHRONIC HAZARD WARNING LONG-TERM EXPOSURE TO HIGH AIRBORNE CONCENTRATIONS CAN LEAD TO PROTEIN METABOLISM. DISTURBANCES, MODERATE EMPHYSEMA, AND CHRONIC WEIGHT LOSS.

POTENTIAL HEALTH EFFECTS

INHALATION:
Causes irritation to the respiratory tract.

INGESTION:
Causes irritation to the garstrointestinal tract.

SKIN:
Causes irritation to the skin.

EYES:
Causes irritation to the eyes.

SIGNS AND SYMPTOMS 0F OVEREXPOSURE

INHALATION:
Symptoms may include coughing, shortness of breath. May be absorbed into the bloodstream with symptoms similar to ingestion.

INGESTION:
Symptoms may include nausea, vomiting, and diarrhea. May also cause headache, confusion and electrolyte depletion.

SKIN:
Symptoms include redness, itching, and pain.

EYES:
Redness, itching and pain.

CARCINOGENICITY:
Not listed as a carcinogen by NTP or IARC.

MUTAGENICITY:
No information found.

REPRODUCTIVE TOXICITY:

No information found.

TERATOGENIC EFFECTS:

No information found.

ROUTES OF ENTRY:

Ingestion and inhalation.

TARGET ORGAN STATEMENT:

Supersensitive individuals with skin or eye problems, kidney impairment or asthmatic condition should have physician's approval before exposure to urea dust.

4. FIRST AID MEASURES

INHALATION:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

INGESTION:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Call a physician.

SKIN:

Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

EYES:

Immediately flush eyes with plenty of water for at least fifteen minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. FIRE FIGHTING MEASURES

FLASH POINT:	N.A	FLAMMABLE LIMITS:	N.A
FLASH POINT METHOD:	N.A	AUTOIGNITION TEMPERATURE:	N.A

EXTINGUISHING MEDIA:

Use media appropriate to the primary cause of fire.

PROTECTIVE EQUIPMENT:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

HAZARDOUS COMBUSTION PRODUCTS:

Urea decomposes upon heating and can form products including ammonia, oxides or nitrogen, cyanuric acid, cyanic acid, biuret, carbon dioxide.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Not considered an explosion hazard.

NFPA CODES: Health: 1 Flammability: 0 Reactivity: 0

6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

Ventilate area. Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

WASTE DISPOSAL METHOD:

Disposal must be made in accordance with applicable federal, state, and local regulations

PERSONAL PRECAUTIONS:

Wear appropriate protective equipment as specified in section 8.

7. HANDLING AND STORAGE

HANDLING:

Avoid contact and inhalation. Do not get in eyes, on skin, on clothing. Wash thoroughly after handling.

STORAGE:

Keep in a tightly closed container, stored in a cooled, dry, ventilated area. Protect from physical damage. Isolate from incompatible materials (section 10).

STORAGE TEMPERATURE: Room Temperature

DISPOSAL:

Observe all national, state, and local regulations regarding disposal.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

AIRBORNE EXPOSURE LIMITS:

Component: Urea

ACGIH Threshold Limit Value (TLV): 10 mg/m3, 8-hour TWA

OSHA Permissible Exposure Limit (PEL): not available

ENGINEERING CONTROLS:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborn Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source.

RESPIRATORY PROTECTION:

For conditions of use where exposure to the dust or mist is apparent, a full-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator.

EYE PROTECTION:

Safety glasses

SKIN PROTECTION:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

OTHER CONTROL MEASURES:

N.A.

9. PHYSICAL PROPERTIES

Boiling Point	Decomposes	Evaporation Rate	No data found.
Melting Point	132-135C (270-275F)	Solubility in Water	Very soluble.
Vapor Pressure mm Hg	No data found.	PH	7.2 (10% in water)
Vapor Density Air = 1	No data found.	Specific Gravity (H20 = 1)	1.32 @ 20C
% Volatile by Volume	0		

10. STABILITY AND REACTIVITY

STABILITY:

This product is stable.

CONDITIONS TO AVOID:

Incompatibles.

HAZARDOUS DECOMPOSITION PRODUCTS:

Urea decomposes upon heating and can form products including ammonia, oxides or nitrogen, cyanuric acid, cyanic acid, biuret, carbon dioxide.

HAZARDOUS POLYMERIZATION:
Will not occur.

INCOMPATIBLES:

Urea reacts with calcium hypochlorite or sodium hypochlorite to form the explosive nitrogen trichloride. It is incompatible with sodium nitrite, gallium perchlorate, strong oxidizing agents (permanganate, dichromate, nitrate, chlorine), phosphorus penta

11. TOXICOLOGICAL INFORMATION

PRODUCT LD50 VALUES:

Urea	Oral Rat LD50 (mg/kg):	8471
Urea	Dermal Rabbit LD50 (mg/kg):	N.A.

COMPONENT CANCER LIST STATUS:

Component	NTP Carcinogen Known	Anticipated	IARC Category
Urea	No	No	None

12. ECOLOGICAL INFORMATION

When urea is released to soil, this material will hydrolyze into ammonium in a matter of days to several weeks. When released into the soil, this material may leach into groundwater. When released into water, this material may biodegrade to a moderate extent. When released into water, this material is not expected to evaporate significantly. This material has an experimentally determined bioconcentration factor (BCF) of less than 100. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with

photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day.

13. DISPOSAL CONSIDERATIONS

Observe all national, state, and local regulations regarding disposal.

14. TRANSPORT INFORMATION

D.O.T.

Proper Shipping Name: Not regulated.

Hazard Class: N.A.
UN Number: N.A.
Packing Group: N.A.

I.A.T.A.: Item is not prohibited or restricted as per IATA.

Proper Shipping Name: Not regulated.

Hazard Class: N.A.
UN Number: N.A.
Packing Group: N.A.

I.M.O.

Proper Shipping Name: Not regulated.

Hazard Class: N.A.
UN Number: N.A.
Packing Group: N.A.

15. REGULATORY INFORMATION
UNITED STATES

Hazardous Label(s): N.A.
Safety phases: S 24/25

	Avoid contact with skin and eyes
Risk phases:	R 36/37/38/60

16. OTHER INFORMATION

NFPA CODES: Health: 1 Flammability: 0 Reactivity: 0

Annexure VIII NABET Certificate

QUALITY COUNCIL OF INDIA
Creating an Ecosystem for Quality

National Accreditation Board for Education and Training

Certificate of Accreditation

Eco Chem Sales and Services

Office Floor, Ashoka Pavillion - A,Opp. Kapadia Health Club, New Civil Road,Surat- 395001,

*The organization is accredited as **Category-A** under the QCI-NABET Scheme for Accreditation of EIA Consultant Organization, Version 3: for preparing EIA-EMP reports in the following Sectors –*

S. No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals – Opencast only.	1	1 (a) (i)	A
	Mining of minerals including opencast and underground			B
2	Offshore and onshore oil and gas exploration, development & production	2	1 (b)	A
3	Thermal power plants	4	1 (d)	B
4	Mineral beneficiation	7	2(b)	B
5	Metallurgical industries (ferrous & non-ferrous)	8	3 (a)	A
6	Cements plants	9	3 (b)	A
7	Chlor-alkali industry	13	4 (d)	A
8	Chemical fertilizers	16	5 (a)	A
9	Pesticides industry and pesticide specific intermediates (excluding formulations)	17	5 (b)	A
10	Petro-chemical complexes	18	5 (c)	A
11	Manmade fibers manufacturing	19	5 (d)	B
12	Petrochemical based processing	20	5 (e)	A
13	Synthetic organic chemicals industry	21	5 (f)	A
14	Distilleries	22	5 (g)	A
15	Pulp & paper industry	24	5 (i)	A
16	Sugar Industry	25	5 (j)	B
17	Oil & gas transportation pipeline	27	6 (a)	A
18	Air ports	29	7 (a)	A
19	Industrial estates/ parks/ complexes/ Areas	31	7 (c)	A
20	Common hazardous waste treatment, storage and disposal facilities (TSDFs)	32	7 (d)	A
21	Bio-medical waste treatment facilities	32A	7 (da)	B
22	Ports, harbours, break waters and dredging	33	7 (e)	A
23	Highways	34	7 (f)	A
24	Common Effluent Treatment Plants (CETPs)	36	7 (h)	B
25	Common Municipal Solid Waste Management Facility (CMSWMF)	37	7 (i)	B
26	Building and construction projects	38	8 (a)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in SAAC minutes dated Feb. 04, 2022 posted on QCI-NABET website

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no. QCI/NABET/ENV/ACO/22/2287 dated Mar. 28, 2022. The accreditation needs to be renewed before the expiry date by Eco Chems Sales and Services, Surat following due process of assessment.

Sr. Director, NABET
Dated: Mar. 28, 2022

Certificate No.
NABET/EIA/2023/SA 0156

Valid up to
Mar. 15, 2023

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