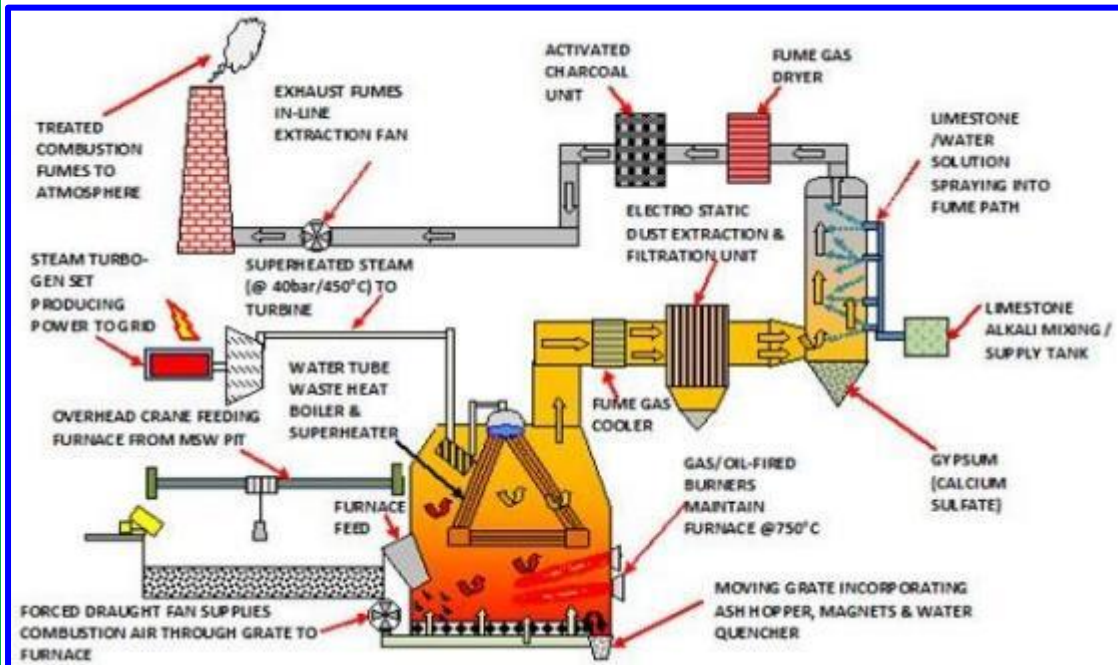


ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR)

SETTING-UP OF A PLANT FOR RECEIPT, STORAGE AND DISPOSAL THROUGH INCINERATION OF ALL AND VARIOUS TYPES OF WASTES [INCLUDING, BUT NOT LIMITED TO, INDUSTRIAL, COMMERCIAL, INSTITUTIONAL, DOMESTIC, BIOMEDICAL, HAZARDOUS, NON-HAZARDOUS AND ALL OTHER SOLID AND LIQUID WASTES ETC.]



360 ENVIRONMENTAL SOLUTIONS [PVT] LTD

Phoolnagar Bypass Road, Mauza Behramke
Tehsil Pattoki, District Kasur

Final Report
(February 2023)

Prepared by



GREEN REVOLUTION

Environmental Management and Legal Consultants
Tel: 0333-4222232
green-sul@hotmail.com

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR)

SETTING-UP OF A PLANT FOR RECEIPT, STORAGE AND DISPOSAL THROUGH INCINERATION OF ALL AND VARIOUS TYPES OF WASTES [INCLUDING, BUT NOT LIMITED TO, INDUSTRIAL, COMMERCIAL, INSTITUTIONAL, DOMESTIC, BIOMEDICAL, HAZARDOUS, NON-HAZARDOUS AND ALL OTHER SOLID AND LIQUID WASTES ETC.]



360 ENVIRONMENTAL SOLUTIONS [PVT] LTD
Phoolnagar Bypass Road
Mauza Behramke, Tehsil Pattoki, Distt Kasur

Final Report
(February 2023)

Prepared by



GREEN REVOLUTION

Environmental Management and Legal Consultants
Tel: 0333-4222232
green-sul@hotmail.com



ACKNOWLEDGEMENT & DISCLAIMER



ACKNOWLEDGMENT & DISCLAIMER

Acknowledgement

The Team of Professionals and Associates, who carried out this Environmental Impact Assessment (EIA) are thankful to the sponsor, planner, designer, architect and contractor of the plant as well as all those persons, who helped directly and indirectly in conducting this EIA in the best professional manner. The report presents a comprehensive examination of the likely environmental and social impacts of “setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]”. The plant will be setup on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur. The Team of Environmental Experts and Allied Professionals expresses its special gratitude for **Mr. Mazhar Hussain, Owner/Proprietor and Mr. Zeshan Ahmed, Director, 360 Environmental Solutions [Pvt] Ltd.** for the assistance provided by them in connection with visits of the site during the course of the EIA. The Team is indebted deeply to **Assistant Director (Env)** and his office staff for their assistance, guidance, advice and invaluable contributions, which helped in accomplishing EIA, the way it ought to have been.

Disclaimer

This document is an Environmental Impact Assessment Report (EIAR) of the project named “setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]”. The report presents a detailed examination of the most likely environmental and social impacts of setting-up of the plant’s building on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur. The report presents a review of the most likely environmental impacts of setting up of the project, as may occur to the existing environmental and social profile of the site/area. For the purpose of environmental impact evaluation, a concentric area of the radius upto 100 metres from the centre of the site was assumed to be the likely zone of environmental influence of the site/activities. The prevailing baseline environmental and social profile of the site/area was used as the benchmark for assessing the changes therein, if any, and the environmental and social impacts of setting-up of the plant.

This EIA report is project specific and of limited applicability and liability only to the extent of the activities and the operations relating to setting up of the instant plant and its operation subsequent thereto and none else. The report has been prepared in compliance to directions of the EPA-Pb.

All rights of this report are reserved with the proponent and the environmental consultant. No part of this report may be reproduced, copied, published, transcribed or cited in any manner in a context different from the purpose for which it has been prepared, except with prior permission of the proponent and the authoring consultant.

Team of Environmental Experts

The team of experts, who carried out the instant EIA, comprised the following Members:

- Engr. Mukhtar A Khan (Civil Engineer & Design Specialist)
- Engr. Jamshed Yaqub (Chemical Engineer)
- Gulbaz Ali Khan (Environmental Ecologist)
- Muhammad Azeem (Environmental & Resettlement Specialist)
- Khurram Jameel (Environmental Geologist)
- Miss Saira Irum (Environmental Sociologist)
- Mr. Kashif Ikram (Environmental Lawyer)



ABBREVIATIONS



ABBREVIATIONS

Acronym	Full Text
BHU	Basic Health Unit
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
dB	Decibel
DHQH	District Headquarters Hospital
ESRMP	Environmental, Social & Risk Management Plan
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMP	Environmental Management Plan
EPA-Pb	Environmental Protection Agency, Punjab
EPD	Environment Protection Department
ERS	Emergency Response System
ESH	Environmental Safety and Health
ESHU	Environmental Safety and Health Unit
GoPb	Government of the Punjab
GoPk	Government of Pakistan
IEE	Initial Environmental Examination
IEER	Initial Environmental Examination Report
IWT	Indus Water Treaty
JICA	Japan International Cooperation Agency
MCH	Mother and Child Healthcare Centre
PEQS	Punjab Environmental Quality Standards
NOC	No Objection Certificate
Pak EPA	Pakistan Environmental Protection Agency
PEPA	Punjab Environmental Protection Act
PM	Particulate Matter
PSDP	Public Sector Development Programme
RHC	Rural Health Centre
SHC	Sub Health Centre
SPM	Suspended Particulate Matter
SW	Solid Waste(s)
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
UBC	Uniform Building Code
WAPDA	Water and Power Development Authority
WHO	World Health Organization



CONTENTS



CONTENTS

Sr. No.	Contents	Page No.
	Acknowledgement & Disclaimer	i
	Abbreviations/Acronyms	ii
	Contents	iii
	EPA's Guideline Proforma & Checklist	xxiii
	Executive Summary	a
Section-1	Introduction	1-9
1.1	Purpose of Report	1
1.2	Identification of the Project & Proponent	1
1.3	Environmental Consultant	1
1.4	Brief Description of the Project	2
1.4.1	Design and Layout	3
1.4.2	Stack Emissions Capturing, Treatment and Disposal System and Equipment	3
1.4.3	Bottom Ash Collection and Disposal System	3
1.4.4	Engineering and Design Features	4
1.4.4.1	Key Features	5
1.4.4.2	Technical Specifications and Features	5
1.4.4.3	Running Principle	6
1.4.4.4	Special (Primary) Combustion Chamber for Hazardous Waste	6
1.4.4.5	Composition of the Refractory Lining	6
1.4.4.6	Combustion Burners	6
1.4.4.7	Temperature Range	6
1.4.4.8	Central Air Supply Fan	6
1.4.4.9	Chamber Size/Volume	6
1.4.4.10	Dual Post-Combustion Chambers	6
1.4.4.11	Technical Specifications of Post Combustion Chamber	7
1.4.4.12	Wet Scrubber	7
1.4.4.13	Chimney / Stack	7
1.4.4.14	Electric Control and Regulation Panel	7
1.4.4.15	Technical Data Sheet	7
1.4.4.16	Operational Requirements	7
Section-2	Brief Description of the Project	10-35
2.1	Type and Category of Project	10
2.2	Objectives of the Project	10
2.3	Alternatives of the Project	10
2.4	Location & Layout of the Project	11
2.5	Land Use of the Site	15
2.6	Road Access	15
2.7	Vegetation Features of the Site	15
2.8	Cost & Magnitude of Operation	15
2.9	Schedule of Implementation	15
2.10	Brief Description of the Project	16
2.10.1	Design and Layout Features	16
2.10.2	Management and Treatment of Emission Gases	20
2.10.3	Summary of Essential Info	21
2.10.4	Environmental Considerations	21
2.10.5	Brief Overview of Incineration	23
2.10.5.1	Principles and basis of incineration or controlled combustion	23
2.10.5.2	Definition of incineration	23
2.10.5.3	Usefulness of incineration	23
2.10.5.4	Objections on incineration	24
2.10.5.5	Classification of incinerators	24
2.10.6	Incineration Parameters	24



2.10.6.1	Heat Value	24
2.10.6.2	Moisture	25
2.10.6.3	Combustion air	25
2.10.7	Combustion Conditions	25
2.10.8	Mechanisms for Turbulence of Wastes	25
2.10.9	Air Supply Control	25
2.10.10	Temperature Control	25
2.10.11	Combustion Gases (Flue Gases)	26
2.10.11.1	Carbon Monoxide (CO)	26
2.10.11.2	Carbon Dioxide (CO ₂)	26
2.10.11.3	Oxides of Sulphur / Sulphur Dioxide (SO ₂)	26
2.10.11.4	Oxides of Nitrogen (NO _x)	27
2.10.11.5	Particulates	27
2.10.11.6	Heavy Metals	27
2.10.12	Air Emissions	27
2.10.13	Settling Chambers	27
2.10.14	Cyclones	27
2.10.15	Electrostatic Precipitators	27
2.10.16	Fabric Filters	27
2.10.17	Wet Scrubbers	27
2.10.18	Disposal of Combustion Ash	27
2.10.19	General Design Features	27
2.10.19.1	Tipping Area	27
2.10.19.2	Storage Enclosure	27
2.10.19.3	Feeding/Charging Mechanism	28
2.10.19.4	Combustion Chamber / Furnace	28
2.10.20	Types of Incinerators	28
2.10.20.1	Mass Burn Incinerators	28
2.10.20.2	Modular Incinerators	28
2.10.20.3	Fluid-bed Incinerators	28
2.10.21	Performance of Incinerators	29
2.10.22	Problems associated with Incinerators / Incineration	29
2.10.23	Composition of Combustion Gases	29
2.10.24	Process Flow of Operation	29
2.10.25	Main Sections of the Plant	31
2.11	Restoration and Rehabilitation Plans	34
2.12	Government Approvals	35
Section-3	Baseline Environmental & Socioeconomic Profile	36-54
3.1	Baseline Environmental Settings	36
3.2	Studies and Surveys for Baseline Profile	36
3.3	Environmental Description of the Area	37
3.4	Geo-Physical Environment	38
3.4.1	Site & District	38
3.4.2	Location & Accessibility of the Site	39
3.4.3	Geography	39
3.4.4	Topography	39
3.4.5	Geology	40
3.4.6	Seismology	40
3.4.7	Soil Morphology	40
3.4.8	Surface Hydrology	40
3.4.9	Hydrogeology & Groundwater	41
3.4.10	Meteorology and Climate	42
3.4.11	Floods and Water Storms	43
3.4.12	Air Quality	43
3.4.13	Effluent Disposal	43
3.4.14	Background Radiological Characteristics	44
3.4.15	Ambient Noise Characteristics	44



3.5	Eco-Biological Environment	45
3.5.1	Forests, Habitat, and Ecologically Sensitive Areas	45
3.5.2	Local Flora	45
3.5.3	Local Fauna	45
3.5.4	Protected and Ecologically Sensitive Areas	46
3.5.5	Endangered Species	46
3.5.6	Fisheries	46
3.5.7	Aquaculture	46
3.5.8	Apiculture	46
3.5.9	Sericulture	46
3.6	Sociocultural Environment	46
3.6.1	Demographic Profile	46
3.6.2	Land Use/Agricultural Profile	47
3.6.3	Industrial Profile	48
3.6.4	Healthcare Facilities Profile	49
3.6.5	Educational Facilities Profile	50
3.6.6	Livestock and Farming	50
3.6.7	Infrastructure Profile	51
3.6.8	Socioeconomic Profile	52
3.6.9	Culture, Religion, Customs and Specialities	52
3.6.10	Recreation and Sports	53
3.6.11	Historical and Archaeological Heritage	53
3.7	Lab Reports of Environmental Analyses	53
Section 4	Screening of Potential Environmental Impacts and their Mitigation	55-76
4.1	Environmental Impacts and Their Mitigations	55
4.2	Assessment Methodology	56
4.3	Mitigation Strategy	56
4.4	Likely Impacts and Mitigations of Location, Design & Planning	56
4.4.1	Design, Location & Layout Planning	56
i)	Likely Impacts	57
ii)	Activities Likely to Produce the Impacts	57
iii)	Mitigation Measures	57
4.5	Likely Impacts and Mitigations of Construction Phase	57
4.5.1	Parametric Impacts of Construction Phase	57
4.5.1.1	Soils and Lands	57
i)	Likely Impacts	57
ii)	Activities Likely to Produce the Impacts	57
iii)	Mitigation Measures	57
4.5.1.2	Surface Water Quality	58
i)	Likely Impacts	58
ii)	Activities Likely to Produce the Impacts	58
iii)	Mitigation Measures	58
4.5.1.3	Groundwater Abstraction and Quality	58
i)	Likely Impacts	58
ii)	Activities Likely to Produce the Impacts	58
iii)	Mitigation Measures	58
4.5.1.4	Wastewaters and Effluents	59
i)	Likely Impacts	59
ii)	Activities Likely to Produce the Impacts	59
iii)	Mitigation Measures	59
4.5.1.5	Air Quality	59
i)	Likely Impacts	59
ii)	Activities Likely to Produce the Impacts	59
iii)	Mitigation Measures	60
4.5.1.6	Noise and Vibrations	60
i)	Likely Impacts	60
ii)	Activities Likely to Produce the Impacts	60



iii)	Mitigation Measures	56
4.5.2	Non-Parametric Impacts of the Construction Phase	56
4.5.2.1	Land use change	60
i)	Likely Impacts	61
ii)	Activities Likely to Produce the Impacts	61
iii)	Mitigation Measures	61
4.5.2.2	Solid Wastes	61
i)	Likely Impacts	61
ii)	Activities Likely to Produce the Impacts	61
iii)	Mitigation Measures	61
4.5.2.3	Access, Easement, Health, Wellbeing, and Worksite Safety	61
i)	Likely Impacts	62
ii)	Activities Likely to Produce the Impacts	62
iii)	Mitigation Measures	62
4.5.2.4	Cutting and Removal Trees and Crops	62
i)	Likely Impacts	62
ii)	Activities Likely to Produce the Impacts	62
iii)	Mitigation Measures	62
4.6	Likely Environmental Impacts of the Operation Phase	62
4.6.1	Parametric Impacts of the Operation (Usage) Phase	63
4.6.1.1	Soils and Land	63
i)	Likely Impacts	63
ii)	Activities Likely to Produce the Impacts	63
iii)	Mitigation Measures	63
4.6.1.2	Surface Water Quality	63
i)	Likely Impacts	63
ii)	Activities Likely to Produce the Impacts	63
iii)	Mitigation Measures	63
4.6.1.3	Groundwater Abstraction and Quality	64
i)	Likely Impacts	64
ii)	Activities Likely to Produce the Impacts	64
iii)	Mitigation Measures	64
4.6.1.4	Wastewaters and Effluents	64
i)	Likely Impacts	64
ii)	Activities Likely to Produce the Impacts	65
iii)	Mitigation Measures	65
4.6.1.5	Air Quality	65
i)	Likely Impacts	65
ii)	Activities Likely to Produce the Impacts	65
iii)	Mitigation Measures	65
4.6.2	Non-Parametric Impacts of the Operation Phase	66
4.6.2.1	Electricity Usage	66
i)	Likely Impacts	66
ii)	Activities Likely to Produce the Impacts	66
iii)	Mitigation Measures	66
4.6.2.2	Water Usage	66
i)	Likely Impacts	67
ii)	Activities Likely to Produce the Impacts	67
iii)	Mitigation Measures	67
4.6.2.3	Solid Wastes	67
i)	Likely Impacts	67
ii)	Activities Likely to Produce the Impacts	67
iii)	Mitigation Measures	68
4.6.2.4	Noise, Vibrations and Odours	68
i)	Likely Impacts	68
ii)	Activities Likely to Produce the Impacts	68
iii)	Mitigation Measures	68
4.6.2.5	Access, Easement, Health, Community Wellbeing and Worksite Safety	68



i)	Likely Impacts	68
ii)	Activities Likely to Produce the Impacts	68
iii)	Mitigation Measures	68
4.6.2.6	Receiving of Waste Materials	69
i)	Likely Impacts	69
ii)	Activities Likely to Produce the Impacts	69
iii)	Mitigation Measures	69
4.6.2.7	Incineration Operations	69
i)	Likely Impacts	69
ii)	Activities Likely to Produce the Impacts	69
iii)	Mitigation Measures	69
4.6.2.8	Marketing of Services	71
i)	Likely Impacts	71
ii)	Activities Likely to Produce the Impacts	71
iii)	Mitigation Measures	71
4.7	Environmental Enhancement Measures	71
Section 5	Environmental Management & Monitoring Plan (EMMP)	77-86
5.1	Institutional Capacity	77
5.2	Training Schedule	78
5.3	Summary of Impacts & Mitigations	78
5.4	Equipment Maintenance	79
5.5	Environmental Budget	79
Section 6	Stakeholders Consultations	87-93
6.1	Objectives and Rationale of Consultations	87
6.2	Identification of the Relevant Stakeholders	87
6.3	Consultation Methodology	88
6.4	Issues Discussed	88
6.5	Outcome of the Consultation	89
6.5.1	Design Aspects	89
6.5.2	Construction Aspects	89
6.5.3	Operation Aspects	89
6.6	Measures to Address the Concerns	89
	Findings & Conclusion	94
	Findings & Conclusion	94
	References	95
	References	95

TABLES

Table No.	Description	Page
1.3	Contact Details of the Focal Persons of Proponent & Environmental Consultant	2
1.4	Summary of the Essential Info	2
1.4.4.2	Technical Design Specifications and Features	5
1.4.4.15	Summary of Technical Specifications	7
2.10.3	Summary of the Essential Info	21
2.10.6.1a	Higher (Gross) Heat Values of Some Selected Materials	24
2.10.6.1b	Composition and Estimated Heating Value for MSW by Mass in Different Countries	24
3.4.8	Surface Water Quality of the Area	41
3.4.9a	Typical Groundwater Quality of the Area	42
3.4.9b	Typical Microbiological Quality of Groundwater of Area	42
3.4.9c	Number of Tubewells in the Project District	42
3.4.10	Typical Climatic Features of the Area	42
3.4.12	Typical Ambient Air Quality Profile of the Area	43
3.4.15a	Noise Records at the Site	44
3.4.15b	Expected Noise Levels at various Plant Locations	44
3.4.15c	Noise Annoyance Levels for Resident Communities	44



3.5.3	Some Common Flora & Fauna along with Botanical & Zoological Names	45
3.6.1	Demographic Profile of the Project District	47
3.6.2a	Land Use/Agricultural Profile of the Project District	48
3.6.2b	Production of Main Vegetables	48
3.6.3a	Census Statistics of Industry in the Project District	48
3.6.3b	Number of Registered Factories and Employment	49
3.6.4a	Healthcare Profile of the Project District	49
3.6.4b	Some Common Diseases of the Area	49
3.6.5	Education Sector Profile of the Project District	50
3.6.6	Livestock Resources of the Project District	51
3.6.7	Infrastructure Profile/Length of Roads	52
3.6.11	Archaeological & Historical Heritage	53
4.2a	Modified Environmental and Social Impact Matrix (Unmitigated Impacts)	72
4.2b	Modified Environmental and Social Impact Matrix (Mitigated Impacts)	73
4.2c	Environmental Questionnaire	74
4.2d	Environmental Screening Proforma	75
5.6	Tentative Environmental Budget	79
5.4a	Environmental Management and Monitoring Plan / Framework (Activity based)	80
5.4b	Environmental Management and Monitoring Plan / Framework (Parameter based)	85
6.2a	Stakeholders of the Project and Nature of their Stakes (Construction Phase)	87
6.2b	Stakeholders of the Project and Nature of Their Stakes (Operation Phase)	87
6.6	Summary of Stakeholders' Concerns alongwith Remedial Measures	89

FIGURES AND PICS

Fig/Plate	Description	Page
1.4.4a	Engineering and Design Features [Side View]	8
1.4.4b	Engineering and Design Features [Top View]	9
Fig. 2.4a	A Google Earth Imagery of the Site	12
Fig. 2.4b	A Google Earth Imagery of the Site	12
Fig. 2.4c	A Google Earth Imagery of the Site	12
Fig. 2.4d	A Google Earth Imagery of the Site	13
Fig. 2.4e	A Google Earth Imagery of the Site	13
Fig. 2.4f	A Google Earth Imagery of the Site	13
Pic. 2.4a	A Real Time Pic of the Site prior to Setting-up of the Plant	14
Pic. 2.4b	A Real Time Pic of the Site prior to Setting-up of the Plant	14
Fig.2.10.24a	Process Flow Diagram	30
Fig.2.10.24b	Process Flow Diagram	30
Fig.2.10.24c	Process Flow Diagram	30
Fig. 3.3	Site's Zone of Environmental and Social Influence	37
Fig. 3.4.1a	Map of Punjab showing location of Kasur relative to other distts	54
Fig. 3.4.1b	Map of Punjab showing location of Kasur relative to other distts	54
Fig. 3.5.1a	Wildlife Map of Punjab	54
Fig. 3.5.1b	Ecological Map of Punjab	54
Fig. 5.5	Location Placement of Emergency Handling Equipment at the Premises	79
Fig. 6a	Onsite Stakeholders Consultation	91
Fig. 6b	Onsite Stakeholders Consultation	92
Fig. 6c	Onsite Stakeholders Consultation	93

ANNEXES

Annex No.	Description	Page
Annex-1	Layout Map, Site Plan and Aks Shajra etc.	96
Annex-2	Project Related and Other Docs	99
Annex-3	Lab Analysis Reports of Environmental Parameters	103
Annex-4	Process Flow Chart	112
Annex-5	Persons Interviewed during the EIA Process	113
Annex-6	Internal Monitoring Proforma	114
Annex-7	Terms of Reference (ToR)	115



EPA'S GUIDELINE PROFORMA CHECKLIST



EPA'S GUIDELINE PROFORMA & CHECKLIST FOR IEE/EIA REPORTS

GUIDELINES FOR PREPARATION AND REVIEW OF ENVIRONMENTAL REPORTS CHECKLIST

Clause No.	Requirements for Preparation and Review of Environmental Reports	IEE/EIA Report		
		Present	Lacking	Page No. (If Present)
2	Commencing Environmental Assessment			
2.3	Format of Report: Report should contain:			
2.3 (A)	Executive Summary, which should contain:	Yes	No	Page a to i
	1. Title and Location of Project	Yes	No	Page a
	2. Name of the Proponent	Yes	No	Page a
	3. Name of the Organization preparing the Report	Yes	No	Page a
	4. A brief Outline of the Proposal	Yes	No	Page a
	5. The Major Impacts	Yes	No	Page c
	6. Recommendations for Mitigation Measures	Yes	No	Page g
	7. Proposed Monitoring	Yes	No	Page h
2.3(B)	Introduction should include:	Yes	No	Page 1-4
2.3(C)	1. Purpose of Report	Yes	No	Page 1
	2. Identification of Project and Proponent	Yes	No	Page 1
	3. Details of Consultant	Yes	No	Page 1
	4. Brief Description of Nature, Size, and Location of Project	Yes	No	Page 2
	Description of the Project should include:	Yes	No	Page 5-31
	1. Type and Category of Project	Yes	No	Page 5
	2. Objectives of Project	Yes	No	Page 5
	3. Alternatives Considered Realistically (in detailed) and Reason for Their Rejection	Yes	No	Page 5
	4. Location and Site Layout of the Project (may be annexed at the end of Report)	Yes	No	Page 6
	5. Land Use of the Site	Yes	No	Page 11
	6. Road Access	Yes	No	Page 11
	7. Vegetation Features of the Site	Yes	No	Page 11
	8. Cost and Magnitude of Operation	Yes	No	Page 11
	9. Schedule of Implementation	Yes	No	Page 11
	10. Description of the Project (Process Flow Chart/Steps)	Yes	No	Page 12
	11. Restoration and Rehabilitation Plans	NR	No	Page 30
	12. Government Approvals	NR	No	Page 31
2.3(D)	Description of Environment should include:	Yes	No	Page 32-50
2.3(D)	1. Clear-cut Picture of Existing Environmental Resources: ▪ Physical ▪ Ecological ▪ Socioeconomic	Yes	No	Page 32-49
	2. Quality of Life Values	Yes	No	Page 32-49
	3. Lab Reports of Environmental Analyses	NR	No	Page 49
2.3(E)	Screening of Potential Environmental Impacts and Mitigation Measures should include Environmental Parameters regarding:	Yes	No	Page 51-72
2.3(E)	1. Project Location	Yes	No	Page 52
	2. Design	Yes	No	Page 52
	3. During Construction Phase	Yes	No	Page 53
	4. During Operational Phase	Yes	No	Page 58
	5. Potential Environmental Enhancement Measures	Yes	No	Page 67
2.3(F)	Environmental Management and Monitoring Programme	Yes	No	Page 73-82



	should include:			
	▪ Institutional Capacity	Yes	No	Page 73
	▪ Training Schedules	Yes	No	Page 74
	▪ Summary of Impacts and Their Mitigation Measures	Yes	No	Page 74
	▪ Equipment Maintenance Details	Yes	No	Page 75
	▪ Environmental Budget	Yes	No	Page 75
2.5	Involvement of Stakeholders/Public Consultation: Communicate the Possible Impacts and Concerns to Assist further Analysis and Decision Making	Yes	No	Page 83-86
	▪ Proponent	Yes	No	Page 83-86
	▪ The Responsible Authority	Yes	No	Page 83-86
	▪ Other Departments and Agencies	Yes	No	Page 83-86
	▪ Environmental Practitioners and Experts	Yes	No	Page 83-86
	▪ Affected and Wider Community	Yes	No	Page 83-86
2.7	Site Selection should Include: Suitability of the Site (will not be Prohibited, Environmentally Sensitive, Incompatible to Surroundings and Unsuitable)	Yes	No	Page 83-86
3	Assessing Impacts (For EIA only)			
3.2	Identification of all Impacts	Yes	No	Page 51-72
3.2	Methodologies for Impact Identifications (One/More)	Yes	No	Page 68-81
Table 2	▪ Checklists	Yes	No	Page 70-71
	▪ Matrices	Yes	No	Page 68-69
	▪ Networks	NR	No	Page 76-81
	▪ Overlays	NR	No	
	▪ GIS and Computer Expert Systems	NR	No	
3.3	Impact Analysis and Prediction (One/More)	Yes	No	Page 83-86
and 3.6	▪ Meetings	Yes	No	-do-
	▪ Workshops	Yes	No	-do-
	▪ Consultations / Case Studies	Yes	No	-do-
3.5	Characteristics of Impacts (Nature, Magnitude, Extent and Location, Timing, Duration, Reversibility, Risk)	Yes	No	Page 51-72
3.10	Impact Significance: Acceptable, Require Mitigation or are Unacceptable to the Community	Yes	No	-do-
	▪ Ecological Importance	Yes	No	-do-
	▪ Social Importance	Yes	No	-do-
	▪ Environmental Standards	Yes	No	-do-
4	Mitigation and Impact Assessment			
	Purpose of Mitigation Measures should include:	Yes	No	Page 51-72
4.1	1. What is the Problem	Yes	No	-do-
	2. When will Problem will occur and when it should be addressed	Yes	No	-do-
	3. Where Problem should be addressed	Yes	No	-do-
	4. How the Problem should be addressed	Yes	No	-do-
4.2	Ways of Achieving Mitigation Measures	Yes	No	-do-
	▪ Changing in Planning and Design	Yes	No	-do-
	▪ Improved Monitoring and Management Practices	Yes	No	-do-
	▪ Compensation in Money Terms	Yes	No	-do-
	▪ Replacement, Relocation and Rehabilitation	Yes	No	-do-
4.3	Prepare an Environmental Management Plan	Yes	No	Page 73-82
5	Reporting			
5.1	Clear Reporting Style supported by Maps or other Descriptive Details	Yes	No	Yes
5.2	Specific Term of References should be present in Report	Yes	No	Page 102
5.3	1. Appendices	Yes	No	Pg 89-102
	2. Glossary	Yes	No	Page xxii
	3. List of Abbreviations	Yes	No	Page xxii
	4. Lists of Individuals and Organizations Consulted alongwith their Written Feedback	Yes	No	Page 100



	5. Sources of data and a full list of all reference material used	Yes	No	Page 88
	6. Terms of References of Environmental Reports and those given to Individual Specialists	Yes	No	Page 102
	7. List of Names, Qualifications and Roles of Team Members carrying out the IEE/EIA	Yes	No	Page xxi



Clause No. 2: Commencing Environmental Assessment

The Punjab Environmental Protection Act 1997 prescribes two broader categories of evaluation of the environmental impacts of a project. These are:

- Initial Environmental Examination, abbreviated as IEE, and
- Environmental Impact Assessment, abbreviated as EIA

Both categories of environmental appraisals have been defined in the following words in the Punjab Environmental Protection Act:

“Initial Environmental Examination” means a preliminary environmental review of the reasonably foreseeable qualitative and quantitative impacts on the environment of a proposed project to determine whether it is likely to cause an adverse environmental effect for requiring preparation of an environmental impact assessment.

“Environmental Impact Assessment” means an environmental study comprising collection of data, prediction of qualitative and quantitative impacts, comparison of alternatives, evaluation of preventive, mitigatory and compensatory measures, formulation of environmental management and training plans and monitoring arrangements, and framing of recommendations and such other components as may be prescribed.

The first step towards evaluation and appraisal of the probable, potential or the likely environmental impacts of an activity or a project is to determine and find out as to what type of environmental appraisal is required for a particular project. That is to say whether the project warrants an initial environmental examination (IEE) or a comprehensive and in-depth environmental impact assessment (EIA) or none. In this regard, the Regulations named, “Pakistan Environmental Protection Agency (Review of IEE/EIA) Regulations 2022” provide a guideline as to whether the project would require IEE or EIA. Schedule-I of the said Regulations contains a list of the projects requiring IEE. Similarly, Schedule-II contains a list of the project requiring EIA. There are number of projects that will not require either an IEE or an EIA at all. The provisions with regard to such like projects are contained in Regulation 5 of the IEE/EIA Regulations 2022. According to the said provision, the Environmental Protection Agency Punjab (EPA-Pb), on the written recommendations of the Environmental Assessment Advisory Committee, may ask for environmental appraisal (IEE/EIA) required for a particular project. However, this determination will be based on a scientific, objective and rational criterion and not on whims, wishes and discretion of the officers of the EPA-Pb.

It is noticeable that setting-up of an incineration plant is mentioned under Category-G of Schedule-II of the IEE/EIA Regulations 2022. Therefore, setting-up of such a unit qualifies for a comprehensive EIA, like the instant one. If setup and operated with sound engineering and management practices and fitted with appropriate and efficient pollution control equipment, the “setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]” will not be associated with any challenging environmental impacts. The condition is that the appropriate pollution control equipment is installed with the main plant. The instant project of setting-up of an incineration plant for disposal of wastes falls under Category-G of Schedule-II of the IEE/EIA Regulations 2022 *ibid*. According to Category-G, the proponent of a project for storage and disposal of hazardous or toxic wastes (including landfill sites, incineration of hospital toxic waste) is required to file an EIA. The instant project on account of its mentioning under Category-G of Schedule-II of the Regulations *ibid*, qualifies for an EIA. Therefore, in accordance with the said Regulations and insistence of the Environmental Protection Agency Punjab (EPA-Pb), the proponent has filed the instant EIAR, as required under the law, rules or regulations.

Clause 2.3

Format of the Report

Generally, the format of an IEE/EIA is either project specific or area specific or a combination of both. The instant project is simply the “setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]”. The project building will be constructed on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur. Keeping in view the nature, scope and extent of the activities relating to setting-up of the plant on a vacant land, the instant EIAR has been prepared according to the combination format. The baseline environmental conditions, which provide the comparative basis to review and ascertain



the extent of the likely environmental impacts of an activity or a project, have been described according to this format approach. The Section on baseline environmental portfolio contains a detailed description of the baseline characteristics of the area and of the district of the project, wherever relevant.

Apart from other pertinent aspects, the EIAR provides an insight into the likely environmental and social impacts of setting-up of the plant by adjudging them against the standard environmental and social impact assessment guidelines, rules and regulations of the Government of the Punjab as well as other international organizations (like the World Bank, WHO etc.). Format of the report, to the extent possible, is in consonance with the prevailing international best practices in the field of environmental examination and assessment and also in line with the checklist guidelines of the EPA.

In preparing this EIA, reliance has been placed primarily on the data and information provided by the proponent and obtained from other agencies and deptts of Government of the Punjab. However, wherever so required and found relevant, additional data and information has been gathered through various reliable sources including visits of the site by the Team of Experts in order to evaluate the impacts with relation to geographical and social contexts of setting-up of the plant.

The format and mode of the environmental impact examination/assessment has been kept, as far as practicable, in conformity with the national and international practices in the field of IEE/EIA. The report contains a detailed examination of the essential baseline conditions, likely or foreseeable disturbances or impacts to those conditions, and the mitigation measures/recommendations regarding the environmental impacts, both during construction and during subsequent operation phase of the plant. This, of course, included evaluation, both of the potential and the actual positive or negative impacts, on the physical (tangible) & abstract (non-tangible) environments. The report covers all aspects of construction and operation of the plant including civil-, mechanical-, electrical-works and the array of other pertinent activities. Reliance has been placed on the following sources of data and information in preparing the instant EIA Report:

1. Environmental Guidelines for Selected Infrastructure Projects, Office of the Environment, Asian Development Bank, 1993
2. Environmental Impact Assessment Guidelines, Government of Pakistan, Ministry of Housing & Works (Environment & Urban Affairs Division 1986
3. Guidance for Implementing the Environmental Impact Assessment (EIA) Process, Central Environmental Authority, Ministry of Forestry & Environment, Government of Sri Lanka
4. Introduction to Environmental Impact Assessment, Principles & Procedures, Process, Practice and Prospects, John Glasson

In accordance with the above-referred sources, the EIAR comprises the following sections/subsections:

- ✓ EPA's Guideline Proforma
- ✓ Acknowledgment & Disclaimer
- ✓ Abbreviations and Acronyms used in the EIAR
- ✓ Executive Summary
- ✓ Introduction to the Project
- ✓ Brief Description of the Project and its Salient Features
- ✓ Baseline Environmental Profile of the Site/Area/District
- ✓ Radius of Influence of the Site/Activities
- ✓ Examination of the likely Disturbances to the Baseline Profile
- ✓ Description & Characterization of the likely Environmental Impacts of the Project
- ✓ Measures to Avoid, Control and Mitigate the Foreseeable Environmental Impacts of the Project
- ✓ Environmental and Social Environmental Management and Risk Avoidance Strategy and Plan
- ✓ Consultations with the Important Stakeholders alongwith Outcome
- ✓ Considerations of the various Alternative Options of the Project
- ✓ Strategy, Methodology and Modalities of carrying out the EIA
- ✓ A Brief Outline of the Environmental Legal Framework and its relevance to the Project
- ✓ References, Sources and Bibliography

On account of its format, based on the above given scheme of things, the instant EIAR is fully comprehensive and contains all essential details to help the EPA-Pb to review it critically for the grant of environmental approval of the project as envisaged under the PEP Act 1997.



Clause 2.3(A)

Executive Summary, which should contain:

1.	Title and Location of the Project	“setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]” by 360 Environmental Solutions [Pvt] Ltd. The plant will be located Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur.																										
2.	Name of the Proponent	Mazhar Hussain, Proprietor/Proponent, 360 Environmental Solutions [Pvt] Ltd., Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur.																										
3.	Name of the Organization Preparing the Report	“Green Revolution”, who are the leading environmental management consultants have prepared the EIA report in accordance with the applicable rules, regulations, guidelines and provisions of other relevant laws in vogue. Green Revolution have their Head Office at Lahore and branch offices in the Federal Capital and Provincial Capitals at Karachi, Peshawar, Quetta.																										
4.	A Brief Outline of the Proposal	The project essentially is “setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]”. It is noticeable that incineration is one of the many methods of treatment, processing and disposal of waste materials. All salient features of the plant are given in the table hereunder: <table><tr><th>Particulars</th><th>Description</th></tr><tr><td>Name of the project</td><td>“setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]” by 360 Environmental Solutions [Pvt] Ltd.</td></tr><tr><td>Location</td><td>The plant will be located Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur</td></tr><tr><td>Area</td><td>4-Kanal, 1-Marla. However, additional land will be made available by the proponent if so needed for future expansion.</td></tr><tr><td>Make, model and manufacture</td><td>Locally fabricated double chamber furnace fitted with wet scrubbing system</td></tr><tr><td>Specifications</td><td>Dual chamber incinerator (primary and secondary furnaces)</td></tr><tr><td>Temperature control</td><td>Temperature probes with screen display, monitoring and control</td></tr><tr><td>Installed capacity</td><td>Upto 500 per hour including the auxiliary and standby incinerators</td></tr><tr><td>Operational capacity</td><td>The initial operational capacity will be 500 kg per hour.</td></tr><tr><td>Road access</td><td>Phoolnagar Bypass Road linking with National Highway (N5)</td></tr><tr><td>Nature of wastes</td><td>All types of municipal, commercial, domestic, industrial and other wastes including the hazardous wastes, biomedical and healthcare waste, obnoxious waste except the radiological and explosive waste</td></tr><tr><td>Igniting fuel</td><td>Furnace oil, which will be replaced with natural gas, as and when the latter becomes available</td></tr><tr><td>Water availability</td><td>Water is available at site. Water will be stored</td></tr></table>	Particulars	Description	Name of the project	“setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]” by 360 Environmental Solutions [Pvt] Ltd.	Location	The plant will be located Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur	Area	4-Kanal, 1-Marla. However, additional land will be made available by the proponent if so needed for future expansion.	Make, model and manufacture	Locally fabricated double chamber furnace fitted with wet scrubbing system	Specifications	Dual chamber incinerator (primary and secondary furnaces)	Temperature control	Temperature probes with screen display, monitoring and control	Installed capacity	Upto 500 per hour including the auxiliary and standby incinerators	Operational capacity	The initial operational capacity will be 500 kg per hour.	Road access	Phoolnagar Bypass Road linking with National Highway (N5)	Nature of wastes	All types of municipal, commercial, domestic, industrial and other wastes including the hazardous wastes, biomedical and healthcare waste, obnoxious waste except the radiological and explosive waste	Igniting fuel	Furnace oil, which will be replaced with natural gas, as and when the latter becomes available	Water availability	Water is available at site. Water will be stored
Particulars	Description																											
Name of the project	“setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]” by 360 Environmental Solutions [Pvt] Ltd.																											
Location	The plant will be located Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur																											
Area	4-Kanal, 1-Marla. However, additional land will be made available by the proponent if so needed for future expansion.																											
Make, model and manufacture	Locally fabricated double chamber furnace fitted with wet scrubbing system																											
Specifications	Dual chamber incinerator (primary and secondary furnaces)																											
Temperature control	Temperature probes with screen display, monitoring and control																											
Installed capacity	Upto 500 per hour including the auxiliary and standby incinerators																											
Operational capacity	The initial operational capacity will be 500 kg per hour.																											
Road access	Phoolnagar Bypass Road linking with National Highway (N5)																											
Nature of wastes	All types of municipal, commercial, domestic, industrial and other wastes including the hazardous wastes, biomedical and healthcare waste, obnoxious waste except the radiological and explosive waste																											
Igniting fuel	Furnace oil, which will be replaced with natural gas, as and when the latter becomes available																											
Water availability	Water is available at site. Water will be stored																											



			first in an underground tank from where it will be pump lifted to an overhead tank/reservoir
	Emissions and effluent control		The air or stack emissions from the incinerators to be treated through wet scrubbing system. After treatment, only the PEQS emissions will be released through the stack mouth. The stack tower height will be 30-35 feet. Used water from the scrubbing system and other sources will be treated and stored in the settling tank and will be reused and recycled in the scrubbing system and for watering the green area at and around the premises. Surplus water, if any, will be released to the nearby wastewater channel after making it conformant to the applicable PEQS. Concerned regulatory authority has already granted NOC in this respect. There will not be the generation of any solid wastes. Whatsoever little solid wastes produced at the plant premises will be disposed of alongwith the waste received for incineration. The bottom ash will be dumped in a special enclosure at one corner of the premises in an environment friendly manner
	Power source		An industrial electricity connection supplemented by a standby diesel generator
	Start of operation		The operation of the plant will commence only after complete setting-up of the machinery, equipment and the pollution control system and that too under environmental approval from the EPA-Pb
	Design and Layout of the Incinerator The proponent has not yet selected the final source or procurement of the incinerators to be installed onsite under the instant project. However, the propensity is that the locally fabricated incinerators will be installed. The proponent is searching for the best manufacturer in order to be sure that the incinerators fabricated by him conform to the applicable PEQS. Nevertheless and regardless of the manufacturer, the salient features of the design and layout of the plant will consist of the following: ▪ Incoming and outgoing gate with a guardroom fitted with an inventory recording system ▪ Parking area for the incoming carriage and personal vehicles ▪ Vehicle weighbridge (optional) ▪ Waste receiving and storage enclosure (yellow room) ▪ Incinerator fitted with all essential feed and control systems and equipment ▪ Chamber temperature monitoring and control system ▪ Stack emissions capturing, treatment and disposal system and equipment ▪ Bottom ash collection and disposal system ▪ Onsite laboratory ▪ Other support equipment and facilities (e.g., generator) ▪ Fire safety and emergency control systems and facilities ▪ Real time GPS vehicle tracking system ▪ Admn building / office rooms ▪ Green areas, grassy lawns and tree plantations Stack Emissions Capturing, Treatment and Disposal System and Equipment The unit will be fitted with an efficient and effective wet scrubbing		



	system. The hot flue gases coming out from the secondary chamber will pass through a vertical wet scrubber. The capacity of the scrubber body will be around 2 to 5 cubic meters. Here, the gases will be showered from above with a stream of water mist. The particulates will impinge against the water droplets and will settle down towards the scrubber bottom. The scrubber bottom will open into a settling tank of the dimensions of around 8'x8'x4'. Here, the solid particulate from the slurry will settle down at the bottom under gravity. The supernatant clear water from the settling tank will be recirculated in the system for showering the flue gases again. The bottom settled sludge will be removed as and when a cake of sufficient thickness of around 1' to 2' is formed at the tank floor. The scrubbed and cooled down gas will move towards the stack tower or the chimney from where it will be released out. It will be ensured that the final stack gas is conformant to the applicable PEQS. The unit will be fitted with a vertical stack tower or chimney. It will be made of steel sheet. Its base will have a diameter of around 10' and the top mouth of around 5' diameter. its height will be 60 feet. It will receive the cleaned and cooled gases from the wet scrubber. The cleaned and cooled gas will move out of the chimney mouth. Bottom Ash Collection and Disposal System The combustion process inside the primary furnace chamber will generate the bottom ash from complete burning of the waste material @ 1% by weight basis approx. The waste load of around 10 kg is thus expected to produce around 1 kg of bottom ash. The bottom ash will drop down through the bottom grate of the primary furnace. Once the batch process of burning is complete, the bottom ash will be allowed to cool down. Thereafter, it will be slashed out with the help of rakes before starting the incinerator operation again. The raked out bottom ash will be shifted into a hand barrow and will be transported to the ash dumping pit/trench at the plant premises. Here, the bottom ash will be dumped and covered with an impervious sheet to avoid its dispersion to the environment. If needed, the bottom ash will be showered lightly to prevent surface billowing of the particulates. The burnt material, also called the bottom ash, will drop down at the bottom of the combustion chamber. It will be raked out regularly before charging the incinerator with the fresh waste load, prior to start of operation every day. It will be collected and disposed of separately. The bottom ash will be first allowed to cool down to the ambient room temperature. Thereafter, it will be disposed of in the bottom ash disposal pit, to be dug at one side of the premises. The ash receiving and disposal pit will be a rectangular dug-hole of 1'x1'x1' and the ash holding capacity of around 1000 cubic feet. Keeping in view the expected rate of generation of bottom ash, the life of the ash pit is expected to be around 20 to 25 years. Its inside walls and floor will be lined with impervious material or geomembrane to prevent ingress of any leachate, if formed, in the soil beneath. In the same way, its top will always be kept covered with impervious sheet to prevent entry of rainwater into the pit. The disposed of ash will be compressed with manual or mechanical compressors to reduce its volume. Daily inspection and monitoring of the ash pit will be a standard operational regime of the plant. The plant will have a proper emission control and off-gas cleaning system, installed complementary to the incineration furnace. All fumes, gases and dusts, which will be generated during the incineration process, will be duly treated by the cleaning system. It will consist of a venturi
--	--



		washer/wet scrubber. From the furnace the hot gases will pass through a hot dust chamber and/or a hot cyclone, where most of the coarse dust particles will be separated from the gas stream. From here the off-gas will feed into a wet scrubbing system, which will consist of a venturi washer/wet scrubber. The wet scrubber will separate and collect the fine dust particles. The water and off-gas will thus mix under high turbulence forming a fine slurry, which will be discharged into a sedimentation tank. The dust free off-gas will then enter the stack tower and discharged via the chimney opening atop of the tower. The operation of the plant shall commence only after complete setting-up of the machinery, equipment and the pollution control system and that too under environmental approval from the EPA-Pb.
5.	The Major Impacts	There will not be any likely environmental impacts of setting-up (i.e., on ground construction of building and concomitant installation of machinery) of the plant. The plant building will be constructed on a vacant land on a long-term lease with the proponent. The site situated Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Kasur. However, the operational activities of the plant could be associated with some environmental impacts, if suitable pollution control equipment is not installed or its operation is faulty. The implementation of the EMP will further ensure environmental compliance and compatibility if the plant. As regards the benefits and positive impacts, construction and operation of the plant will ensure environment friendly disposal of the solid and hazardous wastes as well as opportunities of job and employment for a fair number of persons including residents of the surrounding areas. A complete detail of the likely environmental impacts and their mitigation is given in a separate section of this EIAR.
6.	Recommendations for Mitigation Measures	The construction of the building, installation of machinery and equipment and other support components on a vacant land, leased and possessed by the proponent will be devoid of any major environmental impacts. However, the operational activities of the plant could be associated with some environmental impacts, if suitable pollution control equipment is not installed or its operation is faulty. The implementation of the EMP will further ensure environmental compliance and compatibility if the plant. As regards the benefits and positive impacts, construction and operation of the plant will ensure environment friendly disposal of the solid and hazardous wastes as well as opportunities of job and employment for a fair number of persons including residents of the surrounding areas. A complete detail of the likely environmental impacts and their mitigation is given in a separate section of this EIAR. All operations at the plant, right from receipt of the waste materials (to be incinerated) to disposal of bottom-ash and treatment of the flue-gas will be devoid of any impacts on the environment, if appropriate pollution control equipment is installed and EMP is followed. Owing to installation of the requisite pollution control equipment, the operational activities at the plant will be devoid of any serious environmental impacts. However, in order to improve performance of the plant further, some good housekeeping practices including safety and cleanliness of the plant premises have been recommended. Implementation of these recommendations will enhance outlook and aesthetics of the premises.
7.	Proposed Monitoring	In order to ensure conformance to applicable environmental quality standards, a robust monitoring regime has been proposed for the entire operational life of the plant. In order to ensure infallibility and optimal quality of monitoring; formulation of a smart and efficient Environmental Safety & Monitoring Unit (ESMU) has been proposed. The ESMU will be headed by a qualified person having due knowledge of the subject and worksite environmental safety. In addition to regular and round the clock internal monitoring by the ESMU, an agreement will be made with "Green



		Revolution” for a long term and regular annual as well as periodic external environmental audits, inspections and monitoring regime. The monitoring reports, both of the internal as well as of the external audits, will be submitted to the concerned quarters, if, so and when desired.
--	--	--

Clause 2.3(B)**Introduction should include:**

1.	Purpose of the Report	To make a preliminary environmental review of the reasonably foreseeable qualitative and quantitative impacts on the environment, if any, regarding setting-up of the plant on a vacant land, leased and possessed by the proponent. Further to determine whether setting-up of the plant will cause or is likely to cause any adverse environmental effects, if any.																		
2.	Identification of the Project and Proponent	Project: ““setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous non-hazardous and all other solid and liquid wastes etc.]” by 360 Environmental Solutions [Pvt} Ltd. The plant will be located Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur. Proponent: Mazhar Hussain, Proprietor/Proponent, 360 Environmental Solutions [Pvt} Ltd. The plant will be located Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur”.																		
3.	Details of the Consultant	M/s Green Revolution, who are the leading environmental management consultants have performed as the accredited environmental consultants of the project. Green Revolution have their Head Office at Lahore and branch offices in the Federal Capital and all Provincial Capitals of Karachi, Peshawar and Quetta																		
4.	Brief Description of Nature, Size and Location of Project	The project essentially is “setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]”. It is noticeable that incineration is one of the many methods of treatment, processing and disposal of waste materials. All salient features of the plant are given in the table hereunder: <table><tr><th>Particulars</th><th>Description</th></tr><tr><td>Name of the project</td><td>“setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]” by 360 Environmental Solutions [Pvt} Ltd.</td></tr><tr><td>Location</td><td>The plant will be located Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur</td></tr><tr><td>Area</td><td>4-Kanal, 1-Marla. However, additional land will be made available by the proponent if so needed for future expansion.</td></tr><tr><td>Make, model and manufacture</td><td>Locally fabricated double chamber furnace fitted with wet scrubbing system</td></tr><tr><td>Specifications</td><td>Dual chamber incinerator (primary and secondary furnaces)</td></tr><tr><td>Temperature control</td><td>Temperature probes with screen display, monitoring and control</td></tr><tr><td>Installed capacity</td><td>Upto 500 per hour including the auxiliary and standby incinerators</td></tr><tr><td>Operational</td><td>The initial operational capacity will be 500 kg per</td></tr></table>	Particulars	Description	Name of the project	“setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]” by 360 Environmental Solutions [Pvt} Ltd.	Location	The plant will be located Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur	Area	4-Kanal, 1-Marla. However, additional land will be made available by the proponent if so needed for future expansion.	Make, model and manufacture	Locally fabricated double chamber furnace fitted with wet scrubbing system	Specifications	Dual chamber incinerator (primary and secondary furnaces)	Temperature control	Temperature probes with screen display, monitoring and control	Installed capacity	Upto 500 per hour including the auxiliary and standby incinerators	Operational	The initial operational capacity will be 500 kg per
Particulars	Description																			
Name of the project	“setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]” by 360 Environmental Solutions [Pvt} Ltd.																			
Location	The plant will be located Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur																			
Area	4-Kanal, 1-Marla. However, additional land will be made available by the proponent if so needed for future expansion.																			
Make, model and manufacture	Locally fabricated double chamber furnace fitted with wet scrubbing system																			
Specifications	Dual chamber incinerator (primary and secondary furnaces)																			
Temperature control	Temperature probes with screen display, monitoring and control																			
Installed capacity	Upto 500 per hour including the auxiliary and standby incinerators																			
Operational	The initial operational capacity will be 500 kg per																			



	capacity	hour,
	Road access	Phoolnagar Bypass Road linking with National Highway (N5)
	Nature of wastes	All types of municipal, commercial, domestic, industrial and other wastes including the hazardous wastes, biomedical and healthcare waste, obnoxious waste except the radiological and explosive waste
	Igniting fuel	Furnace oil, which will be replaced with natural gas, as and when the latter becomes available
	Water availability	Water is available at site. Water will be stored first in an underground tank from where it will be pump lifted to an overhead tank/reservoir
	Emissions and effluent control	The air or stack emissions from the incinerators to be treated through wet scrubbing system. After treatment, only the PEQS emissions will be released through the stack mouth. The stack tower height will be 30-35 feet. Used water from the scrubbing system and other sources will be treated and stored in the settling tank and will be reused and recycled in the scrubbing system and for watering the green area at and around the premises. Surplus water, if any, will be released to the nearby wastewater channel after making it conformant to the applicable PEQS. Concerned regulatory authority has already granted NOC in this respect. There will not be the generation of any solid wastes. Whatsoever little solid wastes produced at the plant premises will be disposed of alongwith the waste received for incineration. The bottom ash will be dumped in a special enclosure at one corner of the premises in an environment friendly manner
	Power source	An industrial electricity connection supplemented by a standby diesel generator
	Start of operation	The operation of the plant will commence only after complete setting-up of the machinery, equipment and the pollution control system and that too under environmental approval from the EPA-Pb
Design and Layout of the Incinerator The proponent has not yet selected the final source or procurement of the incinerators to be installed onsite under the instant project. However, the propensity is that the locally fabricated incinerators will be installed. The proponent is searching for the best manufacturer in order to be sure that the incinerators fabricated by him conform to the applicable PEQS. Nevertheless and regardless of the manufacturer, the salient features of the design and layout of the plant will consist of the following: ▪ Incoming and outgoing gate with a guardroom fitted with an inventory recording system ▪ Parking area for the incoming carriage and personal vehicles ▪ Vehicle weighbridge (optional) ▪ Waste receiving and storage enclosure (yellow room) ▪ Incinerator fitted with all essential feed and control systems and equipment ▪ Chamber temperature monitoring and control system ▪ Stack emissions capturing, treatment and disposal system and equipment		



	▪ Bottom ash collection and disposal system ▪ Onsite laboratory ▪ Other support equipment and facilities (e.g., generator) ▪ Fire safety and emergency control systems and facilities ▪ Real time GPS vehicle tracking system ▪ Admn building / office rooms ▪ Green areas, grassy lawns and tree plantations Stack Emissions Capturing, Treatment and Disposal System and Equipment The unit will be fitted with an efficient and effective wet scrubbing system. The hot flue gases coming out from the secondary chamber will pass through a vertical wet scrubber. The capacity of the scrubber body will be around 12 to 15 cubic meters. Here, the gases will be showered from above with a stream of water mist. The particulates will impinge against the water droplets and will settle down towards the scrubber bottom. The scrubber bottom will open into a settling tank of the dimensions of around 8'x8'x4'. Here, the solid particulate from the slurry will settle down at the bottom under gravity. The supernatant clear water from the settling tank will be recirculated in the system for showering the flue gases again. The bottom settled sludge will be removed as and when a cake of sufficient thickness of around 1' to 2' is formed at the tank floor. The scrubbed and cooled down gas will move towards the stack tower or the chimney from where it will be released out. It will be ensured that the final stack gas is conformant to the applicable PEQS. The unit will be fitted with a vertical stack tower or chimney. It will be made of steel sheet. Its base will have a diameter of around 10' and the top mouth of around 5' diameter. its height will be 60 feet. It will receive the cleaned and cooled gases from the wet scrubber. The cleaned and cooled gas will move out of the chimney mouth. Bottom Ash Collection and Disposal System The combustion process inside the primary furnace chamber will generate the bottom ash from complete burning of the waste material @ 1% by weight basis approx. The waste load of around 100 kg is thus expected to produce around 1 kg of bottom ash. The bottom ash will drop down through the bottom grate of the primary furnace. Once the batch process of burning is complete, the bottom ash will be allowed to cool down. Thereafter, it will be slashed out with the help of rakes before starting the incinerator operation again. The raked out bottom ash will be shifted into a hand barrow and will be transported to the ash dumping pit/trench at the plant premises. Here, the bottom ash will be dumped and covered with an impervious sheet to avoid its dispersion to the environment. If needed, the bottom ash will be showered lightly to prevent surface billowing of the particulates. The burnt material, also called the bottom ash, will drop down at the bottom of the combustion chamber. It will be raked out regularly before charging the incinerator with the fresh waste load, prior to start of operation every day. It will be collected and disposed of separately. The bottom ash will be first allowed to cool down to the ambient room temperature. Thereafter, it will be disposed of in the bottom ash disposal pit, to be dug at one side of the premises. The ash receiving and disposal pit will be a rectangular dug-hole of 10'x10'x10' and the ash holding capacity of around 1000 cubic feet. Keeping in view the expected rate of generation of bottom ash, the life of the ash pit is expected to be around 20 to 25 years. It's inside walls and floor will be lined with impervious material or geomembrane to prevent
--	--



		ingress of any leachate, if formed, in the soil beneath. In the same way, its top will always be kept covered with impervious sheet to prevent entry of rainwater into the pit. The disposed of ash will be compressed with manual or mechanical compressors to reduce its volume. Daily inspection and monitoring of the ash pit will be a standard operational regime of the plant. The plant will have a proper emission control and off-gas cleaning system, installed complementary to the incineration furnace. All fumes, gases and dusts, which will be generated during the incineration process, will be duly treated by the cleaning system. It will consist of a venturi washer/wet scrubber. From the furnace the hot gases will pass through a hot dust chamber and/or a hot cyclone, where most of the coarse dust particles will be separated from the gas stream. From here the off-gas will feed into a wet scrubbing system, which will consist of a venturi washer/wet scrubber. The wet scrubber will separate and collect the fine dust particles. The water and off-gas will thus mix under high turbulence forming a fine slurry, which will be discharged into a sedimentation tank. The dust free off-gas will then enter the stack tower and discharged via the chimney opening atop of the tower. The operation of the plant shall commence only after complete setting-up of the machinery, equipment and the pollution control system and that too under environmental approval from the EPA-Pb. Nature: A plant for storage and disposal through incineration of all and various types of waste materials [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]. Size: 4-Kanal, 1-Marla (1/2 Acre) Location: The plant will be located Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur”.
--	--	---

Clause 2.3(C)

Description of the Project should include:

1.	Type and Category of Project	A plant for storage and disposal through incineration of all and various types of waste materials [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]. A project for waste disposal and/or storage of hazardous or toxic wastes through incineration/autoclave is listed under Category-G of Schedule-II of the IEE/EIA Regulations. The plant will be a non-invasive, non-intrusive and a benign unit, as it will be meant for safe, secure and efficient incineration of wastes and management of incineration emissions. The construction of the plant building and machinery installation will not have any serious environmental, social and health implications. Whereas, operation will also be devoid of any impacts provided efficient and effective emissions control equipment is installed and the recommended mitigation measures are implemented in letter and spirit.
2.	Objectives of Project	The primary objective of “setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]”. Owing to increased awareness about environmental concerns, the demand for safe, secure and efficient disposal of all types of wastes, particularly of the health affecting wastes, by the public and the



		regulatory authorities is on the increase. The public pressure for safe disposal is mounting with every passing day. Although, reliable statistics are not available, yet generation of various types of wastes is on the increase and runs into thousand tonnes per day. Whereas, only a fraction of it is disposed/treated through incineration, primarily due to dearth of incineration facilities. It is, therefore, need of the time that construction, installation and setting up of efficient waste incineration plants is ensured by encouraging the private sector and the entrepreneurs. Looking from this perspective, the setting-up of the instant plant can be regarded as a positive step in this direction, as its construction will offer a commercially viable and environmentally compatible solution for the management and disposal of the ever-growing volume of the wastes. Another linked objective of setting-up of the plant at this site is to help uplifting of the socioeconomic profile of the area. The benefits coming in the wake of setting-up of the plant will help in improving the socioeconomic conditions and lifestyle of the local populace. This can be counted as another direct benefit of setting-up of the plant here. Similarly, impetus to commercial activities from trading of the commodities to be consumed, operation of the plant and creation of opportunities of job and employment for the locals, which will come in the wake of setting-up of the plant, will be another inseparable benefit. The setting-up of the plant will ensure timely and round the year availability of a facility for safe and secure disposal through incineration of various types of wastes. The setting-up of the plant is in line with the “Environmental and Health Policy” of Government of the Punjab (GoPb), which emphasizes safe and secure disposal of waste materials, particularly the health risk wastes. Viewing from this backdrop, the primary objective of setting-up of the plant for storage and disposal of wastes through incineration, apart from providing opportunities of job and employment is to combat environmental pollution through efficient management of wastes.
3.	Alternatives Considered Realistically (in detailed) and Reason for Their Rejection	The possible alternatives to the instant project can be divided broadly into two categories, namely: - a). Technological alternatives - b). Site/location alternatives As far as technological alternatives are concerned, number of options are available for treatment and disposal of the waste materials. These include physical treatment of the wastes (e.g., irradiation, UV application, containment, attenuation, autoclaving, land burial etc.), chemical treatment (e.g., disinfection, gasification etc.), biological treatment (e.g., biodegradation, bioremediation etc.), and other treatment methods (e.g., incineration). The selection of anyone or more of the technological options for treatment and disposal of the wastes will depend primarily on the nature of the waste, type of the point source, weight and volume, availability of budgetary resources/finances for waste management, and cost efficiency of the option. However, the general consensus is that sanitary landfill is the treatment of choice for the ordinary municipal and organic type of wastes, incineration for hazardous and biomedical wastes, and encapsulation / containment for the radiological wastes. The instant plant is intended for treatment and disposal of the industrial and biomedical biohazardous waste. Therefore, incineration will be the



		first choice. Hence, consideration of other technological alternatives does not remain valid and relevant. As regards the site or location alternatives, number of factors need to be taken into consideration while selecting a site for installation of an incineration plant for treatment and disposal of waste materials. These, inter alia, will include availability of land piece of requisite size, distance from the nearby population, availability of a drainage channel for disposal of wastewater (if any), and availability of utilities and amenities (like electricity, gas, water, road etc.). Looking from this aspect, the present site, owing to its location in a predominantly industrial locality near a wastewater drain and away from a settled population, is best-suited for construction of the plant. In view of this position of the matter, consideration of the site selection alternatives becomes invalid and irrelevant. It will be worthwhile to mention that the project simply is “setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]”. The plant will be setup on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur. The alternatives of relocating the plant to some other site, or not to setup the plant at all and or reducing / enhancing the size and magnitude of operation of the plant are of no better advantage than the instant proposal. Hence, consideration of all other alternatives becomes irrelevant and of no use at all.
4.	Location and site layout of the project (may be annexed at the end of Report)	Location map, layout plan and aks shajra is appended as Annex-1
5.	Land Use of the Site	Currently, the site is a vacant land not under any useful purpose. However, if required, the proponent will ensure its land use change from the concerned regulatory authority prior to taking up construction of the plant. The proponent has marked the site for setting-up of the plant here and has already informed the concerned revenue and other authorities of his intention to do so.
6.	Road Access	The site is accessible from the Multan Road (N5) via a link road. N5 is one of the largest national highways of the country that links Peshawar with Karachi. It is the principal road route for transportation of goods and passengers between some major destinations in the country e.g., Karachi, Hyderabad, Sukkur, Rahimyar Khan, Bahawalpur, Multan, Sahiwal, Lahore, Gujranwala, Jhelum, Rawalpindi and Peshawar. Siting of the plant on/near the N5 national highway will be highly advantageous for the intended operations of the plant.
7.	Vegetation features of site	The vegetation features of the site are insignificant. Being an ordinary vacant land, the site is devoid of any special or significant vegetative features. It is just an ordinary chunk of the floodplains of river Ravi.
8.	Cost and Magnitude of Operation	The tentative cost of setting-up of the plant, including the cost of land, plant, machinery, equipment and others will be less than Rs. 50 million. The annual operational cost is expected to be around Rs. 10 million. As regards the magnitude of operation, the installed capacity of the plant will be from 500 Kg per hour, which can be increased further by installing additional/auxiliary furnaces, if need. However, the waste actually incinerated will depend on the aggregate amount of waste received from various sources. If the total amount of waste received daily will be less than the installed incineration capacity, all the waste will be incinerated forth with. On the other hand, if the amount of the received waste will be more than the installed operational capacity, the surplus waste will be



		kept in waiting and will be incinerated on the first opportunity.
9.	Schedule of Implementation	The plant will be setup as a one-go single-step activity within the shortest possible time subject to completion of the requisite legal and regulatory formalities.
10.	Description of the Project (Process Flow Chart/Steps)	The process flow chart is appended as Annex-4 .
11.	Restoration and Rehabilitation Plans	Not any restoration and rehabilitation plans are relevant or warranted on account of the following reasons: ▪ The plant will be setup on a vacant land, leased and possessed by the proponent. ▪ There is not any living quarter or dwelling on the selected land. ▪ There is no infrastructure, building or any physical appurtenant existing or constructed on the selected site. ▪ Setting up of the plant will not cause any loss of livelihood of any person. ▪ Not any person or property will be affected from setting up of the plant at the selected site. ▪ There will not be any massive diggings, excavations or earth moving activities, as might require any restoration plans. In view of the above stated facts, there is no need of any restoration or rehabilitation plan.
12.	Government Approvals	In addition to the environmental approval, for which the instant EIAR is being filed, following NOCs and Governmental approvals have been so far obtained. - a). NOC from the Irrigation Deptt., GoPb for disposal of wastewater from the plant into the nearby designated drainage channel (Annex-2). - b). NOC from the LDA regarding land use status of the selected site (Annex-2). - c). Approved building layout plan from the concerned regulatory authority i.e., District Council, Kasur (Annex-1). Only the environmental approval from EPA-Pb is pending at the moment.

Clause 2.3(D)

Description of Environment should include:

1.	Clear-cut Picture of Existing Environmental Resources	The description of the environmental resources and the socioeconomic profile of the site, area and district has been given at length in the Section on "Baseline Environmental Profile". To summarize, the physical, ecological and socioeconomic resources of the site/area are paltry, insignificant and of no relevance at all. The setting up of the plant at the selected site will not cause any imprint or disturbance to the existing environmental resources and or the baseline environmental profile.
2.	▪ Physical	Insignificant, unimportant and paltry
3.	▪ Ecological	Insignificant, unimportant and paltry
4.	▪ Socioeconomic	Insignificant, unimportant and paltry
5.	Quality of life Values	The majority population near the site, area and the district are Muslims. However, reasonable number of residents of other religions and faiths also dwell in the area. These include Christians and Sikhs. Compared to other minority communities, Christians are far in number. Punjabi is the native language and is spoken widely in the area. However, Urdu is gaining popularity and is becoming the lingua franca, particularly amongst the educated youth. People generally respect chadar and chardewari, i.e. they do not mingle with women publicly and stay away from others houses and respectfully wait to be called in or the residents to come out from their houses. A reasonable proportion of womenfolk observe the purdah etiquette, i.e. they remain secluded from outsiders. However, womenfolk do participate in almost all sort of social, cultural, economic,



		educational, and service activities.
6.	Lab Reports of Environmental Analyses	The lab reports of all essential and applicable parameters i.e., Air, Water and Noise have been made a part of the instant EIAR, as Annex-3 .

Clause 2.3(E)**Screening of Potential Environmental Impacts and Mitigation Measures should include Environmental Parameters regarding:**

1.	Project Location	No impacts relating to location. The site is a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur. Number of industrial concerns are already existing and operational in the vicinity. Therefore, the selected site is best-suited for setting up the instant plant. The Irrigation Department, GoPb has already granted NOC for disposal of the used-up water into the nearby wastewater channel.
2.	Design	No impacts relating of design of the plant. The project simply is “setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]” on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur. As regards the building’s layout plan, it will be in strict accordance with the applicable building bylaws of the concerned regulatory authority. As far as selection of the machinery and equipment is concerned, the proponent is searching for the efficient and the most economical machinery and equipment out of a host of manufacturers, both inland and abroad.
3.	During Construction Phase	No impacts are expected during construction of the plant, as this phase will involve construction of the building and installation of the selected machinery, equipment and other support structure. Not any disturbance to any of the environmental parameters or the bioindicators is expected from any of the construction activities. The small-scale civil works, like the instant one, do not cause any disturbance to the environment in any way at all.
4.	During Operational Phase	The operation of the plant as a facility for incineration of waste materials will be associated with environmental impacts only, if (a) appropriate pollution / emission control equipment is not installed with the machinery and equipment, and (b) the pollution control equipment, somehow, becomes dysfunctional and or operationally faulty. The rest of the environmental impacts of the operation chain, from lifting of the wastes from their source of origin to complete incineration at the plant will be all negligible and of no significance at all. Additionally, they all will be mitigable and will be mitigated by implementing the recommended mitigation measures and the EMP. The environmental impacts of operation of the plant will be all mitigated by fitting appropriate pollution control equipment and practising good housekeeping practices. The air emissions, wastewater and solid waste during operation of the plant will be taken care of through appropriate mitigation measures. Moreover, all operational activities will remain confined within the plant premises and will not be of relevance outside the plan premises.
5.	Potential Environmental Enhancement Measures	In additional installation of the appropriate pollution / emission control equipment, massive tree plantation, development of greenbelts, grassy lawns and floral plantation has been proposed as some other prime environmental enhancement measures. In order to ensure worksite safety and personal health, provision of safety equipment, usage of right kind of apparel, appropriate tools for accomplishing a particular task by the workers, and installation of a robust firefighting system have also been proposed as other environmental enhancement measures.

**Clause 2.3(F)****Environmental Management and Monitoring Program should include:**

1.	Institutional Capacity	A comprehensive environmental management and monitoring plan (EMP) has been made an integral part of the instant EIAR. The EMP enlists the steps and activities regarding upgrading of the institutional capacity.
2.	Training Schedules	-do-
3.	Summary of Impacts and their Mitigation Measures	-do-
4.	Equipment Maintenance Details	-do-
5.	Environmental Budget	-do-

Clause 2.5**Involvement of Stakeholders/Public Consultation:**

1.	Communicate the possible impacts and concerns to assist further analysis and decision making:	In accordance with the laid down practice, preliminary consultation was made with the vicinity residents and the likely stakeholders regarding setting-up of the instant project, the details whereof have been incorporated as a separate chapter in this EIAR. Nevertheless, a full length and comprehensive stakeholders' consultation will be arranged to solicit public concerns during open public hearing into the project, being an integral part of the EIA approval process in terms of Reggaeton 7(1)(a) of the IEE/EIA Regulations 2022.
2.	▪ Proponent	Mazhar Hussain, Proprietor / Proponent
3.	▪ The Responsible Authority	The proponent through the Admn Manger of the plant. The Shift Incharge will act as the designated ESH Manager of the plant.
4.	▪ Other Departments and Agencies	Nil
5.	▪ Environmental Practitioners and Experts	M/s Green Revolution, Environmental Management & legal Consultants
6.	▪ Affected and Wider Community	Nil

Clause 2.7**Site Selection should include:**

1.	suitability of the site (will not be prohibited, environmentally sensitive, incompatible to surroundings and unsuitable)	The selected site is suitable for setting-up of the instant plant. The site is: ✓ Suitable for setting up the plant ✓ Situated away and at a safe distance from any nearby human population ✓ Not situated in an ecologically sensitive zone ✓ Not situated in an environmentally protected area ✓ Not situated in a protected wildlife sanctuary ✓ Not situated in a negative zone ✓ Situated near a drainage channel ✓ All civic amenities and utilities are available ✓ Accessible easily from the main Multan Road (N5) In view of the foregoing factors, the site is fully suitable and compatible with the intended plant.
----	--	--

3. Assessing the Impacts (For EIA only)**Clause 3.2****Identification of all Impacts (Tab 2):**

1.	Methodologies for Impact Identification (one/more)	All relevant methodologies including checklists, integrated matrices and incisive questionnaire methodologies have been employed for assessing and evaluating the likely or foreseeable environmental impact so the instant project
2.	▪ Checklists	-do- (Yes)



3.	▪ Matrices	-do- (Yes)
4.	▪ Networks	-do- (Yes)
5.	▪ Overlays	-do- (Yes)
6.	▪ GIS and computer expert systems	-do- (Yes)

Clause 3.3**Impact Analysis and Prediction (one/more):**

1.	▪ Meetings	Number of meetings were held with the proponent, EPA officials and the relevant stakeholders during the EIA process. The results and outcome of which is recapitulated in the section on stakeholders' consultations
2.	▪ Workshops	-do-
3.	▪ Consultation/Case Study	-do-

Clause 3.5**Impact Analysis and Prediction (one/more):**

1.	Characteristics of Impacts (Nature, Magnitude, Risk Extent, Location, Timing, Duration, Reversibility)	A comprehensive and detailed examination, analysis, valuation, assessment and likely impacts, alongwith appropriate mitigation measures is contained in the relevant section(s) of the EIA. It would suffice to state the instant EIAR is comprehensive and all-encompassing in all aspects relating to the subject including mitigation of the likely impacts.
----	--	---

Clause 3.5**Impact Significance: Acceptable, require Mitigation, or are Unacceptable to the Community:**

1.	Ecological Importance	A comprehensive and detailed examination, analysis, valuation, assessment and likely impacts, alongwith appropriate mitigation measures is contained in the relevant section(s) of the EIA. It would suffice to state the instant EIAR is comprehensive and all-encompassing in all aspects relating to the subject including mitigation of the likely impacts.
2.	Social Importance	-do-
3.	Environmental Standards	-do-

4. Mitigation and Impact Assessment**Clause 4.1****Purpose of Mitigation Measures should include:**

1.	What is the Problem?	A comprehensive and detailed examination, analysis, valuation, assessment and likely impacts, alongwith appropriate mitigation measures is contained in the relevant section(s) of the EIA. It would suffice to state the instant EIAR is comprehensive and all-encompassing in all aspects relating to the subject including mitigation of the likely impacts.
2.	When will the problem occur and when it should be addressed?	-do-
3.	Where problem should be addressed?	-do-
4.	How the problem should be addressed	-do-

Clause 4.2**Ways of achieving Mitigation Measures:**

1.	Changes in Planning and Design	A comprehensive and detailed examination, analysis, valuation, assessment and likely impacts, alongwith appropriate mitigation measures is contained in the relevant section(s) of the EIA. It would
----	--------------------------------	--



		suffice to state the instant EIAR is comprehensive and all-encompassing in all aspects relating to the subject including mitigation of the likely impacts.
2.	Improved Monitoring and Management Practices	-do-
3.	Compensation in Money Terms	-do-
4.	Replacement, Relocation and Rehabilitation	-do-

Clause 4.3

1.	Prepare an Environmental Management Plan	A comprehensive environmental management and monitoring plan (EMP) has been made an integral part / separate section of the instant EIAR
----	--	--

5. Reporting**Clause 5.1**

1.	Clear Reporting Style Supported by Maps or other Descriptive Details	Yes. The EIAR contains complete detail about setting-up of the plant including the relevant drawings, maps and other relevant info.
----	--	---

Clause 5.2

1.	Specific Term of References should be Present in Report	The specific terms of reference, as agreed between the proponent and the consultant, have been reproduced as Annex-7 Of the EIAR.
----	---	--

Clause 5.3

1.	Appendices	Appendices are present at the end of the EIAR
2.	Glossary	Requisite information has been given in the EIAR under the heading "Glossary"
3.	List of Abbreviations	Requisite information has been given in the EIAR under the heading "Abbreviations"
4.	Lists of Individuals and Organizations Consulted alongwith their Written Feedback	Requisite information has been given under the heading "Persons Consulted and Interviewed" as Annex-5 of the IEER
5.	Sources of Data and a Full List of all Reference Material used	Requisite information has been given in the EIAR under the heading "References"
6.	Terms of References of Environmental Reports and those given to Individual Specialists	Requisite information has been given in the EIAR under the heading "Consultant's Team of Professionals"
7.	List of Names, Qualifications and Roles of Team Members carrying out the IEE/EIA	Requisite information has been given in the EIAR under the heading "Consultant's Team of Professionals"



ACKNOWLEDGEMENT & DISCLAIMER



ACKNOWLEDGMENT & DISCLAIMER

Acknowledgement

The Team of Professionals and Associates, who carried out this Environmental Impact Assessment (EIA) are thankful to the sponsor, planner, designer, architect and contractor of the plant as well as all those persons, who helped directly and indirectly in conducting this EIA in the best professional manner. The report presents a comprehensive examination of the likely environmental and social impacts of “setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]”. The plant will be setup on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur. The Team of Environmental Experts and Allied Professionals expresses its special gratitude for **Mr. Mazhar Hussain, Owner/Proprietor** and **Mr. Ghulam Mustafa, Director, 360 Environmental Solutions [Pvt] Ltd.** for the assistance provided by them in connection with visits of the site during the course of the EIA. The Team is indebted deeply to **Mr. Noman Younas, Assistant Director (Env) Kasur** and his office staff for their assistance, guidance, advice and invaluable contributions, which helped in accomplishing EIA, the way it ought to have been.

Disclaimer

This document is an Environmental Impact Assessment Report (EIAR) of the project named ““setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]”. The report presents a detailed examination of the most likely environmental and social impacts of setting-up of the plant’s building on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur. The report presents a review of the most likely environmental impacts of setting up of the project, as may occur to the existing environmental and social profile of the site/area. For the purpose of environmental impact evaluation, a concentric area of the radius upto 100 metres from the centre of the site was assumed to be the likely zone of environmental influence of the site/activities. The prevailing baseline environmental and social profile of the site/area was used as the benchmark for assessing the changes therein, if any, and the environmental and social impacts of setting-up of the plant.

This EIA report is project specific and of limited applicability and liability only to the extent of the activities and the operations relating to setting up of the instant plant and its operation subsequent thereto and none else. The report has been prepared in compliance to directions of the EPA-Pb.

All rights of this report are reserved with the proponent and the environmental consultant. No part of this report may be reproduced, copied, published, transcribed or cited in any manner in a context different from the purpose for which it has been prepared, except with prior permission of the proponent and the authoring consultant.

Team of Environmental Experts

The team of experts, who carried out the instant EIA, comprised the following Members:

- Engr. Mukhtar A Khan (Civil Engineer & Design Specialist)
- Engr. Jamshed Yaqub (Chemical Engineer)
- Gulbaz Ali Khan (Environmental Ecologist)
- Muhammad Azeem (Environmental & Resettlement Specialist)
- Khurram Jameel (Environmental Geologist)
- Miss Saira Irum (Environmental Sociologist)
- Mr. Kashif Ikram (Environmental Lawyer)



EXECUTIVE SUMMARY



EXECUTIVE SUMMARY

ES.1: Title & Location of the Project

Title:

““setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]”.

Location:

Khewat Number 42, Khatooni Nos. 187-188, Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur. The geographical coordinates of the site are 31°12'37.44"N & 73°58'42.80"E and an altitude of 201m above sea.

ES.2 Name of Proponent

Name: Mazhar Hussain, Proprietor/Proponent

M/s 360 Environmental Solutions [Pvt] Ltd. is a sole proprietorship owned by Mr. Mazhar Hussain. Being a sole proprietorship, it does not require to be registered with the Securities and Exchange Commission of Pakistan. The primary business of the proponent is trade of used, discarded, spent and waste materials including their purchase, sale, storage, treatment, reuse, recycling and disposal. The sources of waste materials traded-in by the proponent include the industrial, commercial, institutional, domestic, municipal and healthcare establishments.

ES.3 Name of the Organization Preparing Report

“Green Revolution”, Environmental Management and Legal Consultants, Lahore. Green Revolution are the leading environmental management consultants have performed as the accredited environmental consultants of the project. Green Revolution have their Head Office at Lahore and branch offices in the Federal Capital and all Provincial Capitals of Karachi, Peshawar and Quetta.

ES.4 Brief Outline of the Proposal

The project essentially is “setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]”. It is noticeable that incineration is one of the many methods of treatment, processing and disposal of waste materials. All salient features of the plant are given in the table hereunder:

Sr.	Particulars	Description
1.	Name of the project	““setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]” by 360 Environmental Solutions [Pvt] Ltd.
2.	Location	The plant will be located Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur
3.	Area	4-Kanal, 1-Marla. However, additional land will be made available by the proponent if so needed for future expansion.
4.	Make, model and manufacture	Locally fabricated double chamber furnace fitted with wet scrubbing system
5.	Specifications	Dual chamber incinerator (primary and secondary furnaces)
6.	Temperature control	Temperature probes with screen display, monitoring and control
7.	Installed capacity	Upto 500 kg per hour including the auxiliary and standby incinerators
8.	Operational capacity	The initial operational capacity will be 500 kg per hour,
9.	Road access	Phoolnagar Bypass Road linking with National Highway (N5)
10.	Nature of wastes	All types of municipal, commercial, domestic, industrial and other wastes including the hazardous wastes, biomedical and healthcare waste, obnoxious waste except the radiological and explosive waste
11.	Igniting fuel	Furnace oil, which will be replaced with natural gas, as and when the latter becomes available



12.	Water availability	Water is available at site. Water will be stored first in an underground tank from where it will be pump lifted to an overhead tank/reservoir
13.	Emissions and effluent control	The air or stack emissions from the incinerators to be treated through wet scrubbing system. After treatment, only the PEQS emissions will be released through the stack mouth. The stack tower height will be 30-35 feet. Used water from the scrubbing system and other sources will be treated and stored in the settling tank and will be reused and recycled in the scrubbing system and for watering the green area at and around the premises. Surplus water, if any, will be released to the nearby wastewater channel after making it conformant to the applicable PEQS. Concerned regulatory authority has already granted NOC in this respect. There will not be the generation of any solid wastes. Whatsoever little solid wastes produced at the plant premises will be disposed of along with the waste received for incineration. The bottom ash will be dumped in a special enclosure at one corner of the premises in an environment friendly manner
14.	Power source	An industrial electricity connection supplemented by a standby diesel generator
15.	Start of operation	The operation of the plant will commence only after complete setting-up of the machinery, equipment and the pollution control system and that too under environmental approval from the EPA-Pb

Design and Layout of the Incinerator

The proponent has not yet selected the final source or procurement of the incinerators to be installed onsite under the instant project. However, the propensity is that the locally fabricated incinerators will be installed. The proponent is searching for the best manufacturer in order to be sure that the incinerators fabricated by him conform to the applicable PEQS. Nevertheless and regardless of the manufacturer, the salient features of the design and layout of the plant will consist of the following:

- Incoming and outgoing gate with a guardroom fitted with an inventory recording system
- Parking area for the incoming carriage and personal vehicles
- Vehicle weighbridge (optional)
- Waste receiving and storage enclosure (yellow room)
- Incinerator fitted with all essential feed and control systems and equipment
- Chamber temperature monitoring and control system
- Stack emissions capturing, treatment and disposal system and equipment
- Bottom ash collection and disposal system
- Onsite laboratory
- Other support equipment and facilities (e.g., generator)
- Fire safety and emergency control systems and facilities
- Real time GPS vehicle tracking system
- Admn building / office rooms
- Green areas, grassy lawns and tree plantations

Stack Emissions Capturing, Treatment and Disposal System and Equipment

The unit will be fitted with an efficient and effective wet scrubbing system. The hot flue gases coming out from the secondary chamber will pass through a vertical wet scrubber. The capacity of the scrubber body will be around 12 to 15 cubic meters. Here, the gases will be showered from above with a stream of water mist. The particulates will impinge against the water droplets and will settle down towards the scrubber bottom. The scrubber bottom will open into a settling tank of the dimensions of around 8'x8'x4'. Here, the solid particulate from the slurry will settle down at the bottom under gravity. The supernatant clear water from the settling tank will be recirculated in the system for showering the flue gases again. The bottom settled sludge will be removed as and when a cake of sufficient thickness of around 1' to 2' is formed at the tank floor. The scrubbed and cooled down gas will move towards the stack tower or the chimney from where it will be released out. It will be ensured that the final stack gas is conformant to the applicable PEQS.

The unit will be fitted with a vertical stack tower or chimney. It will be made of steel sheet. Its base will have a diameter of around 10' and the top mouth of around 5' diameter. its height will be 60 feet. It will receive the cleaned and cooled gases from the wet scrubber. The cleaned and cooled gas will move out of the chimney mouth.



Bottom Ash Collection and Disposal System

The combustion process inside the primary furnace chamber will generate the bottom ash from complete burning of the waste material @ 1% by weight basis approx. The waste load of around 100 kg is thus expected to produce around 1 kg of bottom ash. The bottom ash will drop down through the bottom grate of the primary furnace. Once the batch process of burning is complete, the bottom ash will be allowed to cool down. Thereafter, it will be slashed out with the help of rakes before starting the incinerator operation again. The raked out bottom ash will be shifted into a hand barrow and will be transported to the ash dumping pit/trench at the plant premises. Here, the bottom ash will be dumped and covered with an impervious sheet to avoid its dispersion to the environment. If needed, the bottom ash will be showered lightly to prevent surface billowing of the particulates.

The burnt material, also called the bottom ash, will drop down at the bottom of the combustion chamber. It will be raked out regularly before charging the incinerator with the fresh waste load, prior to start of operation every day. It will be collected and disposed of separately. The bottom ash will be first allowed to cool down to the ambient room temperature. Thereafter, it will be disposed of in the bottom ash disposal pit, to be dug at one side of the premises.

The ash receiving and disposal pit will be a rectangular dug-hole of 10'x10'x10' and the ash holding capacity of around 1000 cubic feet. Keeping in view the expected rate of generation of bottom ash, the life of the ash pit is expected to be around 20 to 25 years. Its inside walls and floor will be lined with impervious material or geomembrane to prevent ingress of any leachate, if formed, in the soil beneath. In the same way, its top will always be kept covered with impervious sheet to prevent entry of rainwater into the pit. The disposed of ash will be compressed with manual or mechanical compressors to reduce its volume. Daily inspection and monitoring of the ash pit will be a standard operational regime of the plant.

The plant will have a proper emission control and off-gas cleaning system, installed complementary to the incineration furnace. All fumes, gases and dusts, which will be generated during the incineration process, will be duly treated by the cleaning system. It will consist of a venturi washer/wet scrubber. From the furnace the hot gases will pass through a hot dust chamber and/or a hot cyclone, where most of the coarse dust particles will be separated from the gas stream. From here the off-gas will feed into a wet scrubbing system, which will consist of a venturi washer/wet scrubber. The wet scrubber will separate and collect the fine dust particles. The water and off-gas will thus mix under high turbulence forming a fine slurry, which will be discharged into a sedimentation tank. The dust free off-gas will then enter the stack tower and discharged via the chimney opening atop of the tower.

ES.5 Major Impacts

As regards the construction and setting up, there will not be any likely environmental impacts of the construction part of the plant (i.e., on ground construction of building and installation of machinery). The construction of the plant including installation of the prefabricated machinery and equipment will be a simple physical activity that will not generate any environmental pollutants in any manner, whatsoever. The building will be constructed on a vacant land, which is on a long-term lease with the proponent. The site is situated Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur. Hence, no impacts relating to the initial construction phase.

However, the operation of the plant could be associated with some environmental impacts, only if suitable pollution control equipment is not installed or its operation is imperfect. Nevertheless, installation of appropriate emission control system is an inseparable component of the plant machinery. A fully operational and efficient wet scrubbing system will be installed alongwith the incinerator. In addition to operation of the scrubber equipment, implementation of the EMP will further ensure environmental compliance, conformance and compatibility of the plant.

As regards the benefits and the positive impacts, the construction and operation of the plant will ensure environment friendly disposal of the ordinary solid and the hazardous wastes. Its construction will also provide opportunities of job and employment for a fair number of persons including the residents of the surrounding areas. A complete detail of the likely environmental impacts and their mitigation is given in a separate section of this EIAR.

In order to enhance environmental ambience and aesthetics of the premises, development of greenbelts will be taken up as a separate and independent activity alongside construction of the main plant. The proponent has allocated separately a sum of Rs. 0.5 million as the tentative cost of environmental enrichment, aesthetics



enhancement and improving the landscape of the site. This cost estimate is based on the prevailing market rates of the various input materials, as are prevailing in the market currently. It has been found that setting-up of the plant will not be associated with any undesirable environmental, social and health impacts, and is devoid of any untoward effects on the ambient environment. Nevertheless, certain routine mitigation measures have been suggested to further enhance environmental acceptability of the plant. Of the remote environmental and social impacts, as can be expected during construction of the plant, a few are enumerated, as hereunder. The likely impacts of operation of the plant have been discussed at appropriate places, separately:

- **Impacts relating to land use change:** No serious or significant impacts relating to land use change, as the proponent will obtain necessary NOC from the concerned authority for the permissible land use of the land, which is currently vacant and not under any productive usage. The proponent will setup the plant on a vacant land, leased and possessed by him Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur. The setting-up the plant on a land measuring 4-Kanal, 1-Marla will not result in negative land use change *(The aspect under consideration has no environmental and social impacts at all)*
- **Loss of livelihood and structural damage:** No impacts relating to loss of livelihood and structural damage, as setting-up of the plant on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur will not cause any loss of livelihood and or structural damage to the nearby properties/civil structures, as none exist there *(The aspect under consideration has no environmental and social impacts at all)*
- **Acquisition of houses and allied structures:** No impacts relating to acquisition of houses and allied structures, as setting-up of the plant on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur will not require acquisition of any houses or any allied structures *(The aspect under consideration has no environmental and social impacts at all)*
- **Cutting and removal of trees and crops:** No impacts relating to cutting and removal of trees or crops, as setting-up of the plant on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur will not involve or require cutting and removal of a tree or crop *(The aspect under consideration has no environmental and social impacts at all)*
- **Impeachment of easement rights of the local community:** No impacts relating to impeachment of any easement rights of the local community, as setting-up of the plant on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur will not cause impeachment of easement rights of the local community *(The aspect under consideration has no environmental and social impacts at all)*
- **Impacts on groundwater:** No impacts on groundwater, as setting-up of the plant on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur will require only normal amounts of groundwater for construction. As regards water usage impacts of the operation phase, the same have been discussed under the appropriate section of this EIAR *(The aspect under consideration has no environmental and social impacts at all)*
- **Impacts on surface water:** No impacts on local surface water resources, as setting-up of the plant on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur will not utilize surface water for any activity. There is not any natural or manmade surface water channel/body near or in the zone of influence the site. As regards disposal of the excess or used water, the proponent has already obtained the requisite NOC from the concerned authorities for its discharge into the nearby wastewater drain *(The aspect under consideration has no environmental and social impacts at all)*
- **Impacts of inadequate treatment and disposal of wastewaters:** No impacts of inadequate treatment and disposal of wastewaters, as the used water produced at the plant will be appropriately treated and then discharged into the nearby drain, under permission from the Irrigation Department. The



water discharged into the drain will conform to the applicable PEQS of the EPA-Pb (*The aspect under consideration has no environmental and social impacts at all*)

- **Impacts of inadequate disposal of MSW:** No impacts of inadequate disposal of the municipal solid waste (MSW), as setting-up of the plant on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur will not produce any solid wastes during setting up of the plant. As regards collection, management and disposal of the ordinary municipal solid waste during operation of the plant, the same has been discussed under the relevant section of the EIAR (*The aspect under consideration has no environmental and social impacts at all*)
- **Impacts of generation of ambient or neighbourhood noise:** No impacts relating to generation of ambient or neighbourhood noise, as setting-up of the plant on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur will not produce any ambient or neighbourhood noise during setting up of the plant. As regards the operation phase, the noise associated with operating of the machinery will not be detectable outside the premises, as the machinery will be fitted inside an enclosed enclosure. As regard the plant workers, they all will be provided PPEs including noise masking devices, if indicated and required (*The aspect under consideration has no environmental and social impacts at all*)
- **Impacts on local air quality:** No impacts on local air quality, as setting-up of the plant on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur will not cause any local air quality impacts from any of the civil work activities during setting up of the plant. As regard the impacts on air quality during operation phase of the plant, the same have been discussed separately under the relevant section of the EIAR (*The aspect under consideration has no environmental and social impacts at all*)
- **Blowing-off of the drag dust:** No impacts relating to blowing off the drag dust, as setting-up of the plant on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur will not produce any drag dust during setting up of the plant. There will not be any excessive movement of heavy vehicles to the site (*The aspect under consideration has no environmental and social impacts at all*)
- **Impairment of air quality from exhausts of fossil fuel burning:** No impacts of impairment of air quality from fossil fuel burning, as setting-up of the plant on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur will not require usage of fossil fuels during setting up of the plant. The simple civil work activities relating to construction of building and installation of the machinery will not consume any fossil fuels. Likewise, there will not be the exhausts from burning of fossil fuels that might affect the local air quality (*The aspect under consideration has no environmental and social impacts at all*)
- **Impacts on ambient air quality:** No impacts on ambient air quality, as setting-up of the plant on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur not affect the ambient air quality during setting up of the plant (*The aspect under consideration has no environmental and social impacts at all*)
- **Likelihood of accidents and risks of personal injuries:** The likelihood of accidents and risks of personal injuries, during construction/setting-up of the plant building and machinery on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur cannot be ruled out altogether. Non-observance of the standard safety precautions, operating procedures, steps for carrying out a particular activity in a safe manner and non-compliance of the recommended precautionary measures may render the workers prone to higher chances of worksite and industrial accidents. It is imperative that all workers, particularly those working near the operational machinery put on the requisite safety equipment and the right kind of dress while on work. Similarly, smoking at the worksite, wearing loose clothes while operating the machinery and the tendency of avoidance to put on safety equipment and apparel while on work, should be strictly discouraged (*The aspect under consideration is without any impacts and if there be any, are all mitigable*)



- **Likelihood of land instability and land sliding:** No impacts of likelihood of land instability and land sliding, as setting-up of the plant on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur will not cause any land instability or land sliding from any of the civil work construction activities. The site is situated in the flat floodplains of the central Punjab and not in a hilly terrain. Hence, no impacts relating to this aspect *(The aspect under consideration has no environmental and social impacts at all)*
- **Impacts on local ecology, biodiversity and the habitat:** No impacts on local ecology, biodiversity and the habitat, as setting-up of the plant on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur will not affect the local ecology, biodiversity and habitat. The setting-up of the plant on a vacant land, leased and possessed by the proponent will not involve cutting of any trees or plants. Nevertheless, if any tree is cut, although there are no chances, compensatory tree plantation @ two trees for every tree cut has been recommended as the prime mitigation measure to keep the local ecology intact *(The aspect under consideration is without any impacts and if there be any, are all mitigable)*
- **Displacement & resettlement issues:** No impacts relating to displacement and resettlement issue, as setting-up of the plant on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur will not cause displacement and resettlement of any population or the property. There is not any human settlement even within the assumed zone of environmental influence of the site *(The aspect under consideration has no environmental and social impacts at all)*
- **Social and cultural issues:** No impacts relating to social or cultural aspects, as setting-up of the plant on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur will not interfere with the social, cultural and religious beliefs and practices of the local communities in any manner, whatsoever *(The aspect under consideration has no environmental and social impacts at all)*
- **Impacts of likelihood of poor designing:** No impacts of likelihood of poor structural design, as setting-up of the plant on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur in perfect conformity with design and architectural features *(The aspect under consideration has no environmental and social impacts at all)*
- **Likelihood of risks of personal injury:** No impacts of likelihood of risks of personal injuries, as setting-up of the plant on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur will not pose risks of personal injuries during setting up of the plant. Nevertheless, the likelihood of personal injuries will be there only if the workers expose themselves deliberately to the avoidable risks and site hazards unnecessarily. The most likely causes of which will be non-observance of the standard operating procedures and non-observance of the safety precautions for carrying out a certain activity. Adventurism on the part of the workers can be another cause of personal injuries. Nevertheless, likelihood of the personal injuries from other causes cannot be ruled out altogether. However, efforts should be made to minimize occurrence of the risks of personal injuries by instituting a dependable hazard assessment and risk avoidance strategies *(The aspect under consideration has no environmental and social impacts at all)*

A detailed account of the genesis of the above-referred adverse impacts, their potentiality to affect the ambient environment and the measures for mitigations has been presented in the chapter titled, “Environmental Impacts and Their Mitigations” as contained in this EIA Report. However, it would be sufficed here to state that if construction and operation of the plant is carried out in a sustainable manner and in accordance with the ESRMP and the mitigation measures, as given in this EIAR, then the majority of these adverse impacts would become insignificant and of no relevance at all.

ES.6 Recommendations for Mitigation Measures

Besides presenting an in-depth analysis of the environmental and social impacts of setting-up of the plant on a vacant land, leased and possessed by the proponent; the EIA report details a set of comprehensive mitigation



measures and strategies for avoiding and countering any adverse environmental and social impacts, as are likely to be encountered at any stage, even in the future as well. Apart from the measures relating to construction, additional measures relating to operation of the plant have also been incorporated in the EIAR.

The majority of the mitigation measures, as suggested in the instant EIA report, are activity based. For example, the risks of personal injuries to the workers during setting-up of the plant and its other components at site, if any, can be avoided by observing the suggested mitigation measures. The open lands and the bare surfaces at the premises may be water sprinkled regularly and routinely to reduce blowing of fugitive dust therefrom. Similarly, emission of air pollutants to the ambient air can be avoided by planting trees at all possible places at the premises. The risks of personal injuries during the operation phase can be curtailed by promoting usage of the safety equipment and instituting a dependable and effective monitoring mechanism for checking delinquencies in this regard. The workers doing the risky jobs e.g., welding, moulding and steel fixing etc. should take all necessary precautions and use recommended safety equipment and gadgets to avoid any untoward happening.

As regards the operation phase, usage of reasonable volumes of water is expected, both for human consumption, maintaining incinerator temperature and wet scrubbing of the vent air prior to its discharge to the atmosphere. It is expected that the water usage during operation of the plant will be somewhat around @ 1000 litres per hour. The water used for the operational and other needs will, however, be recirculated indefinitely. Therefore, the water present in the system will continue to be recirculated and reused barring the water that will be lost through evaporation, leakages and atmospheric phenomenon. The water loss will be replenished through fresh water injection from the groundwater turbine to be installed at the plant. The water replenishment is expected to be @ 1/10th of the system water i.e., approx. 100 litres per hour. The process and cooling water will not require installation of any treatment system, except the settling pond for removal of the particulates. The system water will hardly be discharged to the exterior. It will remain within the closed conduit system. As regard other water usages for human and miscellaneous needs, the usage of water at the worksite toilets will be just normal for such like plants i.e., @ 50-70 litres per person per day. However, spendthrift usage of freshwater at the washrooms may be minimized by fitting auto-shutoff taps. As regards treatment of the sanitation origin wastewater from the worksite toilets, the proponent will construct septic tanks of appropriate capacities for its treatment prior to disposal. As far as the ambience and outlook of the premises is concerned, it will be enhanced by generous planting of green plants, trees, fresh and seasonal exotic flora. The green areas at the premises will be irrigated regularly to keep them fresh and green.

The most significant positive impact of setting-up of the plant will be the environmentally compatible incineration of hazardous and industrial wastes. As stated earlier, disposal of the hazardous, infectious and obnoxious waste through incineration is the preferred choice in the current scenario. Therefore, setting up of the efficient incineration plants is need of the time. The incineration of the hazardous and other wastes in a scientific way will ensure protection and preservation of the environment and health and safety of the populace.

The above-mentioned socioeconomic and environmental benefits of setting-up of the plant will far outweigh its potentially negative or adverse impacts, if any. Fortunately, the likely impacts concerning plant's operation are all mitigable. Given the present state of affairs and the increasing awareness about safe disposal of the hazardous wastes in the country, setting-up of the plant will be of great benefit for the people, area, and the environment for all times to come. It will ensure appropriate, effective and efficient disposal of wastes through the process of incineration at the plant, which will be beneficial for the area, region and the country.

The project simply is "setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]". There will not be any undesirable impacts from its construction onsite. As regards the impacts of plant's operation, these will be all mitigable provided the requisite mitigation measures are implemented in letter and spirit. Contrarily, there will be healthy impacts on the local environment from improved landscape, aesthetics and abatement of pollution from construction of a modern and well-designed building. In addition to the above-listed benefits, some other significant socioeconomic benefits and positive impacts of setting-up of the plant will be the opportunities of employment, training and skill development, both for the skilled and the semi-skilled/ unskilled personnel, who would be employed or whose services would be hired in connection with setting-up and subsequently running the plant. Another social benefit of setting-up of the plant will be the income prospects for large number of persons (traders, suppliers, vendors, shopkeepers, service providers, mechanics, artisans etc.) who would be providing goods and services during both construction and operation of the plant. Similarly, setting-up of the plant will be beneficial also for the wholesalers and retailers of the goods and services to be provided



for the plant. In nutshell, setting-up of the plant will be beneficial equally for the industry, economy and the environment.

ES.7 Proposed Monitoring

The environmental, social and risk management plan (ESRMP), as given in this document, is meant to provide a reliable mechanism for addressing the likely adverse environmental and social impacts of construction and operation of the plant, if any. It presents a robust system for mitigation and prevention of the adverse impacts in the form of environmental guidelines, measures for risk/hazard avoidance and an institutional setup for implementing the ESRMP. The hierarchy of choices for implementation of the ESRMP are firstly to avoid, and if it is not possible, to attenuate the adverse impacts to an acceptable level by adopting suitable administrative and or technical options. The key components of the ESRMP include environmental guidelines for the project sponsors, planners, design-engineers, contractors, vendors of the various raw materials and finished products, proponent and various others concerned.

Besides offering a framework of mitigations in the form of environmental and social management guidelines, the ESRMP offers an institutional setup for implementing the environmental guidelines by identifying and designating the focal persons for various activities and other mitigation measures. These focal persons will ensure upward and downward coordination and linkages, removal of bottlenecks in the way of smooth implementation of the ESRMP, establishing a two-way flow of information between the project authorities and the EPA as well as other regulatory authorities and maintaining all the project related monitoring records for a meaningful follow-up.

Apart from the relevant focal persons for the various sub-components, there will be an environmental safety, health and social management unit (ESHU) headed by an environmental manager to cater for environmental and safety issues of the plant right from planning stage to its lifelong operations. The job of the ESHU will be to ensure compliance of the environmental guidelines and implementation of the prescribed mitigation, safety, health and hygiene measures at the site. The Environmental Manager will have an independent office and appropriate number of staff to assist him in smooth accomplishment of his duties.

The ESRMP also delineates mechanisms for internal and external compliance monitoring of the plant's environmental performance to ensure regimental observance of the guidelines and other recommended mitigation measures at various tiers of responsibilities. Members of the environmental safety, health and social management unit (ESHU) will institute a regular system of the sites' inspections to take note of the environmental non-conformances by the construction contractors, vendors and others concerned. They may use the checklist proforma that has been especially developed by the environmental consultant for the purpose. They will submit daily as well as periodical monthly environmental compliance status reports to the environmental unit and will seek guidance from the Environmental Manager during construction as well as on need basis as and when required.

In order to ensure long-term environmental and social sustainability of the plant, the report presents a system of external monitoring in the form of regular annual environmental audits. To ensure objectivity and impartiality, the environmental audit and external monitoring will be outsourced to an environmental consultancy of standing and repute. The consultancy should be given the mandate to review implementation of the ESRMP, identify on-the-ground environmental issues and offer recommendations for making the plant's activities compatible with its actual on-ground requirements.

In order to enhance capacity of the concerned personnel in managing the environmental and social issues, the ESRMP presents a system of environmental trainings and capacity building of the project authorities, particularly of the key stakeholders (officers, staff, community and others). Specialized trainings will be offered to functionaries of the environmental management unit.

The ESRMP suggests to hold a few training workshops of shorter durations (one-day) relating to environmental awareness every year all during operational life of the plant. These workshops will be used to apprise the stakeholders (officers, personnel and community) about importance of the environmental issues and enhancing implementation capacities of the project functionaries and authorities. These training sessions will aim at raising participants' understanding about the environmental and social issues of the plant. They will also emphasize on importance of involvement of the stakeholders towards tackling and addressing various environmental and social concerns of the project.



These workshops will be interactive in essence rather than being one-way flow of information. Some sessions will be reserved solely for the officers and staff of the ESHU and will focus more on policy issues and troubleshooting strategies rather than other routine aspects. Development of the training manuals, selection of the suitable environmental consultancy and selection of the appropriate resource persons will precede actual holding of these workshops.



1 INTRODUCTION



1. INTRODUCTION

1.1 Purpose of Report

The purpose of the instant report is to present a comprehensive assessment of the likely environmental impacts of “setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]”. The plant will be setup on a vacant land, leased and possessed by the proponent. The plant will firstly start working with a single furnace of the capacity of 500 kg per hour. The plant will be primarily a facility for efficient and controlled incineration of all and various types of incinerable wastes, as received from the waste producers. The waste sources may include the industry, factories, institutions, marketplaces, municipal authorities, healthcare establishments and others alike. The objective of the instant EIAR is to present a preliminary environmental examination of setting-up and operation of the plant at the site.

The report presents a detailed review of the various likely environmental impacts relating to setting-up of the plant on a vacant land, leased and possessed by the proponent. In addition thereto, the report presents an incisive and in-depth overview of the foreseeable and the likely impacts of the operation phase i.e., controlled incineration of wastes. In doing so, the EIA report presents a critical review of the activities and the processes relating to both construction and operation of the plant. The report presents a review of the nature, magnitude and implications of the environmental and social impacts of construction and operation of the plant against the standard environmental parameters, as prescribed under the Punjab Environmental Quality Standards (PEQS). The environmental and social impacts of the various operational activities, all during operational life of the plant, are the two key focussed-areas of the EIA. Besides evaluating the environmental profile of the site, the plant and the operational processes, the report outlines a comprehensive mechanism for addressing the various and the likely environmental and social concerns, particularly those relating to receiving, handling, storage, incineration and disposal of the leftovers at the premises. The report suggests a long-term framework for monitoring the all and various impacts of the plant’s operational activities to ensure early detection, remediation, rectification and mitigation of the environmental issues that may crop-up during operation of the plant. Additionally, the report outlines a robust and dependable mechanism to ensure optimal environmental performance of the plant by ensuring an across-the-board implementation of the environmental enhancement programme, comprising the mitigation measures and management guidelines, as contained in the instant EIAR.

1.2 Identification of the Project & Proponent

Project:

“Setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]” at a vacant plot, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur.

Proponent:

Mr. Mazhar Hussain is the principal proponent of the project. He is the proprietor of M/s 360 Environmental Solutions [Pvt] Ltd., which is a sole proprietorship owned by him. Being a sole proprietorship, the business need not be registered with the Securities and Exchange Commission of Pakistan. The primary business of the proponent is trade of used, discarded, spent and waste materials including their purchase, sale, storage, treatment, reuse, recycling and disposal. The sources of waste materials traded-in by the proponent include the industrial, commercial, institutional, domestic, municipal and healthcare establishments. The proponent will look after all the aspects concerning environmental approval from the EPA-Pb and will carry out all necessary steps and measures for setting-up of the plant at the site. He will be responsible for removal of the bottlenecks and troubleshooting of the impediments in the way of construction and operation of the unit.

1.3 Environmental Consultant

M/s Green Revolution are the accredited consultants for conducting a detailed and in-depth EIA of setting-up of the plant in accordance with the rules, regulations, guidelines and provisions of relevant laws in vogue. Green Revolution are the leading environmental management and legal consultants. They have performed as the accredited environmental consultants for number of projects in the public and the private sector. Green Revolution have their Head Office at Lahore and branch offices in the Federal Capital and all Provincial Capitals.



of Karachi, Peshawar and Quetta. The below named persons will act as the Focal Persons for and on behalf of the Proponent and Consultant.

Table 1.3: Contact Details of the Focal Persons of the Proponent and the Environmental Consultant

Proponent	Environmental Consultant
Mazhar Hussain Proprietor/Proponent 360 Environmental Solutions [Pvt] Ltd. Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur Mob: 03004472668	Mr. Kashif Ikram Sh. Chief Executive Green Revolution Office No. 5, Ground Floor Al-Majeed Centre, Link Faridkot Road, Lahore Mob: 0333422232 email: green-sul@gmail.com

1.4 Brief Description of the Project

The project essentially is “setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]”. It is noticeable that incineration is one of the many methods of treatment, processing and disposal of waste materials. All salient features of the plant are given in the table hereunder:

Table 1.4: Summary of the Essential Info

Sr.	Particulars	Description
1.	Name of the project	““setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]” by 360 Environmental Solutions [Pvt] Ltd.
2.	Location	The plant will be located Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur
3.	Area	4-Kanal, 1-Marla. However, additional land will be made available by the proponent if so needed for future expansion.
4.	Make, model and manufacture	Locally fabricated double chamber furnace fitted with wet scrubbing system
5.	Specifications	Dual chamber incinerator (primary and secondary furnaces)
6.	Temperature control	Temperature probes with screen display, monitoring and control
7.	Installed capacity	Upto 500 kg per hour including the auxiliary and standby incinerators
8.	Operational capacity	The initial operational capacity will be 500 kg per hour.
9.	Road access	Phoolnagar Bypass Road linking with National Highway (N5)
10.	Nature of wastes	All types of municipal, commercial, domestic, industrial and other wastes including the hazardous wastes, biomedical and healthcare waste, obnoxious waste except the radiological and explosive waste
11.	Igniting fuel	Furnace oil, which will be replaced with natural gas, as and when the latter becomes available
12.	Water availability	Water is available at site. Water will be stored first in an underground tank from where it will be pump lifted to an overhead tank/reservoir
13.	Emissions and effluent control	The air or stack emissions from the incinerators to be treated through wet scrubbing system. After treatment, only the PEQS emissions will be released through the stack mouth. The stack tower height will be 30-35 feet. Used water from the scrubbing system and other sources will be treated and stored in the settling tank and will be reused and recycled in the scrubbing system and for watering the green area at and around the premises. Surplus water, if any, will be released to the nearby wastewater channel after making it conformant to the applicable PEQS. Concerned regulatory authority has already granted NOC in this respect. There will not be the generation of any solid wastes. Whatsoever little solid wastes produced at the plant premises will be disposed of alongwith the waste received for incineration. The bottom ash will be dumped in a special enclosure at one corner of the premises in an environment friendly manner
14.	Power source	An industrial electricity connection supplemented by a standby diesel



		generator
15.	Start of operation	The operation of the plant will commence only after complete setting-up of the machinery, equipment and the pollution control system and that too under environmental approval from the EPA-Pb

1.4.1 Design and Layout

The proponent has not yet selected the final source or procurement of the incinerators to be installed onsite under the instant project. However, the propensity is that the locally fabricated incinerators will be installed. The proponent is searching for the best manufacturer in order to be sure that the incinerators fabricated by him conform to the applicable PEQS. Nevertheless and regardless of the manufacturer, the salient features of the design and layout of the plant will consist of the following:

- Incoming and outgoing gate with a guardroom fitted with an inventory recording system
- Parking area for the incoming carriage and personal vehicles
- Vehicle weighbridge (optional)
- Waste receiving and storage enclosure (yellow room)
- Incinerator fitted with all essential feed and control systems and equipment
- Chamber temperature monitoring and control system
- Stack emissions capturing, treatment and disposal system and equipment
- Bottom ash collection and disposal system
- Onsite laboratory
- Other support equipment and facilities (e.g., generator)
- Fire safety and emergency control systems and facilities
- Real time GPS vehicle tracking system
- Admn building / office rooms
- Green areas, grassy lawns and tree plantations

1.4.2 Stack Emissions Capturing, Treatment and Disposal System and Equipment

The unit will be fitted with an efficient and effective wet scrubbing system. The hot flue gases coming out from the secondary chamber will pass through a vertical wet scrubber. The capacity of the scrubber body will be around 12 to 15 cubic meters. Here, the gases will be showered from above with a stream of water mist. The particulates will impinge against the water droplets and will settle down towards the scrubber bottom. The scrubber bottom will open into a settling tank of the dimensions of around 8'x8'x4'. Here, the solid particulate from the slurry will settle down at the bottom under gravity. The supernatant clear water from the settling tank will be recirculated in the system for showering the flue gases again. The bottom settled sludge will be removed as and when a cake of sufficient thickness of around 1' to 2' is formed at the tank floor. The scrubbed and cooled down gas will move towards the stack tower or the chimney from where it will be released out. It will be ensured that the final stack gas is conformant to the applicable PEQS.

The unit will be fitted with a vertical stack tower or chimney. It will be made of steel sheet. Its base will have a diameter of around 10' and the top mouth of around 5' diameter. its height will be 60 feet. It will receive the cleaned and cooled gases from the wet scrubber. The cleaned and cooled gas will move out of the chimney mouth.

1.4.3 Bottom Ash Collection and Disposal System

The combustion process inside the primary furnace chamber will generate the bottom ash from complete burning of the waste material @ 1% by weight basis approx. The waste load of around 100 kg is thus expected to produce around 1 kg of bottom ash. The bottom ash will drop down through the bottom grate of the primary furnace. Once the batch process of burning is complete, the bottom ash will be allowed to cool down. Thereafter, it will be slashed out with the help of rakes before starting the incinerator operation again. The raked out bottom ash will be shifted into a hand barrow and will be transported to the ash dumping pit/trench at the plant premises. Here, the bottom ash will be dumped and covered with an impervious sheet to avoid its dispersion to the environment. If needed, the bottom ash will be showered lightly to prevent surface billowing of the particulates.

The burnt material, also called the bottom ash, will drop down at the bottom of the combustion chamber. It will be raked out regularly before charging the incinerator with the fresh waste load, prior to start of operation every day. It will be collected and disposed of separately. The bottom ash will be first allowed to cool down to the ambient room temperature. Thereafter, it will be disposed of in the bottom ash disposal pit, to be dug at one side of the premises.



The ash receiving and disposal pit will be a rectangular dug-hole of 10'x10'x10' and the ash holding capacity of around 1,000 cubic feet. Keeping in view the expected rate of generation of bottom ash, the life of the ash pit is expected to be around 20 to 25 years. Its inside walls and floor will be lined with impervious material or geomembrane to prevent ingress of any leachate, if formed, in the soil beneath. In the same way, its top will always be kept covered with impervious sheet to prevent entry of rainwater into the pit. The disposed of ash will be compressed with manual or mechanical compressors to reduce its volume. Daily inspection and monitoring of the ash pit will be a standard operational regime of the plant.

The plant will have a proper emission control and off-gas cleaning system, installed complementary to the incineration furnace. All fumes, gases and dusts, which will be generated during the incineration process, will be duly treated by the cleaning system. It will consist of a venturi washer/wet scrubber. From the furnace the hot gases will pass through a hot dust chamber and/or a hot cyclone, where most of the coarse dust particles will be separated from the gas stream. From here the off-gas will feed into a wet scrubbing system, which will consist of a venturi washer/wet scrubber. The wet scrubber will separate and collect the fine dust particles. The water and off-gas will thus mix under high turbulence forming a fine slurry, which will be discharged into a sedimentation tank. The dust free off-gas will then enter the stack tower and discharged via the chimney opening atop of the tower.

1.4.4 Engineering and Design Features

As per the site layout plan, the total area of the project will be 4 kanal. However, the actual constructed area under the main incineration unit will be 80'x40'=3,200 sft, which is sufficient to accommodate all essential components of the incineration plant i.e., waste loading system, main furnace, ancillary facilities, vent collection and treatment system, scrubbing system, scrubbed water settling tanks, stack emission chimney and others.

The loading and off-loading shutter door will be of the dimensions 48"x42". It will be hinged at one side of the main incinerator chamber. The waste will be loaded from here in a batched manner and the bottom ash will also be removed through this shutter door. The main incinerator will consist of a primary chamber, a secondary chamber and a post-secondary chamber. The primary and the secondary combustion chamber combined will be of the size and dimensions 84"x60"x36". The post-secondary chamber for treatment of flue gases and the fly ash will be of the dimensions 60"x60"x36". The size, capacity and dimensions of the incineration chambers is as per the international standards for incinerators of such capacity. The incineration chambers will be lined from inward to outward with 4" heat resistant refractory bricks and then a 4" thick glass wool insulation packing all around. This will help to maintain the inner temperature at the requisite level and will also help in energy conservation. Both chambers will be fitted with four modular burners alongwith air blowing injectors and the automatic temperature gauges. The inner combustion temperature inside the primary chamber will be maintained at around 800-900°C and in the secondary chamber between 1000-1200°C. The exhaust or vent for the discharge of the flue gases, hot air and the fly ash will be at the far end of the furnace. The diameter of the exhaust vent pipe will be 12" and it will be made from MS sheets.

All the flue and vent gases will pass through a series of scrubbing devices. There will be three vertically placed scrubbing conduits of increasing diameters from the first to the last. The diameter of the 1st scrubbing conduit will be 20", of the 2nd 30" and of the last one 36". Their height will be 5-6'. The last scrubbing conduit will be linked to the stack tower or the chimney. The diameter of the chimney pipe will be 12" and its height from the ground level will be 30-35 feet. It will be fitted with blowers to effect forced vent of the cleaned, treated and scrubbed air to the exterior.

The used-up water from the scrubbing system will be collected in a settling tank ahead of the last scrubbing conduit. The settling tank, by construction, will be a three-chambered structure to ensure full and effective settling down of any particulate matter from the used-up water at the bottom of the settling tank. The supernatant or the clear water will be discharged out via a 6" wide outlet pipe. It will be reused and recycled in the scrubbing system and the extra water, if left, will be used for irrigating the green areas and the tree plantation at and around the site/premises. The water used for scrubbing at the three scrubbing conduits will be recycled and reused to ensure water use conservation.

The covered platform area under the combustion chamber will be 12'x15', under the scrubbing system 12'x25' and under the settling tank 10'x20'. The furnace of the incinerator will be placed over a concrete platform.



The combustion process inside the primary furnace chamber will generate the bottom ash from complete burning of the waste material @ 1% by weight basis approx. The waste load of around 100 kg is thus expected

1.4.4.1 Key Features

- ✓ Hi-Protec's Incinerator (HP-Inferno) is the most reliable, efficient, thermally effective, robust and environment friendly incinerator in the market.
- ✓ HP-Inferno is fully automatic incinerator with PLC-microprocessor based controller and touch screen 10-inch HMI panel.
- ✓ Robustly constructed and designed in Cubical form, aesthetically painted with high temperature resistant enamel paint (Colours: Blue/Grey).
- ✓ Advanced model with three combustion/treatment chambers provided with burning aid blowers (Comburant air system).
- ✓ First for direct load burning, Second for fume burning and third for Thermal Fume Treatment (TFT) system which essentially provides an additional cleaning of emissions/exhausted gasses immediate after burning.
- ✓ Wide door for loading all types of waste materials in primary chamber.
- ✓ Combustion system consists of total four high intensity burners (Diesel/Gas operated) which are capable of producing an intense burning at 900-1200°C (Celsius).
- ✓ Max smoke/gas retention time (3 sec.) in secondary chamber for the re-burn of harmful emissions.
- ✓ High rated Refractory Bricks are used to create inner lining of chambers and are insulated with adequately thick lining of first rated material.
- ✓ Extensive multistage "Venturi" scrubbing system available comprising scrubbing tanks, Cone & funnel like vessels and mashed structures.
- ✓ Chimney provided: 30 Feet high from ground made of MS, dia 10-12 Inch with suction blower and sampling port.
- ✓ Operates on Natural Gas and LPG with low running cost.
- ✓ User friendly interfacing and operations.
- ✓ Low external heat due to special thick insulation.

1.4.4.2 Technical Specifications and Features

- Brand Name: Hi-Protec
- Product Name: HP-INFERNO
- Capacity: 500 Kg per Hour
- Model: HP-INF- 050 XL

Table 1.4.4.2: Technical Design Specifications and Features

Sr.	Specs	Description
1.	Capacity	500 kg/hour (Batch Feeding)
2.	No. of Incineration Chambers	03 Chambers (Primary, Secondary, Post-Secondary)
3.	Primary Chamber Size	60x60x84 inch (HxWxD)=175 ft ³ =5 m ³ =4900 Litres
4.	Outer Body	Mild Steel (8-10mm Thick)
5.	Combustion Health	Tetra Main Combustion Health (04 Automatic Burners for Combustion)
6.	Combustion Source	Natural Gas / LPG (Optional)
7.	Inner Lining	High Temperature Refractory Fire Bricks with 100 mm Thickness
8.	Insulation	100 mm Thick Special Insulation Lining to Insulate/Cover the Inner Burning Lining
9.	Doors	01 Insulated Wide Door on Front Side of Primary Chamber (Size: 40x48 inch WxH)
10.	Door Locking	Double Kame Door Locking System
11.	Smoke Retention	03 Seconds of smoke/Gas Retention Time in Secondary & Post-Secondary Chamber
12.	Venturi Scrubber	Wet (Venturi) Scrubber to Capture Dust Particles Coming from Secondary Chamber. It finally exhausts white hazard free smoke/Steam from stack
13.	Water Feeding	Automatic Water Feeding for Scrub
14.	Scrub Drain	Installed 3 Inch (Dia) Auto Drain
15.	Automation & Controls	Based on PLC (Fully Automatic)
16.	Operating Panel	Automatic PLC based Operating Panel with Large HMI Display (07 Inch) that shows Setting Values of each Process and Indicates Temperature
17.	Error Indications	Self-Diagnosis and Description of all Kind of In-Process Errors on HMI Display



18.	Body Finishing	High Temp Enamel Paint Finish
19.	Stack / Chimney	MS Made 30-35 Feet Long Chimney with Sampling Port and Suction Blower attached (Dia = 300 mm)

1.4.4.3 Running Principle

- ✓ Hi-Protec incinerator works on continuous loading or batch loading system to increase the capacity of incinerator and combustion efficiency and works according to variable operating ranges up to 10-16h/24.
- ✓ The temperature is modulated in varying flow and percentage in oxygen.
- ✓ Combustion gas is re-burned in the dual post-combustion chamber at a temperature of min. 1,200°C.
- ✓ The control panel is fitted with a functional synoptic view showing the operating situation of the whole installation.
- ✓ Easy accessibility to all equipment and rapid measure points in order to analyse rejected gas (such as dusts, carbon monoxide etc.) by accepted organisms.
- ✓ The incinerator is designed as a packaged unit, having electrical connection pre-wired and fuel & air pipes in place, making installation easier at site.

1.4.4.4 Special (Primary) Combustion Chamber for Hazardous Waste

- ✓ The combustion chamber of incinerator is having adequate capacity to handle a consignment of 500 kg of hospital and medical waste complete in 01 hour.
- ✓ Construction:
- ✓ The inside of combustion chamber is rectangular shape while outer body can be customized in Cubical or cylindrical shape made of 8-10 mm thick Mild Steel sheet.
- ✓ The inner lining of the combustion chamber is composed of refractory bricks having high content aluminium. This lining is covered with insulation bricks in order to assure a minimum temperature on the outside sheet metal.

1.4.4.5 Composition of the Refractory Lining

- **Refractory bricks**
 - Thickness: 100 mm
 - Maximum Temperature Tolerance: 1,400°C
 - Nature: Phlox 42% of Al_2O_3
- **Insulator**
 - Thickness: 100 mm
 - Maximum temperature tolerance: 1,000 °C
 - Nature: Caldegun

1.4.4.6 Combustion Burners

The combustion chamber contains 03-04 No. of automatic heavy duty fire burners.

1.4.4.7 Temperature Range

800-900°C

1.4.4.8 Central Air Supply Fan

01 Electro-ventilator (air blower) installed to distribute the comburant (oxidized) air in the burning chamber in order to provide a healthy burning aid.

1.4.4.9 Chamber Size/Volume

60x60x84 inch (HxWxD) = 175 ft³ = 5 m³ = 4,900 Litres (for 500 kg/hr)

1.4.4.10 Dual Post-Combustion Chambers

The second phase of incineration is a post-combustion of the flue gas produced by the combustion chamber at high temperature. In HP-INFERNO the post-combustion is powered by dual chambers. First one comes posteriorly with primary chamber and second is situated on the top of the combustion chamber so as to re-burn easily the flue gases. The post-combustion of gases takes place at a temperature of 1100 - 1200°C. The cylindrical form of the post combustion chamber enabling to assure the achievement of very low hydrocarbon refuse. It also contributes to the limitation of soot (carbon) in the downstream and of the quantity of solid to be treated in the dust remover. The re-light of the combustion by secondary air with the post-combustion burners and obtained high temperature of the flame allows to finish the combustion of fine carbonized particles. So, there will be small quantity of unburned flying ashes in the downstream of the furnace. The post-combustion chamber is fitted with service door so that a periodical cleaning of dust can be achieved. The post-



combustion series is lined with high thermal insulating materials with a thickness of 100 mm of refractory bricks and 100 mm of insulator. 04 high flame burners are present in post combustion chambers along with comburant air supply fan.

1.4.4.11 Technical Specifications of Post Combustion Chamber

- Free Oxygen Content: 6-8 %
- Rated Gas: 10-12 m/s
- Time Contact Gas: >2 Sec
- Temperature Range: 1100-1200°C

1.4.4.12 Wet Scrubber

Our incinerator has built-in scrub for hazardous fume treatment with suction blower and wet scrubbing to produce clear white emissions from stack. Extensive scrub system consists of multiple tanks with mashed traps. Three stage scrubbing process begins when flue gases entered into first vessel and come in contact with water and forced into a funnel like vessel where velocity of flue gas and water is increased due to narrowing of its pathway. Water treatment system breaks the particle pollutants and transport them into final settling tank. This tank is cone like diverging vessel. At the end the waste slurry like product is removed by a controlled drainage system for safe disposal and remaining clean exhausted gas can pass through chimney into the environment.

1.4.4.13 Chimney / Stack

The height of chimney provided with the system is 30-35 feet from the ground and its internal diameter is 300 mm. The MS made chimney is fitted with a suction blower and a sampling port for the collection and measuring of gas samples. The sampling port is built in a proper direction for easy usage.

1.4.4.14 Electric Control and Regulation Panel

- System having fully automatic PLC microprocessor controls.
- 07 inches touch HMI is used for interfacing, control and Display of values, errors and standard settings.
- All installation is confirmed with regulations in force.
- Warning lights and alarms system is installed.
- 01 temperature probe present in each chamber.
- Incineration cycles are controlled by time limits.
- Power supply: 380 v/3 phase.
- Max Electric power installed: 6 kw.
- Dust-tight control box is used to enclose the electronics.

1.4.4.15 Technical Data Sheet

Table 1.4.4.15 presents a summary of the technical specifications of the plant.

Table 1.4.4.15: Summary of Technical Specifications

Sr.	Description/Parameter	Required Value
1.	Operation time	12-16 H / 24 h
2.	Capacity	500 kg/h
3.	Operating method	Batch type loading
4.	Temperatures * Combustion * Post-combustion	900°C 1,200°C
5.	Max thermal destructive capacity	75,000 kcal/h
6.	Water Consumption	500 l/hr
7.	Total Ash Residual Contents	< 5% of Total Load

1.4.4.16 Operational Requirements

1. Opening in the roof for the passing of the chimney with tight string connections.
2. High and low ventilation.
3. Connection of electricity to control panel (Single phases 380 Volts + neutral + earth).
4. Connection of fuel/gas, pipes to incinerator burners.
5. 03 Nos. of 02-inch dia water supply line for Scrubber with water storage tank (>3 bar).
6. Area = 15x30 (WxD) feet platform with 4-inch thick RCC flooring.
7. Draining system with required SOPs.



Nature: A modern and efficient plant for storage and disposal through incineration of all and various types of waste materials [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.] in an environment friendly manner.

Size: 4-Kanal, 1-Marla (1/2 Acre)

Location: Khewat Number 42, Khatooni Nos. 187-188, Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur. The geographical coordinates of the site are 31°12'37.44"N & 73°58'42.80"E and an altitude of 201m above sea.

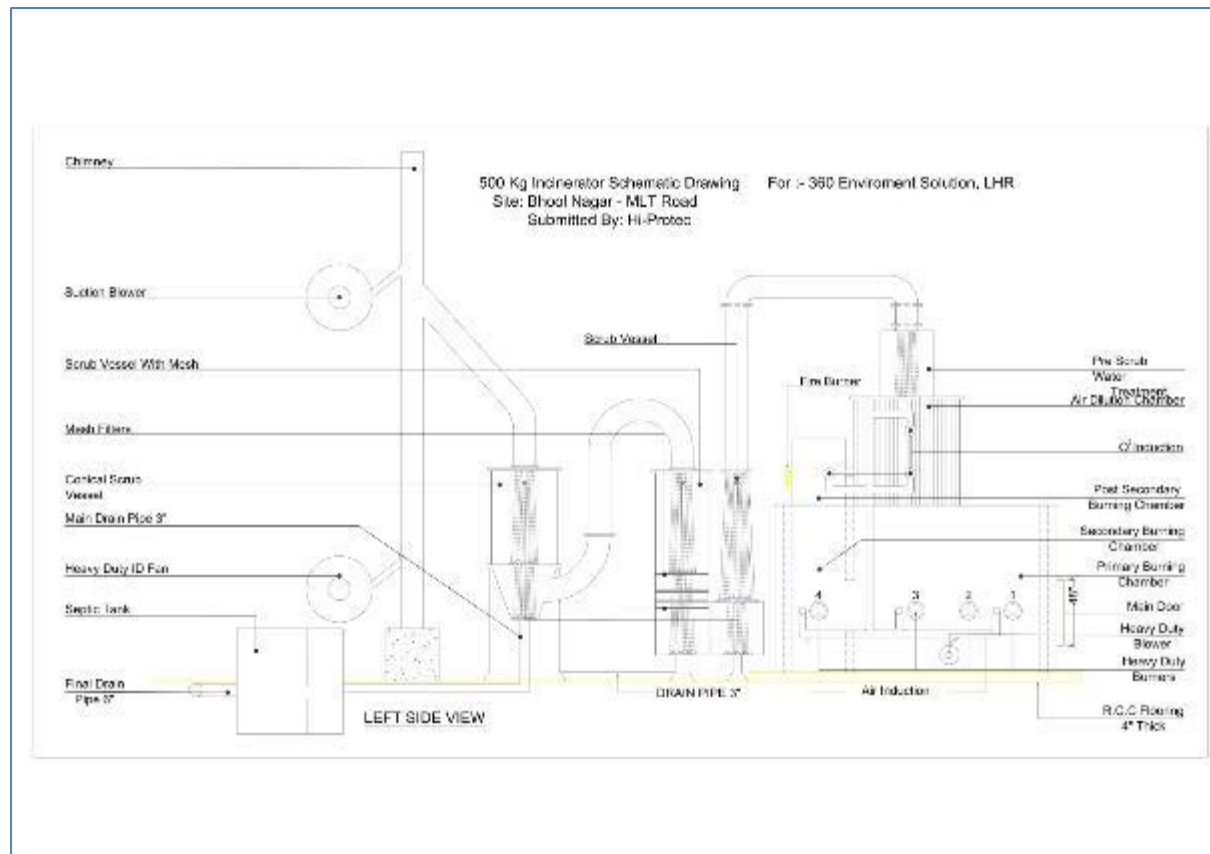


Fig. 1.4.4a: Engineering and Design Features [Side View]



Fig. 1.4.4b: Engineering and Design Features [Top View]



2

BRIEF DESCRIPTION OF THE PROJECT



2. BRIEF DESCRIPTION OF THE PROJECT

2.1 Type and Category of Project

Type:

A modern and efficient plant for storage and disposal through incineration of all and various types of waste materials [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.] in an environment friendly manner.

Category

Nil. A facility for the disposal and/or storage of hazardous or toxic wastes through incineration/autoclave is listed under Category-G of Schedule-II of the IEE/EIA Regulations 2022.

2.2 Objectives of the Project

The primary objective of “setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]”.

Owing to increased awareness about environmental concerns, the demand for safe, secure and efficient disposal of all types of wastes, particularly of the health affecting wastes, by the public and the regulatory authorities is on the increase. The public pressure for safe disposal is mounting with every passing day. Although, reliable statistics are not available, yet generation of various types of wastes is on the increase and runs into thousand tonnes per day. Whereas, only a fraction of it is disposed/treated through incineration, primarily due to dearth of incineration facilities.

It is, therefore, need of the time that construction, installation and setting up of efficient waste incineration plants is ensured by encouraging the private sector and the entrepreneurs. Looking from this perspective, the setting-up of the instant plant can be regarded as a positive step in this direction, as its construction will offer a commercially viable and environmentally compatible solution for the management and disposal of the ever-growing volume of the waste materials.

Another linked objective of setting-up of the plant at this site is to help uplifting of the socioeconomic profile of the area. The benefits coming in the wake of setting-up of the plant will help in improving the socioeconomic conditions and lifestyle of the local populace. This can be counted as another direct benefit of setting-up of the plant here. Similarly, impetus to commercial activities from trading of the commodities to be consumed, operation of the plant and creation of opportunities of job and employment for the locals, which will come in the wake of setting-up of the plant, will be another inseparable benefit. The setting-up of the plant will ensure timely and round the year availability of a facility for safe and secure disposal through incineration of various types of wastes.

The setting-up of the plant is in line with the “Environmental and Health Policy” of Government of the Punjab (GoPb), which emphasizes safe and secure disposal of wastes, particularly the health risk wastes. Viewing from this backdrop, the primary objective of setting-up of the plant for storage and disposal of wastes through incineration, apart from providing opportunities of job and employment is to combat environmental pollution through efficient management of wastes.

2.3 Alternatives of the Project

The possible alternatives to the instant project can be divided broadly into two categories, namely:

- a). Technological alternatives
- b). Site/location alternatives

As far as technological alternatives are concerned, number of options are available for treatment and disposal of the waste materials. These include physical treatment of the wastes (e.g., irradiation, UV application, containment, attenuation, autoclaving, land burial etc.), chemical treatment (e.g., disinfection, gasification etc.), biological treatment (e.g., biodegradation, bioremediation etc.), and other treatment methods (e.g., incineration).



The selection of anyone or more of the technological options for treatment and disposal of the wastes will depend primarily on the nature of the waste, type of the point source, weight and volume, availability of budgetary resources/finances for waste management, and cost efficiency of the option. However, the general consensus is that sanitary landfill is the treatment of choice for the ordinary municipal and organic type of wastes, incineration for hazardous and biomedical wastes, and encapsulation / containment for the radiological wastes.

The instant plant is intended for treatment and disposal of the industrial, healthcare and biohazardous waste. Therefore, incineration will be the first choice. Hence, consideration of other technological alternatives does not remain valid and relevant.

As regards the site or location alternatives, number of factors need to be taken into consideration while selecting a site for installation of an incineration plant for treatment and disposal of waste materials. These, inter alia, will include availability of land piece of requisite size, distance from the nearby population, availability of a drainage channel for disposal of wastewater (if any), and availability of utilities and amenities (like electricity, gas, water, road etc.). Looking from this aspect, the present site, owing to its location in a predominantly industrial locality near a wastewater drain and away from a settled population, is best-suited for construction of the plant. In view of this position of the matter, consideration of the site selection alternatives becomes invalid and irrelevant.

It will be worthwhile to mention that the project simply is “setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]”. The plant will be setup on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur. The alternatives of relocating the plant to some other site, or not to setup the plant at all and or reducing / enhancing the size and magnitude of operation of the plant are of no better advantage than the instant proposal. Hence, consideration of all other alternatives becomes irrelevant and of no use at all.

Nevertheless, the following alternatives were considered concerning setting-up of the plant.

- Abandonment of construction / setting-up of the plant (No Project Alternative)
- Changing the magnitude and scope (Downsizing or Upsizing)
- Relocating the plant to some other site (Shifting to other Site)
- Process Modification Alternative (Technological Alternatives)

All the alternatives, as listed above, even after careful consideration, review and evaluation were found not a better choice than construction the plant at the instant site on a vacant land, leased and possessed by the proponent. All the alternatives, other than setting-up of the plant at the present site, were found either costly, time-consuming, non-beneficial for the environment and or of no better advantage on any account compared to the present proposal. Hence, consideration of all the alternatives was dropped as being not warranted and not beneficial.

2.4 Location and Layout of the Project

Location:

The site is situated in Khewat Number 42, Khatooni Nos. 187-188, Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur. The site is a vacant land, leased and possessed by the proponent. The geographical coordinates of the site are 31°12'37.44"N & 73°58'42.80"E and an altitude of 201m above sea. [Fig 2.4a to 2.4i](#) are a few Google Earth images of the site. [Pic 2.4a to 2.4b](#) are a few real time photographs of the site, as it exists presently and prior to project's implementation.

Layout: Appended as [Annex-1](#) with the instant EIAR





Fig. 2.4d: A Google Earth Image of the Site



Fig. 2.4e: A Google Earth Image of the Site



Fig. 2.4f: A Google Earth Image of the Site



Pic. 2.4a: A Real Time Pic of the Site prior Setting-up of the Plant



Pic. 2.4b: A Real Time Pic of the Site prior Setting-up of the Plant



2.5 Land Use of the Site

Currently, the site is a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road. The land use of the site and of the surroundings is mixed agricultural, commercial, industrial and residential. The site is surrounded all around by open land except on east, on which side it touches the main road.

2.6 Road Access

The site is located on the Phoolnagar Bypass Road. The said road is a link road that links various important villages, towns, cities and districts located on its trajectory.

2.7 Vegetation Features of the Site

The site is a vacant land, leased and possessed by the proponent situated on Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur. As such, the site is devoid of any unique vegetation features. However, the proponent would plant trees and exotic floral plants at and around the site as well as development of grassy lawns as the prime aesthetic and environment enhancement measure. Tree plantation will add to the scenic beauty of the site/premises.

2.8 Cost and Magnitude of Operation

Cost:

The tentative cost of setting-up of the plant, including the cost of land, plant, machinery, equipment and others will be less than Rs. 50 million. The annual operational cost is expected to be around Rs. 10 million.

Magnitude of Operation:

As regards the magnitude of operation, the installed capacity of the plant will be from 0.5 to 10 metric tonnes per hour, which can be increased further by installing additional furnaces, if need. However, the waste actually incinerated will depend on the aggregate amount of waste received from various sources. If the total amount of waste received daily will be less than the installed incineration capacity, all the waste will be incinerated forth with. On the other hand, if the amount of the received waste will be more than the installed operational capacity, the surplus waste will be kept in waiting and will be incinerated on the first opportunity.

2.9 Schedule of Implementation

The machinery, equipment and the allied components of the plant will be installed and commissioned alongwith construction of civil structures and the building as a one-go activity on fast-track basis and within the shortest possible time. After procurement from their manufacturers, fabricators, traders, sellers and importers, all the machinery and equipment will be transported to the site on suitable carriage vehicles. After unloading, the plant machinery will be setup under supervision of expert engineers and professionals. The setting-up of the machinery, equipment and other allied components will comprise the following steps:

Pre-Construction Stage

- Making preliminary arrangements and spadework of setting-up of the plant at the site
- Receiving and unloading the various parts and components of the machinery and equipment
- Opening outer packaging boxes and cartons of various components of the machinery and equipment by the trained personnel and checking their contents
- Laying of electricity wiring for electric power supply to various machine and equipment from the mains in a safe and secure manner
- Intimation of initiation of construction to the local office of the EPA-Pb and requesting for Env Approval

Construction Stage

- Unpacking of the boxes and cartons and taking out the components out of boxes and containers
- Inspection of the machinery to check for any damage during carriage and transportation
- Clearing the individual site for installation of the individual components of machinery and equipment
- Installation of the machinery and equipment at their respective places safely and securely
- Connecting the machinery and equipment to the electric power supply by expert electrician
- Test run of the machinery and equipment to check for its correct installation
- Removal of the packing material, wraps, boxes and cartons
- Intimation of construction to the local office of the EPA-Pb
- Continuous liaisons with the stakeholders and the EPA-Pb

Post-Construction Stage



- Regular cleaning, greasing, oiling and upkeep of the machinery, equipment and other components
- Routine and emergency repair and maintenance works of the machinery, equipment and building
- Maintenance of water supply and sewerage system for the worksite toilets
- Upkeep of the premises and implementation of other environmental enhancement measures, janitorial services, horticulture and beautification (plantation of trees, exotic shrubs and ornamental flowers) etc.
- Maintenance, inspection and regular upkeep of the firefighting system (risk/hazard management)
- Ensuring round the clock security of the premises by deploying security guards
- Provision of first aid cover for the workers

2.10 Description of the Project

The project essentially is “setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]”. It is noticeable that incineration is one of the many methods of treatment, processing and disposal of wastes. The other methods of management and disposal of wastes include, but are limited not to:

- Composting
- Shredding
- Recovery operations (energy recovery)
- Open dumping
- Land application
- Ordinary landfills
- Sanitary landfills

In the hierarchy of the modern-day integrated waste management strategy, incineration with energy recovery and incineration without energy recovery ranks as 5th and 7th preferred choices. The integrated waste management approach envisages efficient and optimal use of resources in order to achieve the goals of long-term, durable, dependable, and secure disposal of wastes. Contrary to the integrated approach, the singular, disjointed and or compartmental approach of waste management has proved unsatisfactory and inadequate. The integrated waste management approach is therefore need of the time. The said management approach comprises the following set of hierarchical choices:

1. Reducing the quantity and toxicity of wastes (source reduction)
2. Reusing materials
3. Recycling materials
4. Composting
5. Incineration with energy recovery
6. Landfills
7. Incineration without recovery

Amongst many other advantages, the main advantage of incineration or controlled combustion is that it does not require much land and therefore it can be adopted as the main mode of waste disposal, particularly where the availability of land is inadequate and or it is relatively costly.

2.10.1 Design and Layout Features

The proponent has not yet selected the final source or procurement of the incinerators to be installed onsite under the instant project. However, the propensity is that the locally fabricated incinerators will be installed. The proponent is searching for the best manufacturer in order to be sure that the incinerators fabricated by him conform to the applicable PEQS. Nevertheless and regardless of the manufacturer, the salient features of the design and layout of the plant will consist of the following:

- Ingress gate with a guardroom having an inventory recording system
- Parking area for the incoming carriage and personal vehicles
- Vehicle weighbridge (optional)
- Waste receiving and storage enclosure (yellow room)
- Incinerator fitted with all essential feed and control systems and equipment
- Chamber temperature monitoring and control system
- Stack emissions capturing, treatment and disposal system and equipment
- Bottom ash collection and disposal system
- In-house laboratory



- Fire safety and emergency control systems and facilities
- Worksite toilets and washrooms
- In-house repair workshop
- Water supply, sewage, electricity and firefighting system
- Other support equipment and facilities (e.g., generator)
- Real time GPS vehicle tracking system
- Admn building / office rooms
- Green areas, grassy lawns and tree plantations

A brief description of each one is given hereunder:

a) Ingress gate with a Guardroom having an inventory recording system

The site will have a boundary wall all around. The height of the boundary wall will be as per the applicable bylaws of the local building control authority. Nevertheless, it will be sufficiently high to prevent climbing by criminal minded persons. It will be fitted atop with barbed wire fence. There will be a 14 feet wide single gate to provide ingress to all incoming and outgoing vehicles. A small size room (8'x6') will be constructed on one side of the gate. This room will serve as the security/guardroom as well as the inventory recording room. A complete log, manual as well as computerized, of all the vehicles coming in and going out from the plant will be recorded here. Likewise, data of all the visitors and the persons, other than the plant management and employees, will be recorded in the appropriate registers and the computer-based software. The trained security personnel will be available here round the clock.

b) Parking area for the incoming personal and carriage vehicles:

The premises will have a dedicated area for parking of the incoming personal and carriage vehicles. The space reserved in the layout plan seems sufficient for parking of the incoming vehicles. The parking site will be paved with tough tiles and will be kept neat and clean.

c) Vehicle weighbridge (optional)

Since, all the incoming waste will be weighed properly at the collection point, construction of an onsite vehicle weighbridge is not included in the first place. However, space will be reserved for the construction of a weighbridge, if needed, at some time later.

d) Waste receiving and storage enclosure (Yellow Room)

All incoming waste will be received and placed in a waste receiving enclosure of the dimensions 30'x20'x20'. The receiving enclosure will have separate compartments for the various types of wastes. The recyclable wastes (e.g., paper and cardboard) will be sorted and stored separately. The ordinary combustible waste will be sorted and stacked separately. The hazardous, obnoxious and biomedical waste will be stored separately in the yellow room. The hazardous or the healthcare waste will be incinerated on priority and first availability. It will not be stored more than a day. The waste receiving enclosure will be covered by a roof and walls of appropriate height to prevent its contact with the rainwater. The biomedical waste will be regularly disinfected with the recommended disinfectant, if so required by the EPA.

e) Incinerator fitted with all essential feed and control systems and equipment

The prefabricated incinerator unit will consist of number of components and complimentary equipment, as described below:

f) Feeding conveyor

A rising roller conveyor with belt will convey the waste from the receiving enclosure to the primary furnace of the incinerator assembly. The width of the conveyor belt will be from 18" to 24". The margins will be little raised to prevent falling down of the feedstock during conveyor movement. The latex rubber made belt will roll over cylindrical steel rollers, which will be a little inclined towards centreline of the conveyor. The length of the conveyor will be adjusted to provide a rising gradient angle of 30 to 45 degree. In addition to the main conveyor, there will be a standby conveyor to be used in case of breakdown of the anyone. Both conveyors will be detachable and adjustable. The upper end of the conveyor will drop the waste material onto a receiving chute of the incinerator.

g) Feedstock receiving chute and window

The waste material will be first received at the inlet chute. It will be an inclined steel plate with both the sides raised. The inclination angle will provide gravity sliding of the received material. The distal end of the plate will



have a plate hinged above that will allow one-way transfer of the material from outside to inside the incinerator furnace. The hinged plate will flap inside as soon as the waste material will push it. It will shut down immediately after dropping down of the feedstock into the incineration chamber. The receiving chute and window will be fitted atop the primary furnace. Its size will be around 2'x2'.

h) Primary incineration chamber or furnace

By its very construction, the incinerator will have two chambers or furnaces. The primary chamber will be of the capacity of around 10 cubic meters. It will receive the waste material through the receiving chute and window atop. The bottom will be fitted with a mesh of heat resistant wired or grate. The grate will hold the incoming material and will ensure complete burning of the waste material. The inside of the furnace body will be lined with heat resistant refractory bricks or tiles or the like material. The furnace chamber will have a circular or rectangular opening at the bottom for raking out the bottom ash. This opening will have an airtight gate. In order to ensure efficient, full and complete burning, the furnace will have two air inlets, one below the grate near the bottom and the other one at the upper part. The air inlets will serve two purposes i.e., provision of requisite amounts of oxygen for complete oxidative burning, as oxygen supply is essential for burning process. Secondly, it will be used to regulate the inner furnace temperature to the required level of 1000°C to 1200°C. A high-speed centrifugal blower will thrust the air inside the furnace chamber through the air nozzles. In order to monitor and regulate the inside temperature, the furnace body will be fitted with temperature measuring probe or gauge. The temperature will display digitally on a screen. In this way, the operator of the machine will be in control of the things and make adjustments in order to ensure complete and efficient burning of the waste material to the fullest.

i) Secondary incineration chamber or furnace

As the incinerator will be a double chamber vertical incinerator, the secondary chamber will be immediately above the primary chamber. Its capacity and size will be around half of the primary chamber, as it is meant only for further combustion and cooling down of the gases coming up from the primary chamber. There will not be any direct burning or igniting of any material here. Like the primary chamber, it will also be lined from inside with heat resistant refractory material. It will also have air inlet nozzles for supply of air and control of the inside temperature. The temperature measuring probe or gauge will display the chamber temperature on a digital display screen. It will have a vent outlet for passing forward the flue gases to the wet scrubbing system. A bypass or escape duct will link the chamber with the stack tower. It will open up automatically in case of increase of the pressure inside the chamber beyond the approved level.

j) Chamber temperature monitoring and control system

The incinerator assembly will be fitted with temperature measuring probes or gauges. The probes will continuously measure the inside temperature of both the chambers. The temperatures of both chambers will appear on a display screen. The display screen will show the inner temperature of both furnace chambers digitally. A complete log of the temperature will be kept and maintained.

k) Stack emissions capturing, treatment and disposal system and equipment

The unit will be fitted with an efficient and effective wet scrubbing system. The hot flue gases coming out from the secondary chamber will pass through a vertical wet scrubber. The capacity of the scrubber body will be around 12 to 15 cubic meters. Here, the gases will be showered from above with a stream of water mist. The particulates will impinge against the water droplets and will settle down towards the scrubber bottom. The scrubber bottom will open into a settling tank of the dimensions of around 8'x8'x4'. Here, the solid particulate from the slurry will settle down at the bottom under gravity. The supernatant clear water from the settling tank will be recirculated in the system for showering the flue gases again. The bottom settled sludge will be removed as and when a cake of sufficient thickness of around 1' to 2' is formed at the tank floor. The scrubbed and cooled down gas will move towards the stack tower or the chimney from where it will be released out. It will be ensured that the final stack gas is conformant to the applicable PEQS.

The unit will be fitted with a vertical stack tower or chimney. It will be made of steel sheet. Its base will have a diameter of around 10' and the top mouth of around 5' diameter. Its height will be 60 feet. It will receive the cleaned and cooled gases from the wet scrubber. The cleaned and cooled gas will move out of the chimney mouth.

l) Bottom ash collection and disposal system

The combustion process inside the primary furnace chamber will generate the bottom ash from complete burning of the waste material @ 1% by weight basis approx. The waste load of around 100 kg is thus expected to produce around 1 kg of bottom ash. The bottom ash will drop down through the bottom grate of the



primary furnace. Once the batch process of burning is complete, the bottom ash will be allowed to cool down. Thereafter, it will be slashed out with the help of rakes before starting the incinerator operation again. The raked out bottom ash will be shifted into a hand barrow and will be transported to the ash dumping pit/trench at the plant premises. Here, the bottom ash will be dumped and covered with an impervious sheet to avoid its dispersion to the environment. If needed, the bottom ash will be showered lightly to prevent surface billowing of the particulates.

The burnt material, also called the bottom ash, will drop down at the bottom of the combustion chamber. It will be raked out regularly before charging the incinerator with the fresh waste load, prior to start of operation every day. It will be collected and disposed of separately. The bottom ash will be first allowed to cool down to the ambient room temperature. Thereafter, it will be disposed of in the bottom ash disposal pit, to be dug at one side of the premises.

The ash receiving and disposal pit will be a rectangular dug-hole of 10'x10'x10' and the ash holding capacity of around 1,000 cubic feet. Keeping in view the expected rate of generation of bottom ash, the life of the ash pit is expected to be around 20 to 25 years. Its inside walls and floor will be lined with impervious material or geomembrane to prevent ingress of any leachate, if formed, in the soil beneath. In the same way, its top will always be overcovered with impervious sheet to prevent entry of rainwater into the pit. The disposed of ash will be compressed with manual or mechanical compressors to reduce its volume. Daily inspection and monitoring of the ash pit will be a standard operational regime of the plant.

m) In-house laboratory

The plant will have its own dedicated analytical laboratory and analysis of the various environmental performance and efficiency parameters of the plant equipment. The laboratory will be fitted with all necessary, equipment, gadgets and machines for carrying out the tests and analyses.

n) Fire safety and emergency control systems and facilities

The plant will have its own dedicated firefighting and control system. In addition to the water-based fire safety system, there will be a parallel line of standalone foaming fire extinguishers. These standalone fire extinguishers will be placed at key locations throughout the premises. They will be ensured to be available in ready to use state round the year. They will be refilled with fresh gas, if the old gas is expired.

In order to ensure worksite personal safety, all workers will be provided personal protection and safety equipment (PPE). The PPE items will include the on-work apparel, antistatic shoes, gloves, helmets, masks, earplugs and goggles. The management will ensure that all the workers are wearing the right kind of apparel and the PPE, while on work. Cigarette and tobacco smoking will be strictly banned inside the plant premises.

o) Worksite toilets and washrooms

There will be a separate toilet and washrooms block located at one side of the premises where the workers and the staff members will attend call of nature and may take bath, wash their clothes and ensure personal cleanliness and hygiene. The spent water from the worksite toilets will be treated in the septic tank and then discharged out. It will preferably be used for watering the greenery at the premises.

p) In-house repair workshop

The plant will have a small in-house repair and maintenance workshop for carrying out minor routine and emergency repairs and maintenance of the machinery, equipment and other components. It will be fitted with all necessary tools and gadgets for carrying out repairs and maintenances.

q) Water supply, sewage, electricity and firefighting system

The premises will have its own water supply and sanitation system. The premises will have water storage tanks of appropriate capacities for storing water to be used, whilst the pumps will be allowed to rest. This arrangement will ensure round the clock availability of water for human consumption as well as other needs. The electricity needs of the plant will be met from an industrial electricity connection to be obtained from LESCO. Since, there is no municipal sewerage and sanitation disposal network in the area, the proponent will construct septic tanks of appropriate capacities for treating the sanitation origin wastewater. There will not be any process wastewater to be discharged to the exterior, except the surplus water from the scrubbing system. The plant will be fitted with an updated and always ready to use firefighting system of standalone fire extinguishers to be placed at key points as well as a centralized firefighting network. This arrangement will effectively control the eruption and spread of any accidental fire.



r) Other support equipment and facilities (e.g., generator)

In addition to the incineration assembly, the plant will have number of support facilities like the weighing machines, generators and computers etc. The standby generator will ensure power supply during breakdown or supply failure from the main power line. The generator will be euro-compliant and its noise and exhaust emissions will be regularly monitors. It will be kept in good running condition by ensuring its cleanliness, upkeep and tuning.

s) Real time GPS vehicle tracking system

The waste collection and transportation vehicles that will bring-in the waste to the plant will be fitted with real time GPS position, monitoring and tracking system. This will ensure proper route planning of the waste collection and shifting to the plant. With the help of this system, the management will watch the vehicle movement while sitting in office even.

t) Admn building / office rooms

The premises will have an admn building block, which will comprise of the office rooms, washrooms, restrooms, guestroom and pantry. All the record and inventories will be available in the office in hard and electronic forms in the computer system. Proper and regular cleanliness of the admn offices and the entire premises will be ensured.

u) Green areas, grassy lawns and tree plantations

In order to improve the aesthetics, ambience and outlook, the premises will have dedicated and exclusive green areas, exotic floral plantation, shadowy trees and lush green grassy lawns. They will be regularly irrigated with treated wear from the wet scrubbing system. A whole-time gardener will be employed to ensure proper look after, upkeep and pruning of the greenery.

2.10.2 Management and Treatment of Emission Gases

During the process of incineration (combustion) of the wastes in the incinerator (primary combustion chamber), a mixture of gases and particulate matter will be produced. The composition of this mixture will depend on the nature and composition of the wastes, water and carbon content of the wastes, waste loading rate, combustion efficiency and the inside temperature of the furnace.

The vent gases from the furnace will pass through the treatment process and only then discharged out, after making it conformant to applicable environmental quality standards. The flue gas, at the exit of the vent will be a mixture of CO, CO₂, NO_x, SO_x and other pollutants. These will be processed through the wet scrubber, cooling tower and the stack tower. During this process, the particulate content in the exhaust will be captured, leaving behind the CO₂ only to be vented to the atmosphere.

The emissions coming out of the chimney will match the applicable environmental quality standards. The emission control line will consist of the following equipment, in series or parallel.

- Conduit for directing the emission air to the wet scrubber system
- Wet scrubber tower with water showering system
- Settling tank for letting the particulate settle down under gravity
- Cooling tower with water recirculation system
- Stack tower or chimney
- Motors and pumps

The slag or slurry, to be deposited at the bottom of the settling tank will remain there unless it becomes of sufficient thickness to be removed easily. The purpose is to render it stable. After removal, the slurry will be allowed to dry in the open air for quite some time. Thereafter, it will be either incinerated (provided it has reasonable organic material) or disposed of in the ash pit (if it has higher inorganic content).

The plant will have a proper emission control and off-gas cleaning system, installed complementary to the incineration furnace. All fumes, gases and dusts, which will be generated during the incineration process, will be duly treated by the cleaning system. It will consist of a venturi washer/wet scrubber. From the furnace the hot gases will pass through a hot dust chamber and/or a hot cyclone, where most of the coarse dust particles will be separated from the gas stream. From here the off-gas will feed into a wet scrubbing system, which will consist of a venturi washer/wet scrubber. The wet scrubber will separate and collect the fine dust particles. The water and off-gas will thus mix under high turbulence forming a fine slurry, which will be discharged into a



sedimentation tank. The dust free off-gas will then enter the stack tower and discharged via the chimney opening atop of the tower.

2.10.3 Summary of Essential Info

Table 2.10.3 presents a self-contained summary of the essential info about the plant.

Table 2.10.3: Summary of the Essential Info

Sr.	Particulars	Description
1.	Name of the project	““setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]” by 360 Environmental Solutions [Pvt] Ltd.
2.	Location	The plant will be located Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur
3.	Area	4-Kanal, 1-Marla. However, additional land will be made available by the proponent if so needed for future expansion.
4.	Make, model and manufacture	Locally fabricated double chamber furnace fitted with wet scrubbing system
5.	Specifications	Dual chamber incinerator (primary and secondary furnaces)
6.	Temperature control	Temperature probes with screen display, monitoring and control
7.	Installed capacity	Upto 500 kg per hour including the auxiliary and standby incinerators
8.	Operational capacity	The initial operational capacity will be 500 kg per hour.
9.	Road access	Phoolnagar Bypass Road linking with National Highway (N5)
10.	Nature of wastes	All types of municipal, commercial, domestic, industrial and other wastes including the hazardous wastes, biomedical and healthcare waste, obnoxious waste except the radiological and explosive waste
11.	Igniting fuel	Furnace oil, which will be replaced with natural gas, as and when the latter becomes available
12.	Water availability	Water is available at site. Water will be stored first in an underground tank from where it will be pump lifted to an overhead tank/reservoir
13.	Emissions and effluent control	The air or stack emissions from the incinerators to be treated through wet scrubbing system. After treatment, only the PEQS emissions will be released through the stack mouth. The stack tower height will be 30-35 feet. Used water from the scrubbing system and other sources will be treated and stored in the settling tank and will be reused and recycled in the scrubbing system and for watering the green area at and around the premises. Surplus water, if any, will be released to the nearby wastewater channel after making it conformant to the applicable PEQS. Concerned regulatory authority has already granted NOC in this respect. There will not be the generation of any solid wastes. Whatsoever little solid wastes produced at the plant premises will be disposed of along with the waste received for incineration. The bottom ash will be dumped in a special enclosure at one corner of the premises in an environment friendly manner
14.	Power source	An industrial electricity connection supplemented by a standby diesel generator
15.	Start of operation	The operation of the plant will commence only after complete setting-up of the machinery, equipment and the pollution control system and that too under environmental approval from the EPA-Pb

2.10.4 Environmental Considerations

As already mentioned, the quantum, magnitude, time of occurrence and the potential health and environmental effects will depend primarily on the quality, efficiency and performance of the plant. They will also depend to some extent to the management practices, as will be employed during the whole process. Nevertheless, subject to the above, following environmental hazards can arise:

- likelihood of soil and groundwater contamination from undesirable disposal of bottom ash (*this is not relevant to the instant plant, as all bottom ash from the incinerator will be properly disposed of in the ash receiving and disposing trench / enclosure*).



- Likelihood of wind dispersal of the particulate matter from the stored stock of the waste material waiting to be incinerated, if the stock is stored without proper precautionary measures and the requisite SOPs (*the proponent will ensure safe, secure and sheltered storage of all the waste material received at the plant prior to its incineration*).
- Likelihood of atmospheric emissions during incineration of wastes of different compositions and from different sources. This is likely to happen only if there is inadequate removal of gases and vapours during the incineration process. Another cause could be the lack of a flue gas treatment system (*this is not relevant to the instant plant, as proper pollution control equipment will be installed*).
- Likelihood of generation of unstabilized bottom ash (*this is not relevant to the instant plant, as appropriate mitigation measures and techniques will be employed for stabilization and disposal of the bottom*).
- likelihood of open storage of bottom ash (*this is not relevant to the instant plant, as appropriate mitigation measures will be taken to remove and dispose of the bottom ash, as per the EMP guidelines and other applicable instructions*).
- Likelihood of open tipping of the bottom ash and the unburnt waste material (*this is not relevant to the instant plant, as the bottom ash will be duly disposed of in the ash receiving trench. Likewise, the unburnt waste material, if any remains in the furnace upon completion of an incineration session, will be loaded to the incinerator furnace once again for complete burning. The plant will receive mostly the incinerable solid wastes from various sources. Hence, the chances of any waste to remain unburnt are quite unlikely*).
- Likelihood of exposure of the workers to harmful substances (*this is not relevant to the instant plant, as all requisite safety, protection and mitigation measures will be employed at the plant under supervision of an Environmental Safety and Healthcare Unit*).

The operation of the plant shall commence only after complete setting-up of the machinery, equipment and the pollution control system and that too under environmental approval from the EPA-Pb.

Currently, the site is a vacant land, leased and possessed by the proponent. The site is situated in Khewat Number 42, Khatooni Nos. 187-188, Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt. Kasur. The site is open from all sides and there is no building or other structure at, near or adjacent to the site. The building and all other structures and facilities will be constructed in strict conformity with the applicable byelaws of the concerned building control authority. The setting-up of the plant and construction of the building will be only a physical activity, whereby various building construction materials (like bricks, sand, cement, steel and many others) will be used for construction of various structures, components and facilities in an environment friendly manner by observing and complying with applicable construction and safety standards. As the site is a vacant land and construction of plant will only be a small size physical activity, there will not be any environmental impacts of setting-up of the plant here.

As per findings of the EIAR, as are based on assessment and analyses of the team of environmental experts, there will hardly be any impact of setting-up of the plant here. However, there is a likelihood that operation of the plant might be associated with some environmental impacts, which have been discussed at appropriate places in this EIAR. Nevertheless, if any impacts of construction are discerned at some later stage, it is stated confidently that they all will be mitigable and of no environmental concern at all. Any other impacts if found, other than those identified and given in the instant EIAR, will be all mitigable by implementing the recommended mitigation measures and the environmental management and monitoring plan, as given in this EIAR. On the other hand, setting-up of the plant will be highly beneficial for the proponent, environment, economy and the local community, as it will provide transfer of technology, opportunities of jobs, employment and earnings for the nearby and the distant communities.

The findings of the EIA further show that setting-up of the plant, for efficient incineration of various types of wastes, will be of immense advantage and benefit for the community. The findings of the EIAR show that there will not be any unnecessary and or exhaustive exploitation and consequential depletion of the local natural resources from setting-up of the plant. Rather, setting-up of the plant will help in conservation of the resources, as none will be consumed in the operations of the plant. In view of the limited and calculated scope and magnitude of activities relating to setting-up of the plant, the local natural resources will remain conserved and available for sustainable future development. The setting-up of the plant will therefore bring-in



positive and healthy improvements in the socio-economic environment and value system of the area. The setting-up of the plant will benefit thousands of persons, locally as well as distantly.

The plant premises will have a dedicated and an always ready-to-use firefighting system consisting of standalone fire extinguishers, as well as a centralized system, for the prevention and control of accidental fire at the premises. In addition to the firefighting system, personal protection equipment (PPE) shall be placed at appropriate locations at the premises.

2.10.5 Brief Overview of Incineration

The subsections following hereinafter present a detailed discussion about the incineration of wastes and the related aspects.

2.10.5.1 Principles and basis of incineration or controlled combustion

Energy can be recovered from solid wastes directly in the form of heat energy by subjecting them to incineration or combustion. Likewise, energy can be recovered indirectly by processing the wastes into a stable and storable fuel called refuse derived fuel (RDF). The direct recovery of thermal energy is accomplished by means of mass burning of the waste material in the specially designed and fabricated combustors or incinerators. The thermal energy, as recovered from mass burning of the waste materials (incineration), besides being captured as steam, can also be used for onsite production of electricity. The production and utilization of electricity would, of course, require construction of a powerhouse and a transmission line and distribution system.

Incineration is fundamentally a form of chemical processing, involving rapid oxidation of the materials. In simple terms, the combustion process involves several stages in which the waste is dried (moisture evaporated) as it enters the furnace, the organic compounds are volatilized, and the volatile compounds are ignited in the presence of oxygen.

2.10.5.2 Definition of incineration

Incineration is defined as the controlled burning of wastes at high temperatures in a facility designed for efficient and complete combustion. By definition, complete combustion involves the conversion of all carbon, to carbon dioxide (CO₂), hydrogen, to water (H₂O) and sulphur, to sulphur dioxide (SO₂). The by-products of incineration are ash, gases, and heat energy. The process is described in the equation, as below:



Specially designed combustors or incinerators are used to burn the ordinary and the hazardous solid waste. Such incinerators made their first appearance, as early as during the onset of the 20th century. A combustor or incinerator may be a simple facility for burning the waste or it may be a resource recovery facility (called waste-to-energy) that converts the heat generated during burning of the wastes into either electricity or steam. It is noticeable that only the organic component of the waste is susceptible to combustion. However, a considerable portion (inorganic) of the wastes comprising mainly of construction/demolition waste, stones, concrete, old appliances, tires etc. cannot be incinerated.

2.10.5.3 Usefulness of incineration

Incineration of the wastes is employed primarily for one of the following reasons:

- *Volume reduction*
- *Destruction of certain chemicals or alteration of chemical characteristics*
- *Destruction of pathogens*
- *Energy recovery*

Currently, incineration is the only environmentally acceptable method of disposing of the majority of the hazardous wastes. The lack of available land for landfilling and the high cost of energy are the two major considerations / factors for including the incineration into the waste management system. Incineration reduces but does not eliminate the need for landfill space. Typically, only about 50% of the wastes are combustible. Incineration reduces the volume of this combustible portion by about 90% and the weight by about 70%. Thus, after proper incineration, a residue is left, which can be handled and disposed of easily in a landfill.



The majority of the modern incinerators are designed for the recovery of energy. In Europe, the steam and hot water produced by incinerators is commonly used for central heating of the houses and businesses. Approximately 75% of the incinerators in the United States are waste-to-energy plants, where the energy is used to produce steam or generate electricity.

2.10.5.4 Objections on incineration

Air pollution and ash disposal are the two major concerns voiced by opponents of incineration. Many communities abandoned incinerators because of the expense of adding air pollution control equipment. As a result of these concerns, the modern incinerators must be fitted with electrostatic precipitators, scrubbers or other equipment to reduce emissions to levels acceptable to regulatory agencies.

Another concern that has been raised by the environmental groups and those responsible for implementing the recycling programs about the incinerators is its potential impact on the recycling efforts. Incineration is viewed as a competitor for the recyclable materials, particularly paper and plastic materials.

2.10.5.5 Classification of incinerators

Incinerators can be classified in a number of ways.

- On the basis of energy recovery, they are classified into (a) incinerators without energy recovery facility, and (b) with energy recovery facility.
- On the basis of the shape, they can be categorized into (a) rectangular, and (b) cylindrical.
- On the basis of the number of furnaces, they are divided into (a) single furnace, and (b) multi furnace incinerators.
- On the basis of design parameters, they are divided into (a) field-erected mass burn incinerators and (b) prefabricated modular incinerators.

The various types of incinerators differ in design, construction, processing capacity, air pollution control requirements, service life, costs and other variables. Historically, the mass burn incinerators have been in extensive use compared to modular incinerators. The municipal waste incinerators are designed to accommodate wastes with widely varying compositions.

2.10.6 Incineration Parameters

The parameters discussed hereinafter are considered to be most relevant ones with regard to incinerators.

2.10.6.1 Heat Value

A major consideration for the selection or design of an incinerator is the fuel value of the material to be burnt. The fuel value is described in terms of the gross heat value, also called the higher heat value (HHV), and the net heat value, called the lower heat value (LHV). The lower heat value represents the energy that can be realistically captured from combustion of the waste material.

In addition to the heat value, other important fuel properties are the moisture content, the combustible material content, and the ash content. Fuel with a high heat value (greater than 5000 kJ/kg), low moisture content (less than 50%), and low ash content (less than 60%) can be burnt without additional fuel, whereas materials with a low heat value, high moisture content and high ash content require supplementary fuel. [Tables 2.10.6.1a and 2.10.6.1b](#) present the typical heat values of some major components of the wastes stream.

Table 2.10.6.1a: Higher (Gross) Heat Values of Some Selected Materials

Type of Waste	Heat Value (kJ/kg)
Mixed MSW	11,600 - 12,100
Paper	16,700 – 18,600
Yard wastes	9,800 – 16,300
Food wastes	4,200 – 18,100
Plastics	22,100 - -41,900
Wood	10,900 – 16,300
Rubber wastes	27,900 – 32,600

Table 2.10.6.1b: Composition and the Estimated Heating Value for MSW by Mass in Different Countries



Country	Paper (%)	Metals (%)	Glass (%)	Food (%)	Plastics (%)	Heat value (MJ/kg)
Australia	38.0	11.0	18.0	13.0	0.1	8.05
Bangladesh	2.0	1.0	9.0	24.0	6.0	10.26
Burma	1.0	3.0	6.0	80.0	4.0	5.96
Denmark	32.9	4.1	6.1	44.0	6.8	11.22
England	37.0	8.0	8.0	28.0	2.0	9.37
France	30.0	4.0	4.0	30.0	1.0	7.76
Germany	20.0	5.0	10.0	21.0	2.0	5.72
India	3.0	1.0	8.0	36.0	1.0	2.88
Japan	21.0	5.7	3.9	50.0	6.2	9.03
Pakistan	2.2	2.2	1.7	52.5	1.2	3.68
Sri Lanka	8.0	1.0	6.0	80.0	1.0	6.19
Sweden	50.0	7.0	8.0	15.0	8.0	13.41
USA	28.9	9.3	10.4	17.8	3.4	7.78

2.10.6.2 Moisture

Moisture significantly lowers the fuel value of the wastes. If the moisture content is high, the availability of the combustible material per unit mass becomes low. Addition, a significant amount of gross heat energy is used to warmup and evaporate the water (i.e., moisture) in the wastes. Thus the net heat value will be low in case of higher moisture content.

2.10.6.3 Combustion air

Another consideration for the design of an incinerator is the quantity of air that must be supplied to achieve full and complete combustion of the waste. The amount of air required for combustion can be computed from the stoichiometric equations for combustion. However, chemical analysis of the waste fuel is a prerequisite for the calculation of the requirements of the combustion air. When the chemical composition of the waste material is not known, a rule-of-thumb for the volume of the combustion air is that 1.05 m³ of air at STP (i.e., 1.35 kg of air) is required for each 4,200 kJ of heating value.

2.10.7 Combustion Conditions

Efficient combustion of the wastes requires the following:

- sufficiently high combustion temperatures,
- adequate retention time of the wastes in the combustion chamber, and
- turbulence to expose unburned surfaces/portions.

When wastes are fed into an incinerator, they are heated by contact with hot combustion gases, preheated air, or radiation from the furnace walls. The heat dries the wastes, then thermally decomposes them to produce volatile matter which is generally combustible and ignitable.

2.10.8 Mechanisms for Turbulence of Wastes

Many incinerators provide necessary turbulence by burning the wastes on the sloping grates that move in such a way so as to agitate the waste. The movement causes the waste to tumble forward through the combustion chamber. The grate system allows ash to fall through the grates as the refuse is transported from the point of induction to a final collection bin. The grates control the speed with which the materials move through the incinerator and also provide some of the turbulence necessary for complete combustion. Incinerator designs exist which provide turbulence in other ways as well. A rotary kiln incinerator burns the waste in a rotating chamber that causes a tumbling action. Fluid bed incinerators use an upward flow of air to keep the waste, along with an inert bed material, in suspension.

2.10.9 Air Supply Control

Primary air is fed through the wastes from below the grate. This air supports the combustion of the wastes and also cools the grates. The velocity of this air must not be too high, because in such a case, the ash that is created during burning will not settle down and will remain suspended. Secondary air is blown into the chamber from nozzles above the wastes in order to promote the mixing and burning of the combustion gases. Tertiary air cools flue gases before they reach the air pollution control equipment.

2.10.10 Temperature Control



The temperature in the incinerator is maintained by controlling the feed rate of the wastes and the primary and secondary air supplies. The amount of air required for complete combustion increases the stoichiometric amount of combustion reaction. Efficient burning typically requires 100% “excess air” (i.e., twice as much as stoichiometric amount) supplied as primary air. This air is introduced from below the grate. Incinerators are generally operated at a temperature above 750°C to ensure complete combustion, but below 1000°C to prevent ash from melting and plugging the grates.

2.10.11 Combustion Gases (Flue Gases)

The quantity and composition of air emissions (combustion gases) depends upon composition of the refuse, design of the incinerator, and completeness of burning. The major products of incineration including the gases resulting from the burning of the wastes are carbon monoxide, carbon dioxide, sulphur dioxide, oxides of nitrogen, oxides of sulphur, H₂O, particulates and trace amounts of other materials, such as heavy metals, etc.

2.10.11.1 Carbon Monoxide (CO)

Carbon monoxide (CO) is produced primarily from incomplete combustion of the wastes from any of the causes. The production of carbon monoxide is an indicator of the efficiency and completeness of the combustion process.

2.10.11.2 Carbon Dioxide (CO₂)

Carbon dioxide is a major combustion gas. Some amount of carbon monoxide is also converted into carbon dioxide in the specially designed facilities.

2.10.11.3 Oxides of Sulphur / Sulphur Dioxide (SO₂)

Sulphur containing compounds/materials in the waste provide for the production of oxides of sulphur, sulphur dioxide, as a part of the flue gases of the incineration process. The amount of production would depend upon the amount of sulphur containing fraction of the waste.

2.10.11.4 Oxides of Nitrogen (NO_x)

High temperatures in a furnace produce nitric oxide (NO) from the nitrogen and oxygen in the air. The amount of production increases as the temperatures are raised to the range of 1000-1300°C. When the NO reaches the atmosphere, it gradually oxidizes to nitrogen dioxide (NO₂). Sunlight may then induce the photochemical reaction that produces ozone (O₃) by liberating one of the oxygen atoms from the NO₂ to combine with O₂. The mixture of nitrogen oxides (NO_x) contributes also in the formation of photochemical smog.

2.10.11.5 Particulates

Particulates are a product of incineration of the wastes. Grate system in the incinerators may yield large amounts of fly ash if the velocity of the under-fire air is so great that it sends the ash aloft rather than allowing it to drop into the collection system below. Also, if the chamber temperatures are too high, the presence of metals with low melting points can form aerosols.

2.10.11.6 Heavy Metals

Lead is the heavy metal that is most consistently found in the wastes and in incinerator air emissions. The lead enters the incinerator from tin cans, electronic components, and scrap. Mercury, cadmium, and arsenic are also found in traces. The sources of these elements are predominantly batteries, paints, inks, and electronic components.

2.10.12 Air Emissions

In order to control the air emissions or the flue gases, some air pollution control system must be provided in the incinerator's design. The common air emission control systems use settling chambers, wet or dry scrubbers, fabric filters, electrostatic precipitators, or some combination of these. Some of the particulate control systems are discussed hereunder.

2.10.13 Settling Chambers

A settling chamber is used as the primary or the first stage collector to remove large particles that may clog filters or foul other equipment. A settling chamber is an enlargement in the flue gas path to slow the speed of the gas to allow gravitational sedimentation of the heavy particles. Settling chambers can efficiently remove the particles with diameters larger than 50×10^{-6} micrometres (50 μ m). Since, a significant fraction of the particles have diameters smaller than this, a settling chamber alone cannot provide effective removal of particulate matter from the flue gases.



2.10.14 Cyclones

Generally, the cyclones have low capital and operating costs. Therefore, they are commonly used for particulate removal. A cyclone comprises a cylindrical chamber fitted with a device to give swirl to the incoming material. Flue gases enter the cylindrical chamber tangentially and swirl around the chamber. As the flue gases move in a circular path around the cylinder, inertia carries the particulates to the wall, where they move downward in the conical section and collected in a hopper below.

2.10.15 Electrostatic Precipitators

Electrostatic precipitators are used widely for removal of the particulates. The flue gases pass through an array of wires and plates. The wires are maintained at a larger positive or negative electrical voltage with respect to the plates. The voltage difference produces charged ions and electrons that attach to the surfaces of particulates. These charged particulates are then detached from the plates or wires and collected beneath.

2.10.16 Fabric Filters

Fabric filters provide another simple pollution control solution. The flue gases are directed through ducts with fabric bags attached to their ends. The bags filter the particulates from the air, as it passes through them. The bags are occasionally shaken to release particles to a collection bin below. Filters efficiently remove particulates with diameters larger than about 5 μm . Removal of smaller particles is possible by using a more tightly woven fabric. Because the filters are made of fabric, the flue gases must be cooled before introduction into the bags.

2.10.17 Wet Scrubbers

Wet scrubbers are used for removing particulate matter from the gas stream. The common types of wet scrubbers include spray towers, packed towers, cyclone scrubbers, jet scrubbers, and mechanical scrubbers. The wet scrubbers work through a process in which fine liquid and aerosol particles are intermingled. Large solid particles are captured by impingement and smaller particles by diffusion into the droplets. Effective removal of particles down to a size of 1 μm is possible with wet scrubbers. The disadvantage of wet scrubbers is that they produce a wet sludge that may require further treatment and disposal.

2.10.18 Disposal of Combustion Ash

An incinerator produces two distinct types of ashes:

- a) bottom ash; and
- b) fly ash

the bottom ash is the residue left from the burned waste and often contains partially burnt materials. The bottom ash accounts for about 90% of the volume of ash that is generated from waste incineration. The fly ash consists of the particulates that are found in the flue gas. The fly ash consists generally of fine particulate and is more uniform in composition than the bottom ash. The ash consists mostly of the metal oxides.

2.10.19 General Design Features

The key components of an incineration facility comprise the following:

- Tipping area
- Storage enclosure
- Equipment for feeding/charging the incinerator
- Combustion chamber(s)
- Stack emission cleaning equipment
- Boiler (for energy recovery incinerators only), and
- Other support facilities

2.10.19.1 Tipping Area

The tipping area is the site where the incoming waste is received first in an incineration facility. In a typical incinerator, the waste load is discharged from the incoming carriage vehicles either onto a tipping floor or directly into a storage enclosure. Where the waste is placed on the tipping floor, it is subsequently transferred either to the storage enclosure (sometimes called yellow room) or fed directly into the incinerator by mechanical means.

2.10.19.2 Storage Enclosure



The storage area (sometimes also called yellow room) serves a threefold purpose:

- Firstly, it permits the storage of an amount of refuse sufficiently large to ensure a 24-hr/day, 7-day/week, and 30-day/month continuous operation of the incinerator.
- Secondly, it provides an area where large non-combustible items can be removed, and the remaining refuse can be well mixed to have a uniform feed material.
- Thirdly, it acts as a barrier that shields interaction of the waste to the outside environment

2.10.19.3 Feeding/Charging Mechanism

From the storage site, the waste is transferred to a feeding/charging hopper in the assembly of the incinerator. This is accomplished either manually, or by means of an overhead sliding crane, or by a front-end loader. The feeding/charging hopper is designed to ensure a continuous feed of waste into the furnace. The waste falls from the hopper into the furnace and onto the furnace stoker, where combustion takes place.

2.10.19.4 Combustion Chamber / Furnace

The furnace is the essential element of an incineration system. It may be rectangular or cylindrical in shape. It may consist of only one chamber or may have a primary and a secondary chamber. The principal function of the secondary chamber is to provide the conditions needed to complete the incineration process. The size and shape of the furnace is usually determined by the manufacturer. It is usually based on number of parameters, among which are the solid and gas flow rates, residence time, temperature and the bed depth. The temperature in the furnace is maintained at roughly around 800 to 1200°C.

A stoker is a series of grates with openings through which air can be passed. Generally, grates are movable. The movement of the grates helps to agitate the refuse and thus promotes combustion, as well as ensure removal of the residue from the furnace.

Air for combustion is forced into the furnace under and around the grates and through the sides or the roof. The air forced through and or around the grates is known as “under fire air”. The air forced through the sides and or the roof is known as “overfire air”. Overfire air is introduced through jets positioned at specific points in the furnace body.

2.10.20 Types of Incinerators

Following are the few most common types of waste incinerators.

2.10.20.1 Mass Burn Incinerators

The mass burn incinerators burn the unprocessed municipal solid wastes in a single chamber or multiple chambers, with excess air provided to ensure complete combustion. The design has the advantage of minimizing downtime for repairs. Wastes are deposited in a pit or tipping floor and fed into the incinerator at a controlled rate. Then the waste is pushed onto a conveyor that leads to the feeding hoppers. The wastes burn on a grate in the combustion chamber with walls covered by a refractory lining or waterwall heat collection tubes covered by a refractory material to protect the tubes from abrasion and corrosion. Energy recovery is in the form of steam. Onsite electricity production can also be accomplished.

2.10.20.2 Modular Incinerators

Modular incinerators are small units, with a capacity of 5 to 100 tonnes per day. They are generally prefabricated off-site and shipped to the construction site for installation. The onsite construction consists of a building with a tipping floor and essential utilities.

The typical modular combustion unit has a primary and a secondary combustion chamber. The modular incinerators burn the wastes in a refractory-lined primary chamber with sub-stoichiometric oxygen. The flue gases, primarily a mixture of CO and H₂O, enter a secondary combustion chamber, where excess air completes the combustion. The chamber temperature usually is 750-1000°C.

The energy is captured from the hot flue gases as they pass waste heat boiler tubes. The steam produced is at low to medium pressure. The steam must be upgraded to high-pressure steam if it is to be used for electrical power generation.

2.10.20.3 Fluid-bed Incinerators

In contrast to conventional incinerators that burn wastes on a grate or hearth, the fluid bed combustors burn wastes in a turbulent bed of heated inert materials, such as sand or limestone. These materials are kept in suspension by an upward flow of high velocity combustion air from below the inert material bed. The



conversion of the waste material into a more homogenous material is generally a prerequisite in order to ensure efficient burning. This means the waste should be processed beforehand into a refuse derived fuel (RDF) for efficient and complete burning in a fluid-bed incinerator. The heat is transferred to the waste particles by contact and radiation. In the standard design of the fluid-bed reactor, the air velocity is 1 to 3 m/s.

The combustion efficiency of the fluid-bed incinerators is better than the conventional incinerators. Whereas, the combustion efficiency exceeds 99% for the fluid-bed incinerators, it is 97-98% for the conventional incinerators. The advantage of the fluid-bed incinerators is that emissions of sulphur dioxide (SO₂) and nitrogen oxides (NO_x) are lesser compared to conventional incinerators. Likewise, the NO_x emissions are also lower because the fluid-bed reactor operates at a lower temperature range (815-925°C) than other types of incinerators. The fluid-bed combustors also operate with lower excess air. The primary disadvantage of the fluid bed units is the requirement of advance processing of the waste into a refuse derived fuel (RDF) before feeding into the incinerator.

2.10.21 Performance of Incinerators

Regardless of their type and construction, the performance and efficiency of the incinerators can be judged on the basis of certain parameters/criteria. These include, but not limited to:

- weight and volume reduction
- composition of the flue gases
- quantity and composition of the residues, and
- boiler efficiency (optional)

if the data on these factors is available, it is possible to determine at what percent of capacity a unit is operating.

2.10.22 Problems associated with Incinerators / Incineration

The design of modern incineration facilities has become a very complex undertaking and can pose number of problems. Apart from high capital and maintenance cost, air pollution and ash disposal are some other major problems associated with incinerators. The high capital cost can be shared, to some extent, by utilizing or selling the heat energy or the electricity generated during incineration on commercially viable scale. For the control of air pollution, the incinerators must be fitted with electrostatic precipitators, scrubbers or other equipment to reduce emissions to levels acceptable to the regulatory agencies. The ash produced during incineration should be properly disposed of through appropriate choice of final disposal and or landfilling. In addition to the above, there are , in particular, three specific problems that must be given special attention. These are:

- system availability
- fouling of heat transfer surfaces, and
- corrosion

usually, the system availability is to the maximum only about 80%. The limitation on availability is mainly a result of the need to frequently clean the grates that become clogged with partially burnt or the unburnt non-combustible materials in the waste feed. The frequency of the downtimes may necessitate a duplication of the equipment or installation of a parallel standby system. Almost all the heating surfaces are subject to fouling. This is caused by the deposition of slag and fly ash. This can be mitigated, to some extent, by modifying the furnace design, addition of additives, through improvement and proper use of the cleaning equipment. Corrosion is a major technical problem in the operation of the incinerator. It is usually caused by a reducing environment, which is not uncommon in the mass burning facilities. It is precipitated by the products of partial combustion.

2.10.23 Composition of Combustion Gases

The quantity and composition of air emissions (combustion gases) depend upon the composition of the refuse, design of the incinerator and the completeness of burning. The major gases resulting from burning of the wastes are carbon dioxide, sulphur dioxide, and oxides of nitrogen.

2.10.24 Process Flow of Operation

Fig. 2.10.24a, 2.10.24b, and 2.10.24c, presents process flow chart of the plant's operations. **Annex-4** is a schematic of the manufacturing and production process.

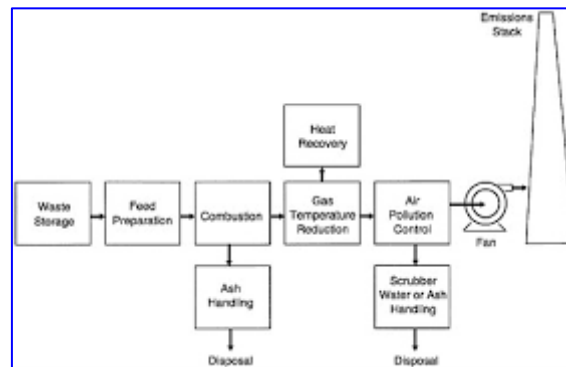


Fig. 2.10.24a: Process Flow of Waste Incineration

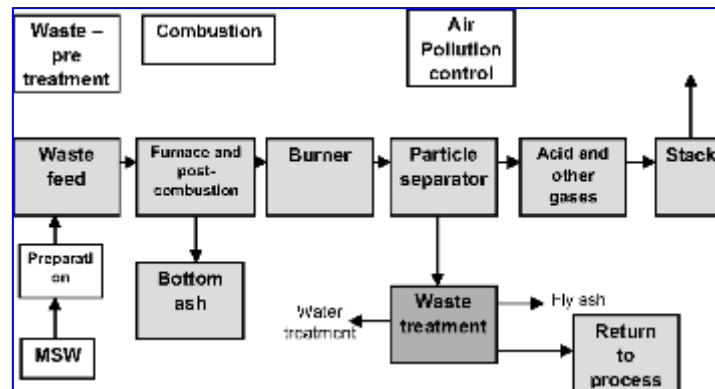


Fig. 2.10.24b: Process Flow of Waste Incineration

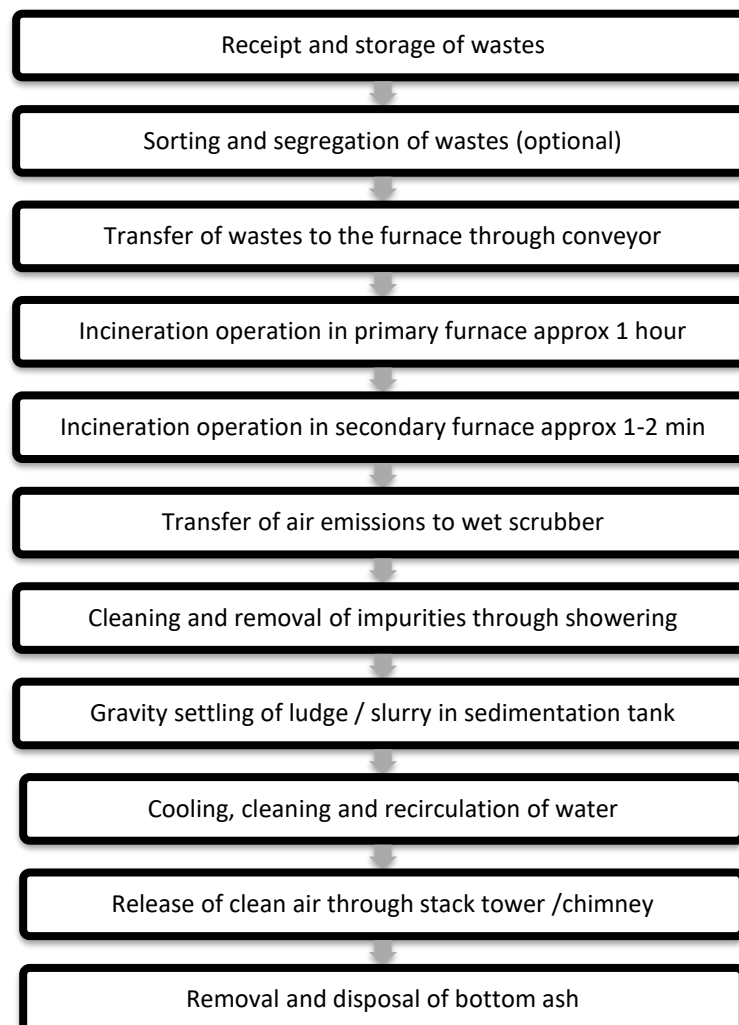


Fig. 2.10.24c: Process Flow Steps of Waste Incineration



2.10.25 Main Sections of the Plant

The plant will consist of the following components, systems or the functional areas:

- Ingress gate with a guardroom having an inventory recording system
- Parking area for the incoming carriage and personal vehicles
- Vehicle weighbridge (optional)
- Waste receiving and storage enclosure (yellow room)
- Incinerator fitted with all essential feed and control systems and equipment
- Chamber temperature monitoring and control system
- Stack emissions capturing, treatment and disposal system and equipment
- Bottom ash collection and disposal system
- In-house laboratory
- Fire safety and emergency control systems and facilities
- Worksite toilets and washrooms
- In-house repair workshop
- Water supply, sewage, electricity and firefighting system
- Other support equipment and facilities (e.g., generator)
- Real time GPS vehicle tracking system
- Admn building / office rooms
- Green areas, grassy lawns and tree plantations

A brief description of each one is given hereunder:

a) Ingress gate with a Guardroom having an inventory recording system

The site will have a boundary wall all around. The height of the boundary wall will be as per the applicable bylaws of the local building control authority. Nevertheless, it will be sufficiently high to prevent climbing by criminal minded persons. It will be fitted atop with barbed wire fence. There will be a 14 feet wide single gate to provide ingress to all incoming and outgoing vehicles. A small size room (8'x6') will be constructed on one side of the gate. This room will serve as the security/guardroom as well as the inventory recording room. A complete log, manual as well as computerized, of all the vehicles coming in and going out from the plant will be recorded here. Likewise, data of all the visitors and the persons, other than the plant management and employees, will be recorded in the appropriate registers and the computer-based software. The trained security personnel will be available here round the clock.

b) Parking area for the incoming personal and carriage vehicles:

The premises will have a dedicated area for parking of the incoming personal and carriage vehicles. The space reserved in the layout plan seems sufficient for parking of the incoming vehicles. The parking site will be paved with tough tiles and will be kept neat and clean.

c) Vehicle weighbridge (optional)

Since, all the incoming waste will be weighed properly at the collection point, construction of an onsite vehicle weighbridge is not included in the first place. However, space will be reserved for the construction of a weighbridge, if needed, at some time later.

d) Waste receiving and storage enclosure (Yellow Room)

All incoming waste will be received and placed in a waste receiving enclosure of the dimensions 30'x20'x20'. The receiving enclosure will have separate compartments for the various types of wastes. The recyclable wastes (e.g., paper and cardboard) will be sorted and stored separately. The ordinary combustible waste will be sorted and stacked separately. The hazardous, obnoxious and biomedical waste will be stored separately in the yellow room. The hazardous or the healthcare waste will be incinerated on priority and first availability. It will not be stored more than a day. The waste receiving enclosure will be covered by a roof and walls of appropriate height to prevent its contact with the rainwater. The biomedical waste will be regularly disinfected with the recommended disinfectant, if so required by the EPA.

e) Incinerator fitted with all essential feed and control systems and equipment

The prefabricated incinerator unit will consist of number of components and complimentary equipment, as described below:

f) Feeding conveyor



A rising roller conveyor with belt will convey the waste from the receiving enclosure to the primary furnace of the incinerator assembly. The width of the conveyor belt will be from 18" to 24". The margins will be little raised to prevent falling down of the feedstock during conveyor movement. The latex rubber made belt will roll over cylindrical steel rollers, which will be a little inclined towards centreline of the conveyor. The length of the conveyor will be adjusted to provide a rising gradient angle of 30 to 45 degree. In addition to the main conveyor, there will be a standby conveyor to be used in case of breakdown of the anyone. Both conveyors will be detachable and adjustable. The upper end of the conveyor will drop the waste material onto a receiving chute of the incinerator.

g) Feedstock receiving chute and window

The waste material will be first received at the inlet chute. It will be an inclined steel plate with both the sides raised. The inclination angle will provide gravity sliding of the received material. The distal end of the plate will have a plate hinged above that will allow one-way transfer of the material from outside to inside the incinerator furnace. The hinged plate will flap inside as soon as the waste material will push it. It will shut down immediately after dropping down of the feedstock into the incineration chamber. The receiving chute and window will be fitted atop the primary furnace. Its size will be around 2'x2'.

h) Primary incineration chamber or furnace

By its very construction, the incinerator will have two chambers or furnaces. The primary chamber will be of the capacity of around 10 cubic meters. It will receive the waste material through the receiving chute and window atop. The bottom will be fitted with a mesh of heat resistant wired or grate. The grate will hold the incoming material and will ensure complete burning of the waste material. The inside of the furnace body will be lined with heat resistant refractory bricks or tiles or the like material. The furnace chamber will have a circular or rectangular opening at the bottom for raking out the bottom ash. This opening will have an airtight gate. In order to ensure efficient, full and complete burning, the furnace will have two air inlets, one below the grate near the bottom and the other one at the upper part. The air inlets will serve two purposes i.e., provision of requisite amounts of oxygen for complete oxidative burning, as oxygen supply is essential for burning process. Secondly, it will be used to regulate the inner furnace temperature to the required level of 1000°C to 1200°C. a high-speed centrifugal blower will thrust the air inside the furnace chamber through the air nozzles. In order to monitor and regulate the inside temperature, the furnace body will be fitted with temperature measuring probe or gauge. The temperature will display digitally on a screen. In this way, the operator of the machine will be in control of the things and make adjustments in order to ensure complete and efficient burning of the waste material to the fullest.

i) Secondary incineration chamber or furnace

As the incinerator will be a double chamber vertical incinerator, the secondary chamber will be immediately above the primary chamber. Its capacity and size will be around half of the primary chamber, as it is meant only for further combustion and cooling down of the gases coming up from the primary chamber. There will not be any direct burning or igniting of any material here. Like the primary chamber, it will also be lined from inside with heat resistant refractory material. It will also have air inlet nozzles for supply of air and control of the inside temperature. The temperature measuring probe or gauge will display the chamber temperature on a digital display screen. it will have a vent outlet for passing forward the flue gases to the wet scrubbing system. A bypass or escape duct will link the chamber with the stack tower. It will open up automatically in case of increase of the pressure inside the chamber beyond the approved level.

j) Chamber temperature monitoring and control system

The incinerator assembly will be fitted with temperature measuring probes or gauges. The probes will continuously measure the inside temperature of both the chambers. The temperatures of both chambers will appear on a display screen. the display screen will show the inner temperature of both furnace chambers digitally. A complete log of the temperature will be kept and maintained.

k) Stack emissions capturing, treatment and disposal system and equipment

The unit will be fitted with an efficient and effective wet scrubbing system. The hot flue gases coming out from the secondary chamber will pass through a vertical wet scrubber. The capacity of the scrubber body will be around 12 to 15 cubic meters. Here, the gases will be showered from above with a stream of waster mist. The particulates will impinge against the water droplets and will settle down towards the scrubber bottom. The scrubber bottom will open into a settling tank of the dimensions of around 8'x8'x4'. Here, the solid particulate from the slurry will settle down at the bottom under gravity. The supernatant clear water from the settling tank will be recirculated in the system for showering the flue gases again. The bottom settled sludge will be removed as and when a cake of sufficient thickness of around 1' to 2' is formed at the tank floor. The scrubbed



and cooled down gas will move towards the stack tower or the chimney from where it will be released out. It will be ensured that the final stack gas is conformant to the applicable PEQS.

The unit will be fitted with a vertical stack tower or chimney. It will be made of steel sheet. Its base will have a diameter of around 10' and the top mouth of around 5' diameter. Its height will be 60 feet. It will receive the cleaned and cooled gases from the wet scrubber. The cleaned and cooled gas will move out of the chimney mouth.

l) Bottom ash collection and disposal system

The combustion process inside the primary furnace chamber will generate the bottom ash from complete burning of the waste material @ 1% by weight basis approx. The waste load of around 100 kg is thus expected to produce around 1 kg of bottom ash. The bottom ash will drop down through the bottom grate of the primary furnace. Once the batch process of burning is complete, the bottom ash will be allowed to cool down. Thereafter, it will be slashed out with the help of rakes before starting the incinerator operation again. The raked out bottom ash will be shifted into a hand barrow and will be transported to the ash dumping pit/trench at the plant premises. Here, the bottom ash will be dumped and covered with an impervious sheet to avoid its dispersion to the environment. If needed, the bottom ash will be showered lightly to prevent surface billowing of the particulates.

The burnt material, also called the bottom ash, will drop down at the bottom of the combustion chamber. It will be raked out regularly before charging the incinerator with the fresh waste load, prior to start of operation every day. It will be collected and disposed of separately. The bottom ash will be first allowed to cool down to the ambient room temperature. Thereafter, it will be disposed of in the bottom ash disposal pit, to be dug at one side of the premises.

The ash receiving and disposal pit will be a rectangular dug-hole of 10'x10'x10' and the ash holding capacity of around 1,000 cubic feet. Keeping in view the expected rate of generation of bottom ash, the life of the ash pit is expected to be around 20 to 25 years. Its inside walls and floor will be lined with impervious material or geomembrane to prevent ingress of any leachate, if formed, in the soil beneath. In the same way, its top will always be overcovered with impervious sheet to prevent entry of rainwater into the pit. The disposed of ash will be compressed with manual or mechanical compressors to reduce its volume. Daily inspection and monitoring of the ash pit will be a standard operational regime of the plant.

m) In-house laboratory

The plant will have its own dedicated analytical laboratory and analysis of the various environmental performance and efficiency parameters of the plant equipment. The laboratory will be fitted with all necessary, equipment, gadgets and machines for carrying out the tests and analyses.

n) Fire safety and emergency control systems and facilities

The plant will have its own dedicated firefighting and control system. In addition to the water-based fire safety system, there will be a parallel line of standalone foaming fire extinguishers. These standalone fire extinguishers will be placed at key locations throughout the premises. They will be ensured to be available in ready to use state round the year. They will be refilled with fresh gas, if the old gas is expired.

In order to ensure worksite personal safety, all workers will be provided personal protection and safety equipment (PPE). The PPE items will include the on-work apparel, antistatic shoes, gloves, helmets, masks, earplugs and goggles. The management will ensure that all the workers are wearing the right kind of apparel and the PPE, while on work. Cigarette and tobacco smoking will be strictly banned inside the plant premises.

o) Worksite toilets and washrooms

There will be a separate toilet and washrooms block located at one side of the premises where the workers and the staff members will attend call of nature and may take bath, wash their clothes and ensure personal cleanliness and hygiene.

p) In-house repair workshop

The plant will have a small in-house repair and maintenance workshop for carrying out minor routine and emergency repairs and maintenance of the machinery, equipment and other components. It will be fitted with all necessary tools and gadgets for carrying out repairs and maintenances.



q) Water supply, sewage, electricity and firefighting system

The premises will have its own water supply and sanitation system. The premises will have water storage tanks of appropriate capacities for storing water to be used, whilst the pumps will be allowed to rest. This arrangement will ensure round the clock availability of water for human consumption as well as other needs. The electricity needs of the plant will be met from an industrial electricity connection to be obtained from LESCO. Since, there is no municipal sewerage and sanitation disposal network in the area, the proponent will construct septic tanks of appropriate capacities for treating the sanitation origin wastewater. There will not be any process wastewater to be discharged to the exterior, except surplus water from scrubbing system. The plant will be fitted with an updated and always ready to use firefighting system of standalone fire extinguishers to be placed at key points as well as a centralized firefighting network. This arrangement will effectively control the eruption and spread of any accidental fire.

r) Other support equipment and facilities (e.g., generator)

In addition to the incineration assembly, the plant will have number of support facilities like the weighing machines, generators and computers etc. The standby generator will ensure power supply during breakdown or supply failure from the main power line. The generator will be euro-compliant and its noise and exhaust emissions will be regularly monitors. It will be kept in good running condition by ensuring its cleanliness, upkeep and tuning.

s) Real time GPS vehicle tracking system

The waste collection and transportation vehicles that will bring-in the waste to the plant will be fitted with real time GPS position, monitoring and tracking system. This will ensure proper route planning of the waste collection and shifting to the plant. With the help of this system, the management will watch the vehicle movement while sitting in office even.

t) Admn building / office rooms

The premises will have an admn building block, which will comprise of the office rooms, washrooms, restrooms, guestroom and pantry. All the record and inventories will be available in the office in hard and electronic forms in the computer system. Proper and regular cleanliness of the admn offices and the entire premises will be ensured.

u) Green areas, grassy lawns and tree plantations

In order to improve the aesthetics, ambience and outlook, the premises will have dedicated and exclusive green areas, exotic floral plantation, shadowy trees and lush green grassy lawns. They will be regularly irrigated with treated wear from the wet scrubbing system. A whole-time gardener will be employed to ensure proper look after, upkeep and pruning of the greenery.

The setting-up of the plant will be an environment friendly activity as there will not be any impacts of onsite construction of the building/structure. The machinery will be installed concomitant with civil work construction. A brief description of each of the sections or components is given as hereunder:

2.11 Restoration & Rehabilitation Plans

Not any restoration or rehabilitation plans required, mainly because of the following reasons:

- The machinery will be installed alongwith construction of the plant building
- The proponent will obtain necessary NOC regarding land use change to permissible usage
- The plant will be situated away from any human settlement, villages and towns
- There are not any vicinity houses, shops or other structures that might need to be demolished during setting-up of the plant
- Setting-up of the plant will not involve acquisition of any private land, as the land, held by the proponent is sufficient for setting-up of the plant
- There is no likelihood of displacement of any persons, as the plant will be constructed on a vacant land
- Setting-up of the plant will not involve displacement of any person or damage to any nearby property as none are existent within the zone of environmental influence of the site
- Construction of the plant will not involve cutting or removal of any trees or green plants
- The onsite setting-up of plant will not involve damage to any public or private infrastructure, as none are existent within the zone of environmental influence of the site
- Setting-up of the plant on a vacant land will not involve displacement of any persons or property. Hence, there will be neither any affected persons nor any issue of payment of compensation to them



Aggressive tree plantation, development of greenbelts and grassy lawns at and around the site/premises has been recommended for improving environmental ambience and aesthetics of the premises.

2.12 Government Approvals

The proponent has already got the layout plan of the building approved by the concerned building control authority. In addition to the environmental approval, for which the instant EIAR is being filed, following NOCs and Governmental approvals have been so far obtained.

- NOC from the Irrigation Deptt., GoPb for disposal of the used-up water from the plant into the nearby designated drainage channel ([Annex-2](#)).
- NOC from the LDA regarding land use status of the selected site ([Annex-2](#)).
- Approved building layout plan from the concerned regulatory authority (District Council Kasur) ([Annex-1](#)).

Only the environmental approval from EPA-Pb is pending at the moment.



3

BASELINE ENVIRONMENTAL & SOCIOECONOMIC PROFILE



3. BASELINE ENVIRONMENTAL & SOCIOECONOMIC PROFILE

3.1 Baseline Environmental Settings

Description of the environmental settings (also referred to as “baseline”, “existing”, “background”, or “affected environment”) is an integral part of an environmental impact/environmental examination. There are two major purposes of describing the environmental settings in an impact study, namely:

- To ascertain and evaluate the existing environmental quality, as well as environmental impacts of the alternatives being studied, including the no-action or no-project alternatives, and
- To identify environmentally significant factors or geographical areas that could preclude the development of a given alternative or alternatives

Additional purposes of describing the baseline settings include, but are not limited to, provision of sufficient information so that the decision makers and the report reviewers, who might be unfamiliar with the general location, may develop an understanding of the project’s needs and environmental characteristics of the area.

One of the significant environmental impacts of a developmental scheme could be the likely changes in the land use profile. If implementation of a developmental scheme involves massive conversion of agriculturally useful land into non-agricultural or otherwise less useful lands or leads to deterioration of the ecological environment by substantially altering the land use pattern in a manner, which is less favourable for propagation of agriculture, then the resultant impacts can be labelled as deleterious and harmful for the environment. Conversely, if a developmental scheme envisages very little or negligible changes in the existing land use scenario or the new land usage is of superior nature, then the development is regarded an environment friendly activity to the extent of this parameter.

It would not be out of place to mention here that usually the format of an IEE/EIA is either project specific or area specific or a combination of both. Because of the nature of the project being only the “setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]”, the instant EIA has been prepared according to the combination format. The baseline environmental conditions, therefore, have been described according to this format approach. The text following hereafter contains a description of the baseline characteristics of the area and the district, wherever relevant.

3.2 Studies and Surveys for Baseline Profile

The Consultant’s Professional Team in conjunction with the proponent and other concerned agencies undertook various studies and surveys relating to the project, such as:

- Studies and investigations into the baseline environmental profile of the area, where relevant
- Physical, geological, hydrological, and topographic environmental surveys of area, where relevant
- Socioeconomic surveys of the area, where relevant
- Surveys about education profile and services in the area, where relevant
- Soil quality surveys and investigations, where relevant
- Water quality investigations and analyses
- Ambient noise profile in the vicinity of the site
- Social surveys
- Surveys and interactive meetings with the neighbouring populations to know their understanding of the project and to solicit their specific concerns over the project, if any

The objectives of the social surveys were:

- Finding out impacts of the project on education, health, hygiene, lifestyle and social value system of the workers and inhabitants within the plant’s zone of influence
- Any probable dislocation of the persons and property and removal of encroachments, if any from project’s construction, expansion or operation



- Assessing the prospects of employment and job opportunities and impacts on the economic portfolio of the beneficiary population of the area
- Ascertaining likelihood of cropping up of any social conflicts and sources of frictions with the neighbouring community or the locals
- Finding out any sources of social and physical nuisances for the project or the local community

The above-mentioned studies included visits and physical surveys of the site and the nearby populations within a radius of 1 km from the site. The social surveys were carried out through random selection of the beneficiaries and the stakeholders. The nearby residents and the businesspersons, being the important stakeholders, were consulted in particular to solicit their views over various aspects of the project facility. Direct interviewing and soliciting the requisite information by asking short questions was found the best mode of eliciting the requisite information. The collective public gatherings were found another effective mode of procuring the requisite information. By and large, the stakeholders and the persons, who were consulted during the EIA, welcomed setting-up of the plant as being beneficial for them from all angles and aspects.

3.3 Environmental Description of the Site/Area

For the purpose of environmental description, a circular area upto 0.1 km from centre of the hospital site was taken as the assumed zone of environmental influence (Fig. 3.3). The hospital building will be constructed on a hitherto vacant and open land leased and possessed by the proponent on Kasur Dinajpur Road. Whereas, electricity is available on the site, rest of the civic amenities like water supply, sewerage and waste collection will be arranged and developed by the proponent through his own means and expenses. The geographical coordinates of the site are 31°12'37.44"N & 73°58'42.80"E and an altitude of 201m above sea. The site is bound on the south by Phoolnagar Bypass Road and on rest of the sides (north, east, west) is bound by open agricultural fields. The geographical disposition of site is as under:

- *To the north:* Open agricultural field
- *To the south:* Phoolnagar Bypass Road
- *To the west:* Open agricultural field
- *To the east:* Open agricultural field

It needs no mention that Phoolnagar Bypass Road is an important and busy highway of the province. It connects Phoolnagar with Kasur. On one side, it merges with Multan Road and on other side it merges with various other roads leading to different destinations as well as with National Highway (N5). In this manner, it connects Kasur with various other districts, cities, towns and destinations. There are number of important settlements, villages, towns and cities situated on this road. One sees reasonable number of marketplaces, commercial concerns, industrial establishments, factories, schools, masjids, healthcare establishments and public sector facilities while travelling on this highway.



Fig. 3.3: Site's approximate zone of environmental influence shown by yellow circle



3.4 Geophysical Environment

The geophysical environment is that part of the overall environmental profile of an area that relates to the geological and physical entities in the area under review, the assumed radius of influence of the plant in the instant case. Amongst number of parameters, the description of the geophysical environment includes particularly the narration of the site, location of the site, geology, hydrology, meteorology and atmospheric features of the site and the surrounding areas.

3.4.1 Site & District

Kasur, the city of Bullhe Shah and the capital of Kasur District, is located 55 km southeast of Lahore. Kasur is located on 31°09'.47.83"N & 73°55'23.81"E and at altitude of 197 metres above sea level in the time zone of +5:00 GMT. It is one of the oldest and famous districts of the province¹. Kasur is adjacent to the border between Pakistan and India and is a tourist attraction because of the guard changing ceremony at Ganda Singhwala Border. It is known for its very spicy fish, a sweet dish called Andrassay, Falooda and Kasuri Methi (Fenugreek). It is also the birthplace of Noor Jehan, the Pakistani singer and actress who gained popularity in the 1950s.

There are different traditions about the name of Kasur. One is that the town was founded by Kasur/ Kasur the son of King Ram and named after him as Kasurpur. (One of Kasu's brothers was Loh and the City of Lahore was named after him.) According to another tradition, the town was founded by Pashtun families from Kabul (today the capital of Afghanistan) during the period of Mughal emperor Akbar. The Pashtuns constructed 12 small forts known as Kot. There were about twelve Kots named after the heads of various families. Kasur had been allotted by the Mughals to Pashtuns or Afghans of Kabul and still contains a colony of Pashtuns. However, the site was occupied by a Rajput town long before the period of Muslim rule.

Kasur as a district headquarters town is the most important city of the district. It is built upon the high bank, which marks the termination of the Majha and looks down upon the lowlands of the Sutlej. It is a place of great antiquity and is identified by the historians as one of the places visited by the Chinese pilgrim, Howang Tsang in the 7th century CE but it does not appear in history until late in the Muslim period when it was settled as a Pashtun colony from east of the Indus. These migrants entered the town either in the reign of Baber or in that of his grandson Akbar and founded a considerable principality with territory on both sides of the Sutlej. When the Sikhs rose to power, they met great opposition from the Pashtuns of Kasur. The chiefs of the Bhangi confederacy stormed the town in the 1763 and again in 1770 and although they succeeded in holding the entire principality for a while, the Pashtun leaders re-established their independence in 1794 and resisted many subsequent attacks. The town of Kasur was incorporated in the Kingdom of Lahore by Ranjit Singh in 1807 and had been a municipality since 1885

Methi (Fenugreek) is used as vegetable in various eatables. Fresh Methi herb does not contain any smell but after drying, it becomes fragrant and possesses a specific type low-grade smell. Methi from Kasur / Qasoor in Punjab (Pakistan) is very famous in its fragrance throughout the country and known as Kasuri Methi. Kasuri Methi leaves are also used as a condiment for flavouring and giving special delicious taste. Steaming is considered the best method of cooking leaves; in this, the vitamins are retained and the vegetable become palatable. The dried leaves can be composed to pulses for their protein content. They supplement the lysine-deficient cereal diets. They have an aromatic odour and agreeable spicy taste. Kasuri Methi leaves is an important ingredient of curry powder and juicy and fry vegetables.

Historically, fenugreek was used for a variety of health conditions, including menopausal symptoms and digestive problems. It was also used for inducing childbirth. Today, it is used for diabetes and loss of appetite, and to stimulate milk production in breastfeeding women. It is also applied to the skin to treat inflammation

On July 1, 1976 the city of Kasur became the capital of Kasur District after the area was detached from Lahore District. Today, Kasur is one of the most important economic centre and political entity. The main political families in the district are Arains, Jats, Pathans, and Kashmiris. There have been many provincial and federal ministers from among the political families and leaders from Kasur. [Fig. 3.4.1a & 3.4.1b](#) show geographical location of the district and [Fig. 3.5.1a & 3.5.1b](#) show ecological and wildlife map of the Punjab.

¹ Punjab Sustainable Development Strategy, EPD, 2008



The reported population of the district as elucidated from the 1998 Census Report is 2376 thousands, which is now crossing 2967 thousands². The average rate of population growth of the district is 2.96 percent per annum³. With the existing growth rate, the population is expected to double by 2025. Urban population has increased from 542 thousand in 1998 to 678 thousand in 2008. Overall sex ratio is 107 males per 100 females⁴. The city of Kasur has considerably expanded during recent years. The sign of expansion are visible along outer rim of the city, where agricultural lands interpose with new constructions, inhabitations, and farmhouses⁵.

District Kasur is playing a pivotal role in country's economics and politics. There are number of technical and vocational training institutions imparting training in various trades e.g., mechanical, electrical, auto-engineering, welding, woodworking, and commerce. Vocational institutions for women are imparting training in hand/machine embroidery, stitching, and knitting. Sugarcane, wheat, and rice are the main crops of the district. Maize, jawar, bajra, cotton, moong, masoor, mash, and oilseeds, are also grown on a smaller area. Guava and citrus are the main fruits grown in the district. Mango, banana, leechi, jaman, and falsa are also grown in minor quantities. The vegetables grown in the district include potatoes, carrot, cauliflower, and salad leaves. Tomato, onion, turnip, peas, chilly, and garlic are also grown in smaller quantities. District Kasur occupy important position in the agriculturally rich and fertile area commanded by the surface irrigation system. Kasur is connected to other parts of the country through railway and roadway network.

After independence of Pakistan in 1947, many Muslims of East Punjab and Haryana migrated to and settled in district Kasur. The predominantly Muslim population of the district supported Muslim League and Pakistan Movement. After the independence of Pakistan in 1947, the minority Hindus and Sikhs migrated to India while the Muslim refugees from India settled in Kasur. Sheikh, Sayed, Qazi, Japaa, Bala, Chadhar, Haral, Sangha, Khokhar, Lali, Sipra, Nesoana, Rehan, Wallahrai and Khundowaa tribes are the leading tribes of the district.

3.4.2 Location and Accessibility of the Site

The site is situated on Phoolnagar Bypass Road in Mauza Behramke, Tehsil Pattoki, District Kasur. Owing to its location on a main provincial highway, the site is accessible easily from all surrounding villages, towns and cities. It is approachable easily from Phoolnagar, Pattoli, Kasur and National Highway (N5). There are hardly any large size villages, settlements and towns in the vicinity area. There also are not any commercial, educational and healthcare establishments upto a reasonable distance from hospital site. There are not any important installations situated within the radius of environmental influence of the site. The open lands around the site, per se, are a part of the fertile agricultural lands of Bari Doab⁶ in the flat floodplains of the Punjab in predominantly rural settings.

3.4.3 Geography

Barring the side, which faces the road, the entire site is bound on all other sides by open lands owned by various landowners. There are not any built-up structures at or around the immediate vicinity of the site. Similarly, there are no residential settlements, commercial properties, shops, educational buildings, healthcare establishments, graveyards, shrines and places of worship etc. within the site's radius of influence of the site. The geographical coordinates of the site are 31°12'37.44"N & 73°58'42.80"E and an altitude of 201m above sea. Fig. 3.4.1a & 3.4.1b present geographical disposition of district Kasur with respect to other districts.

3.4.4 Topography

Topographically, the site is a flat land and falls in the sub-montane zone of the Hindukush foothills. This zone is characterized by flat lands mixed with some dry areas called bars. Topographically, the area around the site forms a part of the wider system of Indus floodplains. The site exhibits the features typical of the flat floodplains of the central Punjab. The site as well as the wider floodplains around are devoid of any significant topographic features. The relief of these flat floodplains has facilitated large-scale cultivation, development of an extensive irrigation network, construction of roads, railways and other infrastructure. The wider area around the site exhibits the same very topographic features, which are typical of the floodplains of the region. The general surface gradient in the region is from north to south and from west to east with an extremely gentle slope of 0.2 to 0.3 m per kilometre⁷. According to the Google map imagery, elevation of the site is 578' above the mean sea level⁸. The most important natural surface water channel of the area is river Ravi, which is

² Punjab Development Statistics, Bureau of Statistics, GoPb, 2022

³ Punjab Development Statistics, Bureau of Statistics, GoPb, 2022

⁴ Punjab Development Statistics, Bureau of Statistics, GoPb, 2022

⁵ Punjab Sustainable Development Strategy, EPD, 2008

⁶ Doab, in the vernacular, is the land bound in between two adjacent rivers

⁷ Geological Features of Punjab, Lecture Notes, Dr. M Nawaz Ch., Punjab University, Lahore

⁸ Topo-sheets of District Kasur, Survey of Pakistan, 2022



an eastern tributary of Indus Basin System. Under the Indus Water Treaty, waters of three eastern rivers have been given to India and the three western rivers to Pakistan. Therefore, there is hardly any flow in Ravi except the diverted waters of Chenab. There are some irrigation channels for irrigating the agricultural lands around. There is not any significant wastewater drain near the site. Apart from the above-mentioned aspects, the site/area does not exhibit any other special physical, geological and geomorphologic features.

3.4.5 Geology

Geologically, the site's land, being a part of Chenab's floodplains, is characterized by light alluvial deposits transported down by the river from its origin in the Himalaya foothills. The depth of these deposits varies from location to location. The underlying bedrock is composed of Precambrian and metamorphic to tertiary consolidated rocks. The overlying alluvium consists of Pleistocene to recent unconsolidated deposits of sand, clay, and silt. The formation age of the alluvium ranges from Pleistocene (50,000 years) to the recent age, the latter being predominant at the site because of its proximity to the river because the latter types of deposits are found mostly near the riverbanks and the former type deposits are typical of central part of the river's flood plains⁹.

3.4.6 Seismology

According to the Seismic Survey Map of Pakistan, District Kasur falls in the seismic zone, which has the seismic activity equivalent to zone "2B" of the Earthquake Zones Classification of the United States Uniform Building Code, 1997 (UBC-97). This zone is associated with unknown geological conditions and the reported earthquake damage is "moderate". Nevertheless, earthquakes of magnitude up to five on the Richter scale, which generate ground acceleration up to 0.1 g, have been reported for this zone¹⁰. No major earthquake has been reported in the district during past two decades¹¹. According to the Pakistan Building Code 2007, district Kasur falls in Zone-4¹² of the seismic zoning map of Pakistan. This zone has very low seismic activity.

3.4.7 Soil Morphology

By their very nature and composition, the soils at the site, which are contiguous with the soils of rest of the surrounding areas, are granular to amorphous mix of sand, silt, clay and loam. The texture, morphology, and moisture holding capacities of these soils show some intrinsic variations as one travels from north to south and from east to west. The soil crust is composed of alluvial deposits consisting of silt, clay, sand, and loam. Clay and silt formations occur in discontinuous layers with limited lateral extent. Their thickness is generally less than five meters¹³. Because of the presence of a rich surface irrigation network, the overall fertility and the per acre yield of the soils is reasonably good¹⁴.

3.4.8 Surface Hydrology

Rivers Ravi and Beyas are the two major surface water channels of the district. Whereas, Ravi flows along western boundary, Beyas runs along the eastern side of district Kasur. Under the Indus Water Treaty of 1965, waters of the three eastern rivers of the country (Ravi, Beyas, and Sutlej) have been given to India. Therefore, there is no flow of water in river Ravi except during monsoon and high floods. The flow in Ravi and Beyas is mainly the diverted water of river Chenab into Ravi and then into Beyas through the link canals.

Ravi is an old river, which serves as boundary between district Lahore and Sheikhpura. It flows approximately 35 km west of the hospital site. Owing to concession given to India over its waters under the Indus Water Treaty, the flow in this river has reduced only as marginal. The waters from Chenab are being released into Ravi through link canals (Marala-Ravi Link Canal and Qadirabad-Balloki Link Canal). Construction of Balloki Headworks, in district Okara, has helped to sustain agriculture in the command area of Ravi downstream of the Headworks.

Beyas is an old river, which runs on eastern side of the district Kasur. It flows approximately 45 km east of the hospital site. Owing to the concessions given to India over its waters under the Indus Water Treaty, there is hardly any flow in this river except during monsoon or high floods. Water in the river actually is the water, which is released by India as flood diversion water during peak floods. Under the Indus Water Treaty (IWT), the waters of three eastern rivers (Ravi, Beyas, & Sutlej) have been given to India and that of three western rivers

⁹ Geological Survey of Pakistan <www.gsp.com.pk>

¹⁰ Geological Survey of Pakistan <www.gsp.com.pk>

¹¹ Geological Survey of Pakistan, www.gsp.gov.pk

¹² <http://www.pec.org.pk/buildingcode.aspx>

¹³ Punjab Sustainable Development Strategy, EPD, 2008

¹⁴ Punjab Sustainable Development Strategy, EPD, 2008



(Indus, Jhelum, and Chenab) to Pakistan. In order to maintain the flow and to meet irrigation requirements of the respective areas, waters from the western rivers are diverted into the eastern rivers through the link canals. Marala-Ravi Link Canal and Qadirabad-Balloki Link Canal are two such canals, which divert waters of river Chenab into river Ravi upstream and downstream of Kasur, respectively. Some of waters of river Ravi are diverted towards river Beyas through link canals. Waters of Chenab therefore keep Ravi and Beyas flowing to meet the irrigations needs to some extent.

The pollution of the surface waters in Pakistan is assuming serious proportions, because of discharging of the untreated industrial and municipal effluents into the nearby rivers with impunity. This problem is more conspicuous in case of the eastern rivers because of lesser volume and lower level of the flowing water. The dilution of the poured-in untreated raw sewage waters, especially near the city section reaches is therefore quite lower. As a result of the unscrupulous pouring in of the effluents, the water quality of the rivers has been deteriorating. The canals are also not saved from this nuisance of direct pouring of the raw sewage. There are number of illegal sewage outlets opening directly into the canals and polluting their waters. **Table 3.4.8** presents typical quality of the surface waters in the wider area around.

Table 3.4.8: Surface Water Quality of the Area

Sr.	Parameter	Unit	Results	Sr.	Parameter	Unit	Results
1.	Alkalinity	m.mol/l	7.11	2.	Bicarbonates	mg/l	369
3.	Calcium	mg/l	50	4.	Chlorides	mg/l	51
5.	Hardness	mg/l	375	6.	Iron	mg/l	0.07
7.	Nitrate	mg/l	1.69	8.	Phosphate	mg/l	0.28
9.	Sulphates	mg/l	121	10.	TDS	mg/l	780
11.	Turbidity	NTU	0.8	12.	pH	--	6.9

3.4.9 Groundwater

Owing to its location in the Bari doab¹⁵ and because of proximity to river and canal waters, the rate of groundwater recharge through downward infiltration in the area, including the site itself, is fair. Water table at the site is at a depth of around 30~35 metres¹⁶. The general quality of the groundwater of the site/area is satisfactory and conforms to the WHO Guidelines for potable water.

Groundwater at the site, like the wider area of the district, is in flux with the recharge occurring from infiltration of the river and the canal waters as well as from the surface precipitation. River Ravi flows along western side of the district and is a source for recharge of groundwater in district, particularly after heavy rainfalls and floods. Owing to the natural east to west topographical gradient, the groundwater of the region and that of the site per se exhibits the flow characteristics conformant to area's topography. As per water quality inspection, the groundwater is of good potable and irrigable quality with no visible impurities.

Government has installed reasonable number of tubewells in the district for abstraction and supply of groundwater to domestic and commercial consumers. As there is deficiency of the canal irrigation water, many of the landowners in the area have installed their own tubewells privately for abstracting groundwater to cater for their irrigation water needs. The number of existing tubewells and the pace of groundwater abstraction exhibit the aquifers to be of reasonable reserve. It will be pertinent to mention that tubewell irrigation is the second major mode of irrigation in the province. According to "Agricultural Statistics of Pakistan", irrigation by tubewells accounts for nearly 30% of water consumption for agriculture¹⁷.

According to Bureau of Statistics, Government of Punjab, there exist 2,674 tubewells in the district. The number of tubewells was around 1,100 in early eighties. Thus, tubewells have approximately doubled in about 20 years¹⁸. The site and its surrounding areas are both canal and tubewell irrigated. According to hydrogeological mapping of the area, the groundwater yield in the vicinity of the facility area varies between 50-150 m³/hr down to the 150m and the aquifer is moderately thick and extensive¹⁹. **Tables 3.4.9a, 3.4.9b & 3.4.9c** present respectively the number of tubewells, typical groundwater quality, and microbiological quality of the groundwater of district Kasur²⁰.

¹⁵ Doab, in the vernacular, is the land bound in between two adjacent rivers

¹⁶ Geotechnical Investigations of the project

¹⁷ Agriculture Statistics of Pakistan, Ministry of Agriculture, Islamabad, 2022

¹⁸ Punjab Development Statistics, Bureau of Statistics, GoPb, 2022

¹⁹ Hydrogeological Map of District Nankana, WAPDA, 2022

²⁰ Punjab Development Statistics, Bureau of Statistics, GoPb, 2022


Table 3.4.9a: Number of Tubewells in District Kasur

Total			Diesel			Electric		
Private	Govt	Total	Private	Govt	Total	Private	Govt	Total
2614	60	2674	2404	--	2404	210	60	270

Table 3.4.9b: Groundwater Quality of the Site

Sr.	Parameter	Unit	WHO Desirable Level	WHO Max Permissible Level	Results
1.	Temperature				30°C
2.	pH	--	7.0~8.5	6.5~9.2	6.9
3.	Odour	--	Unobjectionable		Odourless
4.	Colour	P.C.U	05 Units	50 Units	Colourless
5.	Taste	--	Unobjectionable	Unobjectionable	Tasteless
6.	Turbidity ppm Silica Units	NTU	05 Units	25 Units	--
7.	Total Dissolved Solids	--	500	1500	815
8.	Calcium as Ca ⁺⁺	ppm	75	200	80
9.	Magnesium Mg ⁻⁻	ppm	50	150	53
10.	Total hardness as CaCO ₃	ppm	100	500	410
11.	Total alkalinity as CaCO ₃	ppm			300
12.	Sulphate as SO ₄ ⁻	ppm	200	400	180
13.	Chloride as Cl ⁻	ppm	200	600	99
14.	Conductivity at 25°C	µs/cm			1160

Table 3.4.9c: Microbiological Quality of Groundwater of the Site

Sr.	Parameter	Results	Sr.	Parameter	Results
1.	Total plate count/ml	--	2.	Total coliforms (MPN/100 ml)	--
3.	Faecal coliforms (MPN/100 ml)	--	4.	E. coli (MPN/100 ml)	--

3.4.10 Meteorology & Climate

The site, being part of district Kasur, exhibits a hot and dry climate with low rainfall like rest of the district²¹. According to meteorological profile of the area, summers are generally hot with moderate humidity, whilst winters exhibit extreme cold. Spring and autumn seasons are the most pleasant parts of the year. The mean winter temperature (December/January) ranges between 10.5°C to 14.5°C. The mean summer temperature remains around 35°C to 37°C with spikes crossing 40°C. The mean of the maximum temperature ranges between 29-30°C and mean of the minimum from 15-16°C²². Approximately 50 percent of the average annual rainfall occurs during monsoon in the months of July and August²³.

The past climatic records indicate that rain rich years have been occurring at a cycle of 15-20 years with intervening dry period²⁴. The facility site being a part of the floodplains of central Punjab, the general climatic pattern is characterized by a dry climate except during monsoon whence humidity level in the air is high. There occurs profuse rainfall during the monsoon season with substantial precipitation (approx. 50% of annual total) occurring in July and August. The average annual precipitation of the district for the past 10 years (2010-2020) has been around 229 mm. The wind flow is gentle during most of the year with occasional and sporadic dust storms during peak summer. The rate of evapotranspiration in the built-up areas, for example, the city and the surroundings is lower, compared to the open grassland/cropland in the periphery of the built-up areas. **Table 3.4.10** presents typical meteorological features of the district²⁵.

Table 3.4.10: Climatic Features of the Area

Sr.	Parameter	Value	Sr.	Parameter	Value
1.	Classification of Climate	Hot humid (Tropic)	2.	Wind Direction	East/Southeast
3.	Wind Intensity	Weak to moderate	4.	Average Rainfall (annual)	<229 mm
5.	Rainy Season Duration	July to September	6.	Dry season Duration	October to June
7.	Average Temp (Annual)	19-20 °C	8.	Average Temp (Summer)	36-38 °C
9.	Average Temp (Winter)	6.5-10.5 °C	10.		

²¹ Meteorological Profile of Punjab, Pakistan Meteorology Department, Lahore, 2022 (soft copy)

²² Meteorological Profile of Punjab, Pakistan Meteorology Department, Lahore, 2022 (soft copy)

²³ Meteorological Profile of Punjab, Pakistan Meteorology Department, Lahore, 2022 (soft copy)

²⁴ Meteorological Profile of Punjab, Pakistan Meteorology Department, Lahore, 2022 (soft copy)

²⁵ Meteorological Profile of Punjab, Pakistan Meteorology Department, Lahore, 2022 (soft copy)



3.4.11 Floods and Water Storms

Floods in Ravi result primarily from heavy rainfall in its upper drainage basin, which falls under the most active monsoon belt. Additionally, snowmelt contributes, on the average, 40% of the river flow in July when the snowmelt rate is at its peak. It synchronizes with early monsoon in July, but not with the peak values occurring in August and September. During the monsoon, profuse rainfalls contribute considerably to river flows, which can aggravate the floods. Higher flows in Ravi can lead to heavy flood damages. The historical extreme events were occurred in 1988, 1995, 1996, 1997, 2001, 2005, 2010, 2013, 2018, 2020, 2022 and thereafter.

As the waters of the river, under the Indus Water Treaty, have been granted to India, there is hardly any flow in Ravi except when India releases excess floodwater into the river. Therefore, floods in Ravi are a rarity now.

3.4.12 Air Quality

The entire site is located amidst the vast open lands in rural settings. Because of this disposition, the air quality profile is reasonably good with a low level of airborne dust and pollutants. However, fugitive dust levels are a bit higher on and near the highly trafficked roads than the surrounding open lands. There is no industry, brick kilns or other stationary source of stack emissions within the site's zone of environmental influence. Hence, there is no stack emission from any such sources in the said zone of environmental influence of the site. At the time of visit inspection of the site, the general atmosphere at the site was clear from particulate dust and was of good visibility.

When talking on national scale, the air quality profile of the country, particularly that of some major urban centres show concentrations of some of the air quality parameters higher than the WHO Guideline Values as well as those prescribed under the Provincial Environmental Quality Standards (PEQS). According to a joint air quality investigation report of the major districts in the country by the Pak-EPA and the Japan International Cooperation Agency (JICA), the average suspended particulate matter (SPM) in the study districts was 6.4 times higher than WHO Guideline Values. The levels of sulphur dioxide, carbon monoxide, and oxides of nitrogen also exceeded the acceptable standards in some areas, but the average levels were below the Guideline Values²⁶. Another similar study revealed higher concentrations of SPM in the ambient air²⁷. However, barring the congested urban centres, the air quality in rest of the province generally conforms to WHO Guideline Values²⁸.

Table 3.4.12: Ambient Air Quality Profile of the Area

Parameter	Ozone (ppb)	SO ₂ (ppb)	NO _x (ppb)	NO (ppb)	CO (ppm)	Dust ug/m ³	Humidity (%)	Wind speed (m/s)
Conc.	5.9	10.8	42.0	30	8	395.7	23-35	1.0-2.1

The main road to the site, because of heavy traffic load on it, is broken at some places and is thus a source of fugitive dust at those spots. Higher than normal levels of fugitive dust are seen owing to heavy traffic load on the road. The transportation of various materials for the industry sited in the area has enhanced vehicular traffic in the area, which may cause higher air dust levels linearly along the road line, in particular. The general atmosphere in and around the site, is smeared with some suspended particulate matter but has reasonably good visibility. **Table 3.4.12** presents typical air quality profile of the district, which has been used as the benchmark, because the air quality profile of the site by EPA is not available²⁹.

3.4.13 Effluent Disposal

According to Pakistan Economic Survey³⁰, availability of underground sewerage in the country is deplorable. Barring some major towns, there is hardly any proper sewerage and sanitation system in district Kasur, particularly so in rural areas. Hence, disposal of the domestic effluents in the rural areas outside the municipal limits of the cities and towns is not very satisfactory. Similarly, there is hardly any separate and dedicated system for handling the storm water. Because of non-availability of the storm water channels, the rainwater and the storm water usually make their own ways out to the nearby drains. The project's area of operation being the dried riverbed, is therefore devoid of water supply, effluent disposal and sanitation system.

²⁶ 3-Cities Investigation of Air and Water Quality (Lahore, Rawalpindi, Islamabad), JICA/Pak-EPA, 2001

²⁷ 2-Cities Investigation of Air and Water Quality (Gujranwala and Faisalabad), JICA/Pak-EPA, 2003

²⁸ Air Quality Monitoring in Six Districts of Punjab using Physico-Chemical Techniques, EPD, GoPb, 2005

²⁹ Air Quality Monitoring in Six Districts of Punjab using Physico-Chemical Techniques, EPD, GoPb, 2005

³⁰ Pakistan Economic Survey, GoPk, 2022



3.4.14 Background Radiological Characteristics

There are no known background radiological characteristics along and around the site. The X-ray machines, scanners and the radiotherapy equipment installed at the healthcare establishments and the biomedical facilities at major towns in the district do have radioactive sources installed in them. However, the quantum of emission of radioactivity from these sources is negligible and does not contribute much towards the background ambient radioactivity levels³¹. Because of its rural disposition, there is no likelihood of any background radiological characteristics at or near the site and the immediate surroundings.

3.4.15 Ambient Noise Characteristics

The ambient noise levels in the district and the site vary from place to place and from time to time. Generally, levels of the ambient and background noise in our settings are higher during the peak hours. Vice versa, the ambient noise levels are higher at the busy road junctions, near industrial establishments, commercial concerns and educational institutions during evening and late morning. In order to examine the noise potential of the site, the study team carried out a noise measurement survey, results of which are depicted in **Table 3.4.15a**. Similarly, **Tables 3.4.15b & 3.4.15c** present the hypothetical ambient noise characteristics and their impacts on the human health and behaviour.

Table 3.4.15a: Noise Record at the Site

Date	Time	Noise (dB)	Date	Time	Noise (dB)
20.01.2023	23:00	55	21.01.2023	12:00	70
20.01.2023	23:30	55	21.01.2023	12:30	85
21.01.2023	00:00	55	21.01.2023	13:00	85
21.01.2023	00:30	50	21.01.2023	13:30	85
21.01.2023	01:00	50	21.01.2023	14:00	90
21.01.2023	01:30	45	21.01.2023	14:30	90
21.01.2023	02:00	45	21.01.2023	15:00	90
21.01.2023	02:30	40	21.01.2023	15:30	90
21.01.2023	03:00	35	21.01.2023	16:00	85
21.01.2023	03:30	35	21.01.2023	16:30	90
21.01.2023	04:00	40	21.01.2023	17:00	85
21.01.2023	04:30	35	21.01.2023	17:30	90
21.01.2023	05:00	40	21.01.2023	18:00	90
21.01.2023	05:30	40	21.01.2023	18:30	85
21.01.2023	06:00	45	21.01.2023	19:00	85
21.01.2023	06:30	50	21.01.2023	19:30	90
21.01.2023	07:00	50	21.01.2023	20:00	95
21.01.2023	07:30	55	21.01.2023	20:30	95
21.01.2023	08:00	60	21.01.2023	21:00	85
21.01.2023	08:30	60	21.01.2023	21:30	85
21.01.2023	09:00	65	21.01.2023	22:00	80
21.01.2023	09:30	65	21.01.2023	22:30	75
21.01.2023	10:00	70	21.01.2023	23:00	65
21.01.2023	10:30	65	21.01.2023	23:30	60
21.01.2023	11:00	70	22.01.2023	00:00	55
21.01.2023	11:30	70	22.01.2023	00:30	55

Table 3.4.15b: Expected Noise Level at Different Locations

Sr.	Location	Noise Level (dB)	Sr.	Location	Noise Level (dB)
1.	Active Construction Zone	85-90	2.	Offsite Areas	70-75
3.	Loading/Unloading Areas	80-90	4.	Office/Support Facilities	50-70
5.	Parking Area	40-50	6.	Residential Areas	60-75

Table 3.4.15c: Noise Annoyance Levels for Resident Communities

Day-night average sound level (dB)	Hearing Loss	Average Community Reaction (Likely)	Significance
75 and above	May begin to occur	Very severe	Noise is likely to one of the important adverse aspects of the community environment
70	Will not likely to occur	Severe	-do-

³¹ Based on site visit by the Consultant's Team



65	Will not occur	Significant	-do-
60	Will not occur	Moderate to slight	-do-
55 and below	Will not occur	Un-noticed	-do-

3.5 Ecological and Biological Environment

The ecological and biological environment of an area is generally considered prone to large-scale constructions and developmental schemes. The disturbances and imbalances in the ecological and or biological environment can affect the biodiversity features of an area adversely. The biodiversity of an area reflects generally the abundance and richness of the biological and or the ecological resources. The subsections hereunder contain discussion of the important impacts of plant's construction and operation on the eco-biological environment as well as on the biodiversity characteristics of the area.

3.5.1 Forests, Habitat, and Ecologically Sensitive Areas

The site per se, because of its being the riverbed in the rural landscape, is devoid of any specific species of flora or fauna. Nevertheless, one comes across number of self-grown as well as planned plantation of trees in the area and along the river banks. Almost all the trees are of indigenous varieties like kikar, shisham, beri, bargad, jaman, toot, and sufeda. The sand extraction activities under the project will not involve cutting and removal of any trees or green plants. There are no major forest plantations within the zone of environmental influence of the site except some planned linear roadside plantation. There also are no horticulture parks, wildlife sanctuaries and planned gardens along or around the site. The linear plantations along the roads, railway tracks and water channels constitute as the major floral resources of the wider area³². There are no sensitive bio-receptors at or near the site.

It may be mentioned as a passing reference here that owing to persistent human interventions over centuries, the existing natural habitat of the area, as it exists today, is largely a modified form of the original habitat of the tropical thorn forests. Construction of an extensive irrigation network during the early 20th century paved the way for transformation of the tropical thorn forests into agricultural lands. This has led to a changed landscape and loss of wildlife also. The predominant habitat of Kasur is the Tropical Bushy Forest³³.

3.5.2 Local Flora

Apart from some scanty trees along the river banks, there are no large-scale plantations in and around the site. The predominant species of the flora at the site include shisham (*Dalbergia sissoo*), eucalyptus, silver oak, kikar (*acacia nilotica*), jand (*prosopis spicigera*), karir (*capparis aphylla*), beri (*zizyphus jayaba*), van (*salvadora abeoides*) and akk (*calotropis hamiltonii*). Additionally, some wild varieties of self-grown grass species are found along some poorly maintained watercourses. There are no horticulture, and or wildlife parks and planned gardens near or around the site. Some common forms of weed, bush and the self-grown endemic species of plants are found in the open agricultural lands.

3.5.3 Local Fauna

There is no specific fauna indigenous either to the site or even to the wider area within the radius of influence of the site. Similarly, there are no species of aviary, aqua, or wildlife indigenous, resident or migratory to the site. As such, the biodiversity features of the site are insignificant. Some common forms of reptiles, mammals, and rodents are seen occasionally in the open countryside. Rarely, wild boar, jackals and fox are seen in thick plantations or sugarcane crops. Table 3.5.3 presents names of some common flora and fauna of area alongwith botanical and zoological names. Fig 3.5.1a and 3.5.1b present the wildlife distribution and ecological resources of the Punjab³⁴.

Table 3.5.3: Some Common Flora & Fauna along with Botanical & Zoological Names

Sr.	Common Name	Botanical Name		Common Name	Zoological Name
1.	Jand	Prosopis spicigera	2.	Geedarh	Cannis auris
3.	Van	Salvadora obeoides	4.	Sayyarh (Khargosh)	Lepus capensis
5.	Peelu	Salvadora Percica	6.	Percupine (Seh)	Hysterix Indica
7.	Keekar	Acacia Nilotica	8.	Black partridge (Teetar)	Electoris melanocephala
9.	Shisham	Dalbergia	10.	Eagle (Cheel)	Mitrus migrans
11.	Baqain	Azadrachta indica	12.	Vultures (Giddh)	Gyps futors

³² Brief on Punjab Forest Department, Punjab Forestry Research Institute, Faisalabad, 2022

³³ Punjab Sustainable Development Strategy, EPD, 2008

³⁴ Based on information from Forest & Wildlife Department, GoPb, 2022



13.	Shreen	Albizia Lebeck
15.	Popular	Populus deltoids
17.	Sufeda	Eucalyptus canaldulensis
19.	Pippal	Phycus Religiosa

14.	Bulbul	Pycnonodus xynthopygos
16.	Pigeon (Kabootar)	Treron waalia
18.	Dove (Fakhta)	Streptopilia roseogrisera
20.	Ducks (Batakh)	Anas spp

(Source: Forestry and Wildlife Department GoPb, 2022)

There are no planned or natural forests in the area except the natural plantation along banks and beds of the surface canals and rivers. The Shisham (*Acacia Arabica*) is the most common tree in the area. It is hard, grows quickly and meets almost all the needs of the agriculturists. Its bark is used extensively in tanning of leather and its desi variety yields excellent timber, which can be shaped into all kinds of agricultural implements. The Tahli (*Dalbergia sissoo*) is also common and the crop field forestations mostly comprise of this tree. The Toot or Mulberry (*Morus meraceac*) is much used in the construction of a well apparatus. Of recent years, it is found useful for making cricket bats, hockey sticks and tennis rackets. Other forest plantations in the area include linear plantations of the local varieties of trees along watercourses, irrigation & drainage channels, roadways, railway tracks and the crop field boundaries.

3.5.4 Protected and Ecologically Sensitive Areas

There are no notified wildlife sanctuaries or ecologically sensitive areas at, near or around the site³⁵. The Changa Manga Plantation, which is one of the largest manmade tree plantations, is located far off the site.

3.5.5 Endangered Species

The project district is not a habitat of the rare, extinct and the endangered species. The existing ecosystems are favourable for the survival and continuation of the biodiversity.

3.5.6 Fisheries

There are a few privately owned fish farms in the project district. Additionally, common forms of riverine fish are found in the river waters as is evident from their sale at the local kiosks. The West Pakistan Fisheries Ordinance, 1961 and the Punjab Fisheries Rules, 1976 is applicable in the area.

3.5.7 Aquaculture

There is no organized aquaculture in the area or even in its vicinity. There is no fish hatchery in the plant's zone of environmental influence.

3.5.8 Apiculture

There is no organized apiculture in the area. The native honeybee is found on mulberry trees and is sometimes harvested by the locals. The major portion of the harvested honey is used for personal consumption and the surplus, if any, is sold in the local market. The nearby villages have enough plantations to encourage and sustain apiculture.

3.5.9 Sericulture

No evidence of organized sericulture was found in the area. Locals are perhaps unaware of the techniques and methods of sericulture.

3.6 Socio-Cultural Environment

The sociocultural environment represents the demographic features, social traditions, cultural practices, economy and the lifestyle value system of the area. The pertinent features of socioeconomic environment of the area/district have been highlighted in this subsection.

3.6.1 Demographic Profile

The existing status of the population count of the mauza of the site is not known because of non-availability of the pertinent information and data. Therefore, demographic profile of District Kasur has been used as an alternative for ascertaining the baseline conditions pertinent to this aspect. The population of the district, which was 2376 thousand in the 1998 Census, is now crossing 2967 thousands³⁶. The average rate of population growth of the district is 2.96 percent per annum³⁷. With the existing growth rate, the population is

³⁵ List of Protected Areas published by the Wildlife Department, GoPb, 2022

³⁶ Punjab Development Statistics, Bureau of Statistics, GoPb, 2022

³⁷ Punjab Development Statistics, Bureau of Statistics, GoPb, 2022



expected to double by 2025. Urban population has increased from 542 thousand in 1998 to 678 thousand in 2008. Overall sex ratio is 107 males per 100 females³⁸. The city of Kasur has considerably expanded during recent years. The sign of expansion are visible along outer rim of the city, where agricultural lands interpose with new constructions, inhabitations, and farmhouses³⁹. Jaat, Arain, Gujjar, Kashmiris, Mughal, Rajput and Syed are the main ethnic clans of the area. **Table 3.6.1** presents demographic profile of Kasur.

Table 3.6.1: Demographic Profile of District Kasur

Tehsil	Area (km ²)	1951	1961	1972	1981	1998	2023
Chunian	1212	391	419	599	389	585	
Kasur	1891	370	435	587	736	1157	
Pattoki	892				403	634	
Total	3996	761	854	1186	1528	2376	2942

(Source: Punjab Development Statistics, Bureau of Statistics, GoPb, 2022)

(Thousands)

3.6.2 Land Use/Agricultural Profile

The land use of the block is riverbed. However, the land use pattern around the block site, per se, is typical of the open country lands marked by agricultural fields with mixed disposition of villages and rural dwellings. However, due to pressures of the ever-growing population, the hitherto uninhabited areas are changing into residential areas. The land use status of the areas near the major roads is fast changing into residential and industrial usage. Because of this shift in the land use profile, agricultural lands now interpose with built-up areas, inhabitations, farmhouses and miscellaneous constructions etc.

Because of its proximity to Lahore, Kasur has grown tremendously during the recent past. Resultantly, there has been a marked shift in the land use in the district from agricultural to residential, commercial and industrial categories and from open lands into built-up structures. This change is continuing with an enhanced pace, particularly in the peripheral rim around big towns. Whereas, land use profile in the major towns is predominantly that of permanent and fixed structures, it is of mixed type in the suburbs and along the outer rim of the main towns (like the facility site), where agricultural lands still interpose with new fixed developments, constructions and inhabitations.

Despite industrialization, agriculture is still the predominant economic activity of the district. District Kasur is famous for the production of bamboo. There are large bamboo farms, which produce more than 70% of bamboo in the province. Sericulture, horticulture, and aviculture are also gaining popularity. Investments in honeybee- sheep-, goat-, fish-, poultry, and dairy farming are also increasing. The major seasonal crops include wheat, rice, maize and vegetables. Other agricultural products include fodder, fresh vegetables and lattice⁴⁰.

The reported area of Kasur is 468,000 hectares, out of which 385,000 hectares is cultivated and the remaining is uncultivated⁴¹. The combined cropped area both for rabi and kharif crops is 480,000 hectares. Area under forest cover, however, is only 1,000 hectares. Area not available for cultivation, i.e., partly occupied by fixed structures, buildings, roads, etc is 57,000 hectares.

The principal modes of irrigation in the district are surface channels supplemented by tubewells. Rainfall accounts only for a small proportion of the irrigation supplies. The major seasonal crops are wheat, rice, maize, and vegetables. Other agricultural products include fodder, fresh vegetables, and lattice⁴². Sericulture, horticulture, and aviculture are also a flourishing agriculture related activity. Honeybee farming is also a growing trade. Sheep, goat, fish, and poultry farming are also gaining popularity.

The cropping intensity in the area is 102 percent. The general cropping pattern includes wheat, rice and fodder crops. The survey has revealed that the area under the impact of the proposed project does not contain any productive land worth significance. The principal modes of irrigation are the surface channels supplemented by tubewells. Rainfall accounts only for a small proportion of the irrigation supplies. The major seasonal crops are wheat, rice, maize, and vegetables. Other agricultural products include fodder, fresh vegetables and lattice⁴³. Sericulture, horticulture and aviculture are also a flourishing agriculture related activity. Honeybee

³⁸ Punjab Development Statistics, Bureau of Statistics, GoPb, 2022

³⁹ Punjab Sustainable Development Strategy, EPD, 2008

⁴⁰ Punjab Sustainable Development Strategy, EPD, 2008

⁴¹ Punjab Development Statistics, Bureau of Statistics, GoPb, 2022

⁴² Punjab Development Statistics, Bureau of Statistics, GoPb, 2022

⁴³ Punjab Development Statistics, Bureau of Statistics, GoPb, 2022



farming is also a growing trade. Sheep, goat, fish and poultry farming are also gaining popularity. **Tables 3.6.2a & 3.6.2b** present respectively the land use profile and production of main vegetables in district Kasur⁴⁴.

Table 3.6.2a: Land Use/Agricultural Profile of District Kasur

Reported Area	Cultivated Area	Net Sown	Current Fallow
468	385	64	176

(Source: Punjab Development Statistics, Bureau of Statistics, GoPb, 2022)

(Thousand hectares)

Table 3.6.2b: Production of Main Vegetables

Vegetable	Production (m. tons)		
	2018-19	2019-20	2020-21
Potatoes	75699	67304	62733
Carrot	11533	11589	15676
Cauliflower	5786	6047	6352
Turnip	3166	3376	3434
Ladyfinger	2867	2985	3396
Onion	2874	2318	1792
Tomato	974	784	694

(Source: Punjab Development Statistics, Bureau of Statistics, GoPb, 2022)

3.6.3 Industrial Profile

There is not any industry worth the name in the project's zone of environmental influence. According to the survey status of the industry, conducted by the Directorate of Industries, Government of Punjab, there are 435 industrial units operating in the district. The project district, being one of the politically important districts of the province has a mixed economy of industrial sector, agriculture sector, services sector, commercial sector, and the expatriates' income. The pace of industrialization in the district has remained impressive since after creation of Pakistan. There are a number of small to medium industrial units. There are industrial estates in Chunian and Kasur, where numbers of small to large industrial units exist. The Kasur Chamber of Commerce & Industry (KCCI) is the main hub of industrial economic activities in the district. Kasur has a large industrial estate at Chunian⁴⁵. This industrial estate has large sized textile, confectionary, auto-parts, and manufacturing units. The district of Kasur has over 289 small to large industrial and cottage units absorbing an average daily labour force of 49,000 persons⁴⁶.

There are about 400 cottage-level and small- to large-scale industrial units operating in the district. Rice production and export is the major product of the district. There are many other factories engaged in manufacturing of electrical goods, electric motors and rice cleaning mills. Most are cottage industries, providing employment to a large number of people and accounting, in aggregate, for reasonable share of the domestic market. Kasur has one of the largest tannery clusters of the country and there are hundreds of tannery and leather making units in Kasur.

Despite industrialization, the economy of the district is agriculture based. However, the district has a lot of potential for setting up new industries. Labour is cheap and land is available in abundance. The area has been famous for the production of rice and rice based products, bamboos, turmeric, fenugreek and rapeseed. However, the district lacks in good quality socio-economic infrastructure and ancillary facilities necessary for socioeconomic development of masses. People generally tend to go abroad to earn their livelihood. Kasur city is also an important trade centre for vegetable ghee, oils, toilet and washing soaps, bedding cloth and readymade garments, etc. for the adjoining villages and towns. **Tables 3.6.3a & 3.6.3b** present glimpses of industrial profile of district⁴⁷.

Table 3.6.3a: Census Statistics of Manufacturing Industry

District	Census Year	No. of Factories	Avg. Daily Employment	Gross value of industrial production
Kasur	2020-21	121	49,000	64,625 M

(Source: Punjab Development Statistics, Bureau of Statistics, GoPb, 2022)

Table 3.6.3b: Number of Registered Factories & Employment Status

⁴⁴ Punjab Development Statistics, Bureau of Statistics, GoPb, 2022

⁴⁵ Pattoli is a tehsil of Kasur and approx. 50 km from Lahore

⁴⁶ Punjab Industrial Directory, Directorate of Industries, GoPb, 2022

⁴⁷ Punjab Development Statistics, Bureau of Statistics, GoPb, 2022



District	Factories & Employment		
	<100	>100	Total
Kasur	289	165	124

(Source: Punjab Development Statistics, Bureau of Statistics, GoPb, 2022)

3.6.4 Healthcare Facilities Profile

There is no healthcare facility within the zone of environmental influence of the site. The nearest medical care facility is the Basic Health Unit (BHU) Pattoki. However, this BHU lacks in adequate medical care facilities. The public sector health facilities of the district include one District Headquarter Hospital (DHQH), three Tehsil Headquarter Hospitals (THQH), and number of Rural Health Centres (RHCs) and Basic Health Units (BHUs). A few private clinics, home based healthcare facilities and some small to medium sized medical care facilities are seen while travelling to the site from Kasur city. The major healthcare setup nearest to the site is the DHQH Kasur, which is approx. 23km from the site. The DHQ hospital is providing all types of diagnostics, therapeutic and preventive healthcare services including major surgeries. The hospital provides healthcare facilities to the surrounding population and even to patients from other parts of the districts.

The number of healthcare facilities, their service level, and the area-coverage is reasonable and satisfactory. There is fair number of general and specialized healthcare facilities for providing round-the-clock medical care services. The DHQ hospital has Nursing School for training of nurses and also offers different paramedical and laboratory technician courses as well. The hospital also offers internship facilities for the fresh medical graduates. There are number of private healthcare facilities of comparable standard and quality. The number of private clinics has grown tremendously in the recent past. The public sector healthcare facilities include large hospitals, RHCs, BHUs, Rural Dispensaries⁴⁸. These are providing primary to secondary level outdoor and indoor healthcare services for the affording patients. However, there is no medical teaching Hosp in district.

Because of inadequate availability of the medical facilities in the area, the affording people of the area prefer to go to the nearby big cities of Faisalabad, Lahore, Gujranwala, Gujrat and Rawalpindi. Although, government has established basic health units and dispensaries in number of towns and villages in the district, yet the effort went to dogs because of non-availability of personnel to operate these facilities. The social pattern being patriarchal and male dominated; access of the dependents and the marginalized sections (old, infirm, women and children) to healthcare facilities is almost zero. Poor practices of personal hygiene, lack of knowledge, ill-founded notions, primitive beliefs and financial non-affordability are some of the reasons of disease prevalence in the district. There are some private healthcare facilities of comparable standard and quality. The number of private clinics has grown in the recent past. **Table 3.6.4a** presents healthcare profile of district Kasur. **Table 3.6.4b** some common diseases of area⁴⁹.

Table 3.6.4a: Healthcare Profile of District Kasur

Hospitals		Dispensaries		RHCs		BHUs		TB Clinics		SHC		MCH	
No	Bed	No	Bed	No	Bed	No	Bed	No	Bed	No	Bed	No	Bed
7	437	27	--	16	248	83	162	1	--	--	--	8	--

(Source: Punjab Development Statistics, Bureau of Statistics, GoPb, 2022)

Table 3.6.4b: Some Common Diseases of the Area

Sr.	Common / Local Name	Sr.	Common / Local Name
1	Influenza (endemic)	2	Typhoid fever
3	Whooping cough	4	Leprosy
5	Measles	6	Conjunctivitis
7	Infantile diarrhoea	8	Dermatitis
9	Amoebic dysentery	10	Glaucoma
11	Bacillary dysentery	12	Pneumonia
13	Infectious hepatitis	14	Mumps
15	Viral hepatitis	16	Arthritis
17	Tuberculosis	18	Allergic rhinitis
19	Malaria	20	Nutritional deficiency

(Source: Health Development Statistics, GoPb, 2022)

⁴⁸ A Brief Introduction to Punjab Health Sector Reforms Program, PMIU, 2022

⁴⁹ Punjab Development Statistics, Bureau of Statistics, GoPb, 2022



The city of Pattoki has reasonable healthcare facilities. Both public and private medical care facilities including the Mother and Child Healthcare Centre (MCH) and Civil Hospitals are available at a fair distance. The emergency cover by the DHQH Kasur and THQ Pattoki is also good.

3.6.5 Education Facilities Profile

There are two main streams of education in the area:

- Formal school education as per the Government syllabi
- Informal madrassah education in madrassah attached with masjids or run by religious organizations

As far as formal school education is concerned, the district has reasonable literacy ratio comparable to other districts in the province. According to the Census Report of 1998. The literacy rate amongst those aged 10 years and above is 46.3%. The urban and the rural literacy rates stand at 64.2% and 39.1% respectively. The literacy ratio in males is higher compared to females and stands at 59.2% for the males and 32.7% for the females respectively.

The area per se lacks in essential educational facilities. There is not any public school near the site. However, education institutions of primary and level and above are available in the nearby villages. The secondary and higher secondary level schools are available in bigger towns and cities only. The male students manage their admissions in these schools for getting higher education but the female students are deprived from this facility due to travel distance and other socio-cultural issues and taboos. Therefore, they generally lack access to get education upto and beyond secondary level. This is making negative repercussions on the educational profile of the area.

Except two Government schools for boys and girls in the nearby village, there are not any public sector educational institutions in the immediate area around the site. However, Educational facilities in the district range from primary level Masjid-Maktab⁵⁰ schools upto Degree Colleges and highly specialized research institutions or centres of excellence. However, there is no public sector university in Kasur. There also is good number of technical and vocational training institutions and a fair number of special education institutions in the district run by the Technical Education and Vocational Training Authority (TEVTA) and the Department of Special Education, respectively⁵¹. There are number of private and public sector schools, academies and tuition centres. The literacy rate of the district, as per 1998 Census, is 34.7%. The male literacy rate is 49.1% and the female 29.7%. The literacy rate in the urban population is 49.1% and in the rural folk 31.7%⁵².

The geographical spread of the public sector educational institutions and government schools in the area is fair. There is a government boy's and a girl's primary school in the neighbouring village but both are outside the radius of influence of the site. The higher-level schools and colleges for both boys and girls are present at Kasur and other major towns of the district. The highest educational institutions in the district are the two Government Degree Colleges, one each for Boys and Girls. In addition to normal education stream, there are number of deeni madrassa in the length and breadth of the district. They impart traditional religious education based on "Dars Nizami". A reasonable proportion of the people prefer to send their children to these madrassa instead of formal schools.

While travelling on National Highway (N5), one comes across some privately owned schools and tuition academies. The geographical spread of the public sector and government schools in the district is fair. There is a government primary school in the vicinity of the facility site. the higher-level schools and colleges for both boys and girls are also present at approachable distances from the site. [Table 3.6.5](#) presents education profile of district Kasur⁵³.

Table 3.6.5: Educational Profile of District Kasur

Masjid Schools	Primary Schools	Middle Schools	High/HS Schools	Colleges
92	1,294	240	112	11

(Source: Punjab Development Statistics, Bureau of Statistics, GoPb, 2022)

3.6.6 Livestock and Farming

⁵⁰ Mosque is called "Masjid" in Urdu Language. Maktab is Urdu equivalent of school

⁵¹ Punjab Development Statistics, Bureau of Statistics, GoPb, 2022

⁵² Punjab Development Statistics, Bureau of Statistics, GoPb, 2022

⁵³ Punjab Development Statistics, Bureau of Statistics, GoPb, 2022



Agriculturally fertile land is a big asset of the country. However, because of its fast engulfment by the housing and other non-agrarian sectors, the availability of lands for agricultural pursuits has squeezed over the time. Nevertheless, agriculture and livestock farming are still the major sources of income for the peri-urban and the rural communities of the district. A number of small to medium size dairy and cattle farms can be seen in the villages as well as at some places around the site. These dairy farms provide fresh milk for the residents of the nearby cities. Because of number of factors, livestock-, goat-, and sheep farming are becoming attractive sectors of investments. In a way, livestock is complimentary and dependent on the agricultural farming. Usage of the husbandry for ploughing and for farming purposes is at the decline and is being replaced rapidly by mechanical implements of farming. Government and commercial financial institutions are granting liberal loans to the farmers and the growers for purchasing agricultural machinery⁵⁴.

Because of non-availability of other means of livelihood for the rural folk, livestock is a major source of income next only to agriculture. Almost every rural household has reasonable stock of goats, sheep, cows and bullocks. Livestock is taken out to fields, for grazing in the morning and brought back home in the evening, mostly by the womenfolk. **Table 3.6.6** presents livestock resource profile of Kasur⁵⁵.

Table 3.6.6: Livestock Resources of District Kasur

Cattle	Buffalo	Sheep	Goat	Work Animals							
				Bullock	Cow	M/Bufalo	F/Bufalo	Camel	Horse	Ass	Mules
173000	493000	39000	256000	5435	21	810	111	395	4655	31400	2265

(Source: Punjab Development Statistics, Bureau of Statistics, GoPb, 2022)

(Number)

3.6.7 Communication, Transport and Infrastructures Profile

The site, per se, is devoid of any landline communication and infrastructure facilities except its coverage by the mobile telephony. As far as the district is concerned, there are wide variations in the availability of infrastructure facilities in the district. Whereas, availability and condition of roads in the city of Kasur is fair, it is deplorable in rural areas including the project area⁵⁶. As a part of its developmental agenda, the Government is focussing attention on the construction of farm-to-market roads (FMR) in the province and building of highway infrastructure under the Annual Development Program (ADP) and the Public Sector Development Programs (PSDP). Construction of the roads under various programs has substantially improved agricultural marketing and timely transportation of the farm produce to markets⁵⁷. However, outreach of public transport is not enviable.

The site is devoid currently of any important infrastructure. However, the basic infrastructure is present along Phoolnagar Bypass Road. The area surrounding the site lacks in basic social amenities like gas, water supply, sewerage and healthcare. Electricity is available in almost all the nearby villages. Some healthcare facilities (BHU Pattoki), primary education and mobile telephone coverage is available in the area. However, majority of the people showed their dissatisfaction about the quality of the services provided by the public sector institutions. The site is linked with Kasur and with various other destinations through Phoolnagar Bypass Road.

Public transport is available round the clock for the major cities. General Bus Stand and Municipal Wagon Stand are the biggest road transport terminals in Kasur. Some private transport operators have setup good quality bus terminals at Kasur recently. Kasur Railway Station is an important railway station. There is no airport at Kasur and the citizens use Lahore Airport for domestic and international flights.

The site has all essential infrastructure facilities including coverage by the mobile telephony. As far as the district is concerned, there are wide variations in the availability of infrastructure facilities in the district. Whereas, availability and condition of roads in the city of Kasur is fair, it is deplorable in rural areas including the area⁵⁸. As a part of its developmental agenda, the Government is focussing attention on the construction of farm-to-market roads (FMR) in the province and building of highway infrastructure under the Annual Development Program (ADP) and the Public Sector Development Programs (PSDP). Construction of the roads under various programs has substantially improved agricultural marketing and timely transportation of the farm produce to markets⁵⁹. However, the outreach of public transport is not enviable. The premises has the basic infrastructure. **Table 3.6.7** presents infrastructure profile of Kasur⁶⁰.

⁵⁴ Punjab Development Statistics, Bureau of Statistics, GoPb, 2022

⁵⁵ Punjab Development Statistics, Bureau of Statistics, GoPb, 2022

⁵⁶ Punjab Development Statistics, Bureau of Statistics, GoPb, 2022

⁵⁷ Medium Term Budgetary Framework, P&D Board, GoPb, 2022

⁵⁸ Punjab Development Statistics, Bureau of Statistics, GoPb, 2022

⁵⁹ Medium Term Budgetary Framework, P&D Board, GoPb

⁶⁰ Punjab Development Statistics, Bureau of Statistics, GoPb, 2022

**Table 3.6.7: Infrastructure Profile (Length of Roads in km) District Kasur**

National Highways	Motorway	Provincial Highways	R&B Sector	FMR	Sugarcane Cess Road	Ex-Distt. Council Roads	Total Length
53.13	--	409.83	1048.61	209.80	16.60	--	1721.37

(Source: Punjab Development Statistics, Bureau of Statistics, GoPb, 2022)

(Kilometres)

3.6.8 Socioeconomic Profile

On the socioeconomic front, district Kasur is still not a fully developed district. However, opportunities exist in business, trade, industry and agriculture in the district. Most of the rural folk rely upon animal husbandry for sustenance and income. They tend to rear cows, buffaloes, sheep, goats for milk and meat. Small-scale cottage and the agro-based industry are on the rise. Many of the locals travel to find work in Faisalabad, Islamabad, Lahore and Multan.

The people in rural areas depend largely on livestock for their livelihood and usually keep buffaloes, cows, sheep, goats and bullocks. Cash income of the people is small. As far as employment is concerned, abundant opportunities of business, trade and industry exist. A large section of population is absorbed in services sector, mainly in the civil government. A few are working abroad as expatriates. Large sections of population are engaged in agricultural sector i.e., farming and livestock raising. The mean income level of the people is around Rs. 3,000~5,000 per month.

Communication facilities in the form of regular landlines and mobile telephony are available in the whole district. Telecommunication system in the form of regular landline, broadband wireless telephony, and mobile telephone connections is one of the fast-growing areas of the economy. Internet facility through dialup, broadband DSL and the wireless Wi-Fi is also available. The majority of the educational institutions in the public and the private sector have computers for aiding in learning pursuits and making the students computer literate. The main occupations of the people are farming, shopkeeping, service (government & public), working abroad and working as labourer. According to the statistics relating to income of the main occupational classes, the per capita per day income ranges from Rs. 21 to Rs. 77 for the main occupational groups.

Per capita income appears to be related to the officially announced poverty line of Rs. 878.64/capita/ month (Pakistan Economic Survey, 2022-23) that comes to Rs. 29.28 per capita per day. The latest estimate of inflation-adjusted poverty line per capita per day comes to Rs. 34.82 in 2008, up from Rs 29.28 in 2010-11. The analysis reveals that except for households, whose members are in Govt. or private service, or whose family members have gone abroad, other occupational classes in the area are living below the official poverty line.

3.6.9 Culture, Religion, Customs, Traditions and Specialties

The majority people of Kasur are staunch Muslims by faith. Punjabi is the native language and is spoken widely in the district. However, Urdu is gaining popularity and is becoming the lingua franca, particularly amongst the youngsters and in the roadside settlements. People generally respect “chadar” (a women headgear symbolic of women respect) and chardewari (privacy), i.e. they do not mingle up with women publicly and stay away from others houses and respectfully wait to be called in or the residents to come out from their houses. A reasonable proportion of womenfolk observe the purdah (veil) etiquette, i.e. they remain secluded from outsiders. However, womenfolk do participate in almost all sorts of social, cultural, economic, educational and outdoor activities⁶¹. Although, the Joint family system is the predominant mode of social life, yet “nucleus” or the small family system is found because of the socio-economic compulsions and attitudinal shifts in the youth. Kasur produces low-temperature pottery and ceramic goods, huqqa (or water pipe), artistic handicrafts, flowerpots, *changairian* (made from the leaves of palm and date trees) and cotton mats.

The population of the wider area around the facility sites consists predominantly of Muslims. However, there are reasonable number of Christians residing at the surrounding areas. Punjabi is the native language and is spoken widely in the locality. However, Urdu is gaining popularity and is becoming the lingua franca, particularly amongst the youngsters. People generally respect chadar and chardewari, i.e. they do not mingle up with women publicly and stay away from others houses and respectfully wait to be called in or the residents to come out from their houses. A reasonable proportion of womenfolk observe the purdah etiquette, i.e. they remain secluded from outsiders. However, womenfolk do participate in almost all sort of social, cultural, economic, educational, and service activities⁶².

⁶¹ Based on information obtained during professional team’s visit to the project site

⁶² Punjab Sustainable Development Strategy, EPD, 2008



Although Joint family system is seen in number of households in the surrounding areas, yet the nucleus or small family system is fast emerging as the preferred mode of living, particularly in the urban areas, because of socio economic compulsions and attitudinal shifts in the youth.

3.6.10 Recreation and Sports

In addition to some active political parties, there are various social clubs in Kasur, which are actively working for the social well-being of the city residents. Some of them are Kasur Lions Club, Tameer-e-Millat Club, Progressive Club, Guru Nanak Alliance, Friends of Nature Club etc.

Municipal Stadium is the only standard stadium in Pattoki city. It is located near Kachahri Chowk in the Civil Lines area. It was outwardly re-built during the last government of Pervez Musharraf and Chaudhary Pervez Elahi. Many shops are set up around its wall and it is full of young people at evening hours and on holidays.

3.6.11 Historical & Archaeological Sites

There is no historical site within the zone of environmental influence of the project. However, the district has numerous sites of historical and archaeological importance. There is no antiquity protected under the Federal Legislation, but there are number of such antiquities notified under the Provincial Legislation. However, there is no site of historical or religious prominence around the facility site. [Table 3.6.11](#) presents a list of historical sites of district Kasur.

Table 3.6.11: Historical and Archaeological Sites in District Kasur

Federally Protected	Provincially Protected
▪ NA	▪ Shrine of Hazrat Bullhe Shah ▪ Shrine of Baba Kamal Chishti ▪ Masjid of Sher Shah Suri's period known as Jinnon Wali Masjid

Source: Archaeology Department, Govt of the Punjab

3.7 Lab Reports of Environmental Analyses

The lab reports of all essential and applicable parameters i.e., Air, Water and Noise have been made a part of the instant EIAR, as [Annex-3](#). As per the lab reports, all relevant environmental parameters are within the applicable parameters.

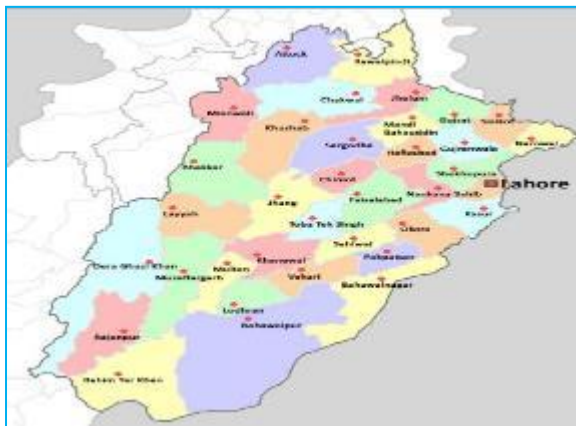


Fig. 3.4.1a: Map showing Location of Kasur



Fig. 3.4.1b: Map showing Location of Kasur



Fig. 3.5.1a: Wildlife Map of Punjab



Fig. 3.5.1b: Ecological Map of Punjab



4

SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS & MITIGATIONS



4. SCREENING OF ENVIRONMENTAL IMPACTS & MITIGATIONS

4.1 Environmental Examination & Mitigations

The instant section describes the aspects of environmental examination of construction and installation of the machinery and its operation on the physical, biological, social aspects of the environment. The report presents an outline of the measures for mitigation of the identified impacts. Both the primary and secondary as well as the direct and the indirect impacts have been discussed with respect to their immediate and the ultimate impacts on the various environmental quality parameters and the social significance.

Unlike the large-scale developmental projects, the instant project, because of its extremely small size, scale and spread, is likely not to produce any significant or even insignificant impacts on the local physical, biological and social environment within or out the project's zone of environmental influence. The setting-up of the plant on a vacant land, leased and possessed by the proponent will involve construction of building, installation of machinery and allied/ancillary infrastructure.

A qualified architectural engineer has prepared the design and architectural features of the plant's building. The design has been prepared in such a manner, as it will not cause any disturbances to the environment. Only some limited scale activities relating to construction of the plant building (such as civil-, mechanical-, and electrical-works etc.) will be carried out alongwith installation of necessary machinery and equipment. Therefore, interaction of construction activities with the environmental parameters and their possible impacts on the baseline environmental profile (positive & negative; visible & invisible; concrete & absolute; and reversible & irreversible) have been examined thoroughly.

The sections and subsections, following hereinafter, present a discussion and analysis of the various foreseeable environmental and social impacts of the project, if any (although none is expected) during both phases of the project i.e., the Construction phase and the subsequent operation phase. Besides presenting analysis of the likely impacts, the discussion presents an outline of the mitigation strategy and the best-suited mitigation measures for avoiding and addressing the identified adverse impacts, if any. The report presents discussion and analysis of the various primary and the secondary impacts as well as the direct and the indirect impacts of the project with respect to their immediate and the ultimate or distant effects on the various environmental quality parameters and the social factors of significance, wherever relevant.

The environmental impacts of operation of the plant are likely to arise mainly from combustion of various kinds of waste materials including biomedical waste during the operation phase. It is assumed that some vehicles running on fossil fuel (like petrol, diesel) will be deployed during construction of the plant building and installation of machinery and equipment on the site. The end-of-pipe exhaust emissions from engines of these vehicles and generation of noise during their deployment might produce some limited scale and momentary impacts on the local environment. Additionally, generation and disposal of the unspent building materials, debris, solid wastes and packaging wastes may also be associated with some other insignificant and transitory impacts of construction. Therefore, the impacts of construction, if any, will be temporary and transitory in nature. They will abate after construction of the plant building, complete in all respects.

As against the negative impacts, there will be number of positive impacts of setting-up of the plant. These would be availability of jobs for both skilled and unskilled personnel, income prospects for the persons involved in carriage and transport of materials and goods for the project and above all round the year easy availability of the products to be produced at the plant with a view to avoid their shortage in the market.

The premier most positive benefit of the plant is equitable availability of the products produced here, even for the distant and the remote areas of the province, at comparative prices. Because of these benefits, it is sufficed here to state that the positive impacts of setting-up of the plant will far outweigh the potentially negative impacts, if any, particularly, whence most of the latter are insignificant and mitigable. As regards the operation phase, not any significant environmental impacts could be discerned except the probability of industrial accidents from non-observance of the precautionary and the standard operating procedures by the workers and carelessness on their part.



4.2 Assessment Methodology

The instant EIA Report is based on the standard impact assessment methodology as prescribed by Government of Pakistan⁶³. In accordance with the said methodology, comparative analysis, both of the negative and the positive impacts has been carried out with respect to the already existing baseline conditions. The said comparison follows a parametric and a non-parametric scheme i.e., how and to what extent various environmental quality parameters (e.g., those relating to soil, air, water, and aesthetics) and non-parametric aspects (economy, social value system, employment, lifestyles, and behavioural patterns) will be influenced by various activities within the plant's zone of environmental influence.

The Modified Impact Assessment Matrices (**Tables 4.2a & 4.2b**) and a specific questionnaire (**Table 4.2c**) have been used for identification, screening and characterization of the unmitigated as well as the residual impacts on the physical, biological and social aspects using a numerical scale from (-)2 to 0 to (+)2 respectively. The value (-) 2 denotes high adverse impacts, (-) 1 low adverse impacts, 0 insignificant impacts, (+) 2 high beneficial impacts, (+) 1 low beneficial impacts, and N denotes nil impacts. This method of scaling up of the magnitude of the impacts helps in easy appreciation of the nature, quantum and effect of the project's impacts. **Table 4.2d** presents the method for environmental screening of the site.

4.3 Mitigation Strategy

The mitigation measures, as presented in this document, are aimed to prevent and reduce the foreseeable impacts of the plant activities during both Construction and the subsequent operation phase. The mitigation strategy for countering the adverse impacts is built on the following hierarchy of choices:

- Avoiding a particular impact altogether by taking or not taking a certain action or activity
- Minimizing the impact by limiting the degree or magnitude of the action and its implementation
- Rectifying the impacts by repairing, rehabilitating or restoring the affected environment
- Reducing or eliminating the impacts over the time by preserving and maintaining the operations all during life of the action
- Compensating for the impacts by replacing or providing substitute resources or environments
- Installing pollution control equipment and devices wherever indicated and necessary
- Improving landscape of the site to augment aesthetics and to reduce visual intrusion
- Reducing transmission of unwanted noise from site or spots of noise generating activities
- Taking any other appropriate step on the basis of feedback information on plant's usage and operation

It is advisable that these measures are implemented in a sequential order, beginning with avoiding the impacts and thereafter adopting the next sequential choices according to the ease of their implementation and cost considerations. Adoption of the above outlined mitigation strategy is expected to ensure long-term environmental and social sustainability of the project.

4.4 Likely Impacts and Mitigations of Location, Design & Planning

The discussion following hereinafter relates to impacts of construction of the plant building and installation of machinery and equipment on various important environmental parameters.

4.4.1 Design, Location & Layout Planning

The subsections following hereinafter present a discussion on environmental impacts of the project's design and planning stage. As per the information provided by the proponent, the site is a vacant and virgin land and the plant will be constructed as an altogether new structure. The proponent will hire professional services of an architect and engineer, who will prepare architectural design and layout plan of the building perfectly in accordance with the laid down criteria, guidelines and specifications of the concerned regulatory agency. As regards construction of the building and installation of plant machinery, the proponent will carry it out by a hired-on-contract labour force and a petty contractor. Therefore, both the proponent and the petty contractor will be responsible for the aspects relating to construction and operation of the plant. The scope of construction work of the building will include preparation of detailed design criteria, design analysis, calculations, detailed architectural drawings and quality control procedures necessary for setting-up of the plant and installation of machinery together with O&M costs. The contractor will also carry out the additional site investigations, if any will be required, for developing and drafting a time schedule suitable to meet construction requirements by adhering to the same.

⁶³ Environmental Impact Assessment Guidelines, GoPk Islamabad, 1997



i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Selection of site	▪ Neighbourhood issues ▪ Land use change ▪ Disposal of wastes and effluents ▪ Availability of amenities and utilities	Start of concept planning	Construction phase	Start of concept planning	▪ Minor ▪ Localized ▪ Insignificant ▪ Unimportant ▪ Mitigable	Not beyond the assumed zone of enviro influence	▪ Neighbours ▪ Residents ▪ Workers ▪ Management ▪ Others in contact	Carry out a feasibility study of the site regarding its fitness for the project including availability of amenities, disposal of wastes and effluents and the likely land use changes

4.5 Likely Impacts and Mitigations of Construction Phase

The discussion following hereinafter relates to impacts of the Construction phase of the project on various important environmental parameters.

4.5.1 Parametric Impacts of Construction Phase

The subsections following hereinafter present a discussion on the various parametric impacts of the project's construction phase.

4.5.1.1 Soils and lands

There will not be any environmental impacts on the soils and lands from construction of plant's building and installation of machinery on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur.

i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project setting up activities	▪ Neighbourhood issues ▪ Access obstruction from haphazard placement of materials ▪ Unnecessary diggings and excavations ▪ Disposal of dugout material and construction waste	From start till completion of construction	Construction phase	Some of the effects are likely to occur with probability	▪ Minor ▪ Localized ▪ Insignificant ▪ Unimportant ▪ Mitigable	Not beyond the assumed zone of enviro influence	▪ Neighbours ▪ Residents ▪ Workers ▪ Management ▪ Others in contact	▪ Ensure implementation of the EMP and the recommended mitigation measures forwarding of the likely impacts. ▪ Cover all loose material with protective sheets and shield off from the exterior ▪ Ensure implementation of



Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
		- excessive usage of water - disposal of used water - worksite accidents and injuries - neighbourhood noise - billowing of dust particulates							worksite safety measures and usage of PPEs

4.5.1.2 Surface Water Quality

As mentioned earlier under Chapter 2, there are not any significant surface water channels, even in the zone of environmental influence of the site. There is not any river or freshwater canal near the site. Therefore, there will not be any interaction of the surface water channels with the site.

i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project setting up activities	Degradation of local surface water resources, channels and waterways	NA	Construction phase	Nil. Site is not in interaction with any surface water body	Nil	NA	NA	NA

4.5.1.3 Groundwater Abstraction and Quality

Generally, construction activities, per se, do not cause groundwater depletion or contamination. The groundwater quality is affected only if wastewater (from any source) somehow succeeds in reaching to the groundwater aquifer. The most plausible route is a groundwater borehole. As there is no borehole at the site, therefore, there is no probability of contamination of groundwater from this route. The requirement of water for civil work and masonry structures will be just normal @ 1 m³ for 10 m² of constructed / covered area. As the total covered area of the plant will be 16,249 ft² (1,510 m²), the total water requirement will be 151 m³. This will be arranged easily either from a local water supply vendor or from the borehole, which is to be constructed to cater for water needs for plant's operation.

i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project setting	Degradation of local	From start till	Construction	Improbable	- Minor - Localized	Not beyond	Vicinity community	Ensure quality of construction



Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
	up activities	groundwater resources and or aquifer ▪ Depletion of groundwater resources from over usage	completion of construction	phase		▪ Insignificant ▪ Unimportant ▪ Mitigable	the assumed zone of environmental influence		groundwater borehole, if any to be constructed ▪ Ensure implementation of the water use conservation practices, as suggested in EMP ▪ Ensure implementation of the EMP recommendations ▪ Check the water quality periodically

4.5.1.4 Wastewaters and Effluents

The construction of the plant building and installation of machinery and equipment therein will not generate any wastewaters, whatsoever

i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project setting up activities	▪ Degradation of local wastewater drainage from indiscriminate throwing of construction wastewater	From start till completion of construction	Construction phase	Improbable	▪ Minor ▪ Localized ▪ Insignificant ▪ Unimportant ▪ Mitigable	Not beyond the assumed zone of environmental influence	▪ Nil	▪ Ensure throwing of construction wastewater, if any, after septic tank treatment and under a valid NOC from the regulatory agency (proponent has already obtained the requisite NOC from the concerned regulatory authority) ▪ Ensure implementation of the EMP recommendations ▪ Check the quality of wastewater periodically

4.5.1.5 Air Quality

The construction of the plant building and installation of machinery and equipment therein will not produce any air quality impacts, whatsoever

i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

**iii) Mitigation Measures**

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project setting up activities	▪ Degradation of local air quality from construction activities ▪ Billowing of dust and particulates from the loose materials stored at the site	From start till completion of construction	Construction phase	Improbable	▪ Minor ▪ Localized ▪ Insignificant ▪ Unimportant ▪ Mitigable	Not beyond the assumed zone of environmental influence	▪ Neighbours ▪ Residents ▪ Workers ▪ Management ▪ Others in contact	▪ Cover all loose materials with protective sheets ▪ Do not carry out construction activities during windy conditions ▪ Shield off the site from the exterior with a curtain shield ▪ Ensure implementation of the EMP recommendations ▪ Check the air quality periodically

4.5.1.6 Noise and Vibrations

Generally, the noise and vibrations are of relevance to construction activities only if their levels exceed the prescribed limits. The noise levels higher than a threshold can produce psychological and social impacts of distracted attention, irritation and short-temperedness. However, owing to non-cumulative property of sound and vibrations, the impacts are reversible and of significance only during continuation of the noisy activities.

i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project setting up activities	▪ Generation of noise and vibrations from construction activities	From start till completion of construction	Construction phase	Only during construction hours	▪ Minor ▪ Localized ▪ Insignificant ▪ Unimportant ▪ Mitigable	Not beyond the assumed zone of environmental influence	▪ Neighbours ▪ Residents ▪ Workers ▪ Management ▪ Others in contact	▪ Carry out the constructions during daylight hours ▪ Provide PPEs to the exposed persons ▪ Ensure implementation of the EMP recommendations

4.5.2 Non-Parametric Impacts of the Construction Phase

The subsections following hereinafter present a discussion on the non-parametric impacts of the plant's Construction phase.

4.5.2.1 Land use change

The land use change from a more useful purpose to a less useful purpose is considered generally a kind of negative environmental impact. As regards construction of plant's building and installation of machinery, there will not be any change in the land use, as the site is a vacant open land. As regards the permissible land use under the applicable bylaws, the proponent shall obtain an NOC in this regard from the concerned regulatory authority regarding use of the land for setting-up the plant.

**i) Likely Impacts**

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project setting up activities	▪ Negative land use change	Concept planning	Construction phase	Once only	▪ Minor ▪ Localized ▪ Insignificant ▪ Unimportant ▪ Mitigable	Not beyond the assumed zone of environmental influence	▪ Owner of land	▪ Ensure land use change only under valid approval of the concerned regulatory authority (proponent has already applied to the LDA in this regard) ▪ Ensure implementation of the EMP recommendations

4.5.2.2 Solid Wastes

The construction of the plant building and installation of machinery and equipment therein will not generate any solid wastes.

i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project setting up activities	▪ Likelihood of degradation of soil, land, air, water and ambient environment from improper disposal of wastes ▪ Likelihood of spread of diseases from growth of disease-causing organisms in the waste	From start till completion of construction	Construction phase	Indeterminate Unsure	▪ Minor ▪ Localized ▪ Insignificant ▪ Unimportant ▪ Mitigable	Not beyond the assumed zone of environmental influence	▪ Nil	▪ Ensure safe and secure collection and disposal of all wastes ▪ Provide waste collection bins at appropriate locations ▪ Display instructional signboards to educate the people not to throw away wastes ▪ Ensure implementation of the EMP recommendations

4.5.2.3 Access, Easement, Health, Wellbeing and Worksite Safety

The construction of the civil structures will not cause any environmental and social impacts of rights of access, easement, health, community's wellbeing and worksite safety. Improper and poor design can lead to construction of poor-quality structures, which in turn can produce psychological, behavioural and health



impacts on the users of the facility. A poorly designed structure can be troublesome for the users and the neighbouring communities. Haphazardly placed materials and debris on or near the site can cause impedance of movement, risks of personal injury and inconvenience for the neighbours. Non-observance of the worksite safety instructions and non-use of safety gadgets during Construction operations can increase vulnerability of the exposed persons to adverse health and personal safety impacts.

i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project setting up activities	▪Likelihood of inconvenience to locals ▪Risks of injuries and hazard exposure of the workers and other persons	From start till completion of construction	Construction phase	Rare and infrequent	▪Minor ▪Localized ▪Insignificant ▪Unimportant ▪Mitigable	Not beyond the assumed zone of environmental influence	▪Neighbours ▪Residents ▪Workers ▪Management ▪Others in contact	▪Ensure that no inconvenience is caused to the neighbours ▪Ensure wearing of PPEs by all the persons while on work ▪Ensure implementation of the EMP recommendations

4.5.2.4 Cutting and Removal Trees and Crops

The construction of the plant building and installation of machinery and equipment therein will not involve cutting and removal of any trees, whatsoever

i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project setting up activities	▪Likelihood of loss of vegetative cover ▪Land instability due to removal of trees ▪Effect on the habitat and local fauna and flora	From start till completion of construction	Construction phase	Unlikely	▪Minor ▪Localized ▪Insignificant ▪Unimportant ▪Mitigable	Not beyond the assumed zone of environmental influence	▪Nil	▪Avoid cutting of any standing tree ▪If cutting of a tree is inevitable, ensure plantation of double the number of trees cut ▪Ensure implementation of the EMP recommendations

4.6 Likely Environmental Impacts of Operation Phase

The discussion following hereinafter relates to some foreseeable impacts of the plant's operation phase on various important environmental parameters as well as of the non-parametric aspects. As a general rule, the potentiality of the negative impacts of a plant is likely to increase with the number of persons using the facility.



Higher the number of users, higher will be the amount of the wastes, effluents and air emissions generated. Thus, volumetric increases of consumption of resources and the resultant generation of effluents and emissions will be proportional directly to the number of the users.

4.6.1 Parametric Impacts of the Operation (Usage) Phase

The subsections following hereinafter present a discussion on the parametric impacts of the plant's operation phase.

4.6.1.1 Soils and Lands

The irresponsible and indiscriminate discharge of wastewaters and solid wastes (e.g., bottom ash, partially burnt and or unburnt materials) on nearby soils can have the potential to contaminate the receiving soils. However, in the instant case, the proponent will not discharge any used water or wastes to the vicinity soils. The returning water from the wet scrubber will be received and treated in the water tank inside the premises. After treatment and cooling down, it will be reused and recirculated into the system. The water loss will be replenished by adding freshwater to the system. In this manner, used water from the plant will not have any interaction with the soils outside. Hence, no impacts on nearby and adjacent soils and lands.

i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project operational activities	▪ Nil	Nil	Operation phase	NA	▪ NA	Not beyond the assumed zone of environmental influence	▪ NA	▪ Ensure implementation of the EMP recommendations

4.6.1.2 Surface Water Quality

The operation of the plant will not have any interaction with any nearby surface waters. There is no natural surface water body near or within the zone of environmental influence of the site. There are few irrigation watercourses in the vicinity for supplying water to the nearby agricultural lands. As a matter of fact, none of the surface water sources of the area is likely to be affected from any of the operational activities of the plant. Furthermore, the local geographical gradient also does not suggest any likelihood of effects on the surface waters from gravity drainage from the site. Therefore, no chances of pollution of the local surface waters during operation.

i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project operational	▪ Degradation of local surface water	NA	Operation phase	Nil. Site is not in interaction	▪ Nil	NA	▪ NA	▪ NA



Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
	activities	resources, channels and waterways			with any surface water body				

4.6.1.3 Groundwater Abstraction and Quality

Water will be required, during operation of the plant, for various usages, which interalia will include the following:

- ✓ Normal human water needs for the workers, staff, employees, visitors and management both at the worksite toilets and the pantry
- ✓ Water requirement for cooling the furnace tower and maintenance of requisite temperature inside the furnace
- ✓ Water requirement for wet scrubbing of the flue gases in the pollution control system
- ✓ Miscellaneous and unclassified water requirements e.g., washing of floor, machinery etc.

As regards water usage for human needs, it will be just normal for such like plant and can be calculated on per capita basis. Generally, the water usage in a small sized industrial unit, like the instant one is around 50-70 litres per person per day. This is normal amount and does not have any bearing on the local water resources. As regards water requirement for the process operations, cooling of furnace and wet scrubbing of emission gases, it is difficult to calculate the exact amount at this stage. However, large amount of water will be required in the initial start-up, as the water tank will have to be filled to ensure continuous and uninterrupted water supply for process operations. The approx. capacity of the water tank will be 1,000 ft³ or 30 m³. After the initial filling, the tank will supply water for the above-mentioned operational needs. The water loss from evaporation, leakages and seepage is calculated @ 10%. Hence, 100 ft³ or 3 m³ will have to be replenished daily from the groundwater turbine to be installed at the plant.

i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project operational activities	▪ Degradation of local groundwater resources and or aquifer ▪ Depletion of groundwater resources from over usage	Operation phase	Operation phase	Indeterminate Indiscernible	▪ Minor ▪ Localized ▪ Insignificant ▪ Unimportant ▪ Mitigable	Not beyond the assumed zone of environmental influence	▪ Vicinity community	▪ Ensure implementation of the water use conservation practices, as suggested in EMP ▪ Ensure implementation of the EMP recommendations ▪ Check the water quality periodically

4.6.1.4 Wastewaters and Effluents

Because of installation of water reuse, recirculation and conservation system, there will not be the wastewater discharge to the exterior from the plant except surplus water from the scrubbing system. All returning water from the furnace and the wet scrubber will come to the water collection tank. After treatment and cooling down, water will be recirculated to the system for reuse. In this way, optimal water conservation will be ensured.

i) Likely Impacts



- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project operational activities	▪ Degradation of local wastewater drainage from indiscriminate throwing of used wastewater ▪ Discharge of sanitation wastewater from toilets and washrooms without treatment	Operation phase	Operation phase	Operation phase	▪ Minor ▪ Localized ▪ Insignificant ▪ Unimportant ▪ Mitigable	Not beyond the assumed zone of environmental influence	▪ Workers ▪ Management ▪ Others in contact	▪ Ensure treatment of process wastewater prior to its discharge into receiving drainage channel under a valid NOC from the regulatory agency (proponent has already obtained the requisite NOC from the concerned regulatory authority) ▪ Ensure treatment of sanitation wastewater in the septic tank prior to its discharge into receiving drainage channel ▪ Ensure implementation of the EMP recommendations ▪ Check the quality of wastewater periodically

4.6.1.5 Air Quality

The emission gases from the rotary furnace will comprise particulate matter, soot and the emission gases, mainly SO₂. The plant will be fitted with an efficient air emission cleaning and control system consisting of a dry cyclone scrubber, fabric baghouse filters and wet venturi scrubber. This arrangement will ensure optimal cleaning of the flue gas and its conformity to the applicable PEQS prior to discharge out. The dry cyclone scrubber will remove the dust, soot and particulate matter. The baghouse filtration system will remove all fine particulates and other impurities. Lastly, the wet scrubber, besides removing the remaining impurities, will convert SO₂ into H₂SO₄. This triple cleaning system will ensure compliance of the final vent air to the PEQS. The only likelihood of affecting of the local air quality will be only if this pollution control system fills or becomes dysfunctional, somehow. The proponent must ensure proper working, repair and maintenance of the system.

i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project operational	▪ Degradation of local air quality from	Operation phase	Operation phase	Linked to particular activity	▪ Minor ▪ Localized ▪ Insignificant	Not beyond the	▪ Neighbours ▪ Residents ▪ Workers	▪ Install appropriate pollution control equipment with all



Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
	activities	operational activities ▪Likelihood of effect on local air quality from stack emissions ▪Blowing of drag dust from movement of vehicles coming and leaving the plant premises				▪Unimportant ▪Mitigable	assumed zone of enviro influence	▪Management ▪Others in contact	likely sources of air emissions ▪Ensure proper working of emission control system ▪Check the stack emission periodically to ensure their conformity with the applicable PEQS ▪Ensure implementation of the EMP recommendations ▪Check the air quality periodically

4.6.2 Non-Parametric Impacts of the Operation Phase

The subsections following hereinafter present a discussion on the non-parametric impacts of the plant's operation phase.

4.6.2.1 Electricity Usage

The plant machinery will run mainly on the electricity connection from the concerned electric power distribution company. The plant will have its own dedicated electric transformer on payment from LESCO.

i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project operational activities	▪Nil	Operation phase	Operation phase	Unknown	▪unknown ▪Mitigable	Backend impacts	▪NA	▪Ensure as minimal usage of electric power, as possible ▪Ensure implementation of the EMP recommendations

4.6.2.2 Water Usage

The routine operations of the plant, per se, will not require any alarming amounts of freshwater. However, freshwater will be required for the various ordinary human, sanitation and other miscellaneous needs of the project staff. As has been mentioned under Section 1, the strength of the operational staff will hardly exceed 10 persons at any one time. If it is assumed that all 10 persons are always present and the average per capita consumption for all and various needs will be 50 litres per person per day, then the total volumetric requirement of freshwater for 10 persons will be 500 litres (0.5 m³) per day, the maximum. Based on these calculations, the monthly consumption will be 15000 (15 m³) litres and the annual consumption against the 280 days' work year will be 140000 (140 m³) litres. This is just normal and without any significance.

As regards water requirement for the process operations, cooling of furnace and wet scrubbing of emission gases, it is difficult to calculate the exact amount at this stage. However, large amount of water will be required in the initial start-up, as the water tank will have to be filled to ensure continuous and uninterrupted water supply for process operations. The approx. capacity of the water tank will be 1,000 ft³ or 30 m³. After the initial filling, the tank will supply water for the above-mentioned operational needs. The water loss from



evaporation, leakages and seepage is calculated @ 10%. Hence, 100 ft³ or 3 m³ will have to be replenished daily from the groundwater turbine to be installed at the plant.

As mentioned above, water will be used mainly in the wet scrubber (for removal of particulates) and cooling tower (for maintaining the desired temperature of the recirculating water). The major usage will be in the wet scrubber, where water showering will be employed for cleaning the vent air. However, the spent water from both points will return to the cooling tank from where it will be recirculated and reused after lowering of its temperature. In this manner, usage of water will be minimised and conserved efficiently. The requirements of water in the worksite toilets and washrooms will be just normal for a such like facility. There is no population or human settlement adjacent to or near the site, which might be affected from water usage at the plant. Therefore, usage of water at the plant will not interfere with community's water resources.

i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project operational activities	▪ Degradation of water quality ▪ Depletion of water source from over usage	Operation phase	Operation phase	Probable	▪ Minor ▪ Localized ▪ Insignificant ▪ Unimportant ▪ Mitigable	Not beyond the assumed zone of environmental influence	▪ Vicinity community	▪ Ensure implementation of the water use conservation practices, as suggested in EMP ▪ Ensure implementation of the EMP recommendations ▪ Check the water quality periodically

4.6.2.3 Solid Wastes

There will not be excessive solid waste generation during operation of the plan except ordinary routine food waste. This ordinary household type waste will consist of food wraps, papers, eatables, food residues, paper, glass, empty cans, tin bottles, food packaging, peelings, PET bottles, plastics, toys and rags⁶⁴. According to a study on the subject, such types of the municipal wastes contain relatively higher amounts of inorganics on comparative weight basis⁶⁵. The organic constituents of these wastes tend to putrefy early and therefore may give rise to foul smells particularly during hot summer days⁶⁶. These solid wastes will be collected by the project authorities separately and will be transported to the municipal solid waste dumping site.

As regard the process operations, the only waste to be generated will be the bottom ash. This will be a homogenous amorphous and powdery material consisting of various metallic, non-metallic and other substances. After collection from the furnace bottom, the bottom ash will be transferred to the designated enclosure. Here, it will be covered with impervious sheets and allowed to stabilize under normal atmospheric conditions. Trench disposal is the only acceptable and the best method for disposal of incineration bottom ash.

i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

⁶⁴ Management of Solid Waste, Solid Waste Management Unit, City District Government, Lahore, 2002

⁶⁵ Characterization of Solid Wastes in Lahore, MSc Thesis, College of Earth & Environmental Sciences, Lahore

⁶⁶ Solid Waste Guidelines, Environmental Protection Agency, GoPb, 2008



iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project operational activities	- Likelihood of degradation of soil, land, air, water and ambient environment from improper disposal of wastes - Likelihood of spread of diseases from growth of disease-causing organisms in the waste	Operation phase	Operation phase	Operation phase	- Minor - Localized - Insignificant - Unimportant - Mitigable	Not beyond the assumed zone of environmental influence	- Neighbours - Residents - Workers - Management - Others in contact	- Ensure safe and secure collection and disposal of all wastes - Provide waste collection bins at appropriate locations - Display instructional signboards to educate the people not to throw away wastes - Ensure implementation of the EMP recommendations

4.6.2.4 Noise, Vibrations and Odours

There will not be the generation of any undesirable noise and vibrations during operation phase of the plant.

i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project operational activities	Generation of noise and vibrations from construction activities	Operation phase	Operation phase	Operation phase	- Minor - Localized - Insignificant - Unimportant - Mitigable	Not beyond the assumed zone of environmental influence	- Neighbours - Residents - Workers - Management - Others in contact	- Ensure proper upkeep and oiling of the noise making machinery regularly - Provide noise barriers around the high noise producing areas - Provide PPEs to the exposed persons - Ensure implementation of the EMP recommendations

4.6.2.5 Health, Safety and Community Wellbeing

There will not be any impacts relating to health, safety and community wellbeing

i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures



▪ Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project operational activities	▪Likelihood of inconvenience to locals ▪Risks of injuries and hazard exposure of the workers and other persons	Operation phase	Operation phase	infrequent	▪Minor ▪Localized ▪Insignificant ▪Unimportant ▪Mitigable	Plant machinery area	▪Workers ▪Management ▪Others in contact	▪Ensure that no inconvenience is caused to the neighbours ▪Ensure wearing of PPEs by all the persons while on work ▪Provide first aid system at the premises ▪Ensure implementation of the EMP recommendations

4.6.2.6 Receiving of Waste Materials

The plant building will have a separate designate enclosure for receiving and storing the incoming waste materials under optimal conditions. The enclosure will be a well-ventilated, airy and well-lit place to ensure favourable conditions for storage of the materials without affecting their quality and characteristics. The incoming materials will be properly unloaded under the supervision of the shift in charge and stacked at their respective places according to nature and type of the material. There will not be any discernible impacts of this activity of unloading and storing of the waste materials at the premises.

i) Likely Impacts

▪ Nil

ii) Activities Likely to Produce the Impacts

▪ Nil

iii) Mitigation Measures

▪ Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project operational activities	▪Unsafe receiving and storage of wastes ▪Generation of foul smells from long storage of degradable organic waste ▪Risks of infection, injuries and hazard exposure of the workers and other persons handling the wastes	Operation phase	Operation phase	infrequent	▪Minor ▪Localized ▪Insignificant ▪Unimportant ▪Mitigable	Waste receiving and storage area	▪Workers ▪Management ▪Others in contact	▪Ensure that the incoming waste is received, stored and handled in strict accordance with the SOPs. ▪Avoid manual and personal contact with the waste material ▪Ensure wearing of PPEs by all the persons while handling the waste ▪Provide first aid system at the premises ▪Ensure implementation of the EMP recommendations

4.6.2.7 Incineration Operations



The incineration of the wastes will take place under strict monitoring in a dual chamber vertical furnace at a temperature of around 1200°C. The chemical and the physical reactions that will take place inside the furnace will convert the wastes into ashes and gases. However, incineration will produce some particulate matter and emission air. The latter will be primarily a mixture of various gases (e.g., CO, CO₂, oxides of sulphur, oxides of nitrogen and traces of other gases). The flue gas from the furnace outlet will be transported to the pollution control system, which will comprise a wet scrubber, a sedimentation tank and a stack tower. Whereas, the particulate matter will be removed through gravity settling and in the form of slurry in the settling tank; the gases will be oxidized into water and CO₂. Only the clean air containing CO₂ and water vapours will be discharged to the atmosphere, after ensuring its conformity to the applicable PEQS. The bottom ash will be collected and disposed of separately in the designated enclosure. It will be ensured that the operations are carried out with the help of suitable machinery with no or minimal manual interference. Nevertheless, all persons working at the plant will observe and comply with the standard regime of industrial safety. They will put on requisite safety and personal protection gadgets, while present in the work area and operating the plant. Owing to adoption of the SOPs, there will not be any discernible impacts of plant's operation provided the recommended mitigation measures are properly implemented and efficient working of the pollution control system is ensured.

i) Likely Impacts

- Industrial accidents
- Escape of flue gas in the atmosphere
- Generation of bottom ash
- Workers' exposure to industrial hazards and process operations

ii) Activities Likely to Produce the Impacts

- Process and production operations
- Faulty working of the pollution control system
- Non observance of the SOPs

iii) Mitigation Measures

- Ensure observance of the SOPs for production operations
- Ensure proper working of the pollution control system
- Timely remove the faults, as and when they may occur
- Ensure strict monitoring of the process operations, pollution control system and all others

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project operational activities	▪ Generation of particulate and air emissions from incineration operations with all likely impacts ▪ Risks of infection, injuries and hazard exposure of the workers and other persons operating the plant	Operation phase	Operation phase	infrequent	▪ Minor ▪ Localized ▪ Insignificant ▪ Unimportant ▪ Mitigable	Not beyond the assumed zone of environmental influence	▪ Neighbours ▪ Residents ▪ Workers ▪ Management ▪ Others in contact	▪ Ensure that all plant operations are carried out in accordance with the standard SOPs ▪ Ensure regular check-up and upkeep of all the machinery and equipment ▪ Ensure proper working of the emission control equipment and system ▪ Ensure wearing of PPEs by all the persons while handling the waste ▪ Provide first aid system at the premises ▪ Carry out lab analysis of the air emissions periodically to



Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
									ensure their conformity with the applicable PEQS ■ Ensure implementation of the EMP recommendations

4.6.2.8 Marketing of Services

There will not any finished products to be manufactured or produced at the plant. However, the proponent will institute a marketing system for fetching business for his investment. In addition to direct receipt of the wastes from industrial, commercial and institutional sources, the proponent will make endeavours to get biomedical and healthcare waste from the hospitals, clinics, dispensaries and alike sources etc. There will not be any discernible impacts of marketing efforts by the proponent.

i) Likely Impacts

- Nil

ii) Activities Likely to Produce the Impacts

- Nil

iii) Mitigation Measures

- Nil

Sr.	Activity	Likely Impacts	Time of Occurrence	Duration of Impact	Frequency Probability Occurrence	Category of Impact	Zone of Effect	Exposed Persons	Mitigation Measure (EMP)
1.	Project operational activities	■ Nil	Operation phase	Operation phase	NA	■ Nil	NA	■ Nil	■ Ensure implementation of the EMP recommendations

4.7 Environmental Enhancement Measures

Aggressive tree plantation, development of grassy plots, lawns and greenbelts is proposed as the prime measure for enhancing and improving the environmental ambience and aesthetics of the plant premises


Table 4.2a

Simplified Environmental and Social Impact Matrix (Unmitigated Impacts)

Environmental Components	Physical				Biological		Social and Socioeconomic																	
Project Activities	Soil Erosion / Contamination	Surface Water Quality	Groundwater Quality	Air Quality	Natural Vegetation	Wildlife	Access and Easement	Noise and Vibrations	Agriculture / Farming	Livestock Grazing	Safety and Hazards	Public infrastructure	Aesthetic Value	Wetlands Eco-system	Health and Wellbeing	Education / Learning	Gender Issues	Employment / Income	Community Empowerment	Price of Land	Community Participation	Archaeological Heritage	Cultural Issues	Impact on occupants
Site Selection	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	+1	+1	+1	0	N	N	N
Master Planning / Layout Designing	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	+1	N	+1	0	N	N	N
Construction Activities	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	+2	+1	+1	+1	N	N	N
Operation	N	N	N	N	N	N	N	N	N	N	N	N	N	N	+2	+2	+1	+2	+1	+1	+1	N	0	N

Key: -2=High Negative Impact -1=Low Negative Impact 0=insignificant/Negligible impact +1=Low Positive Impact +2=High Positive Impact N=No Impact


Table 4.2b

Simplified Environmental and Social Impact Matrix (Mitigated & Residual Impacts)

Environmental Components	Physical				Biological		Social and Socioeconomic																	
Project Activities	Soil Erosion / Contamination	Surface Water Quality	Groundwater Quality	Air Quality	Natural Vegetation	Wildlife	Access and Easement	Noise and Vibrations	Agriculture / Farming	Livestock Grazing	Safety and Hazards	Public infrastructure	Aesthetic Value	Wetlands Eco-system	Health and Wellbeing	Education / Learning	Gender Issues	Employment / Income	Community Empowerment	Price of Land	Community Participation	Archaeological Heritage	Cultural Issues	Impact on occupants
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	+1	+1	+1	0	N	N	N
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	+1	N	+1	0	N	N	N
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	+2	+1	+1	+1	N	N	N
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	+2	+2	+1	+2	+1	+1	+1	N	0	N
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	+2	+2	+1	+2	+1	+1	+1	N	0

Key: -2=High Negative Impact -1=Low Negative Impact 0=insignificant/Negligible impact +1=Low Positive Impact +2=High Positive Impact N=No Impact



Table 4.2c

Environmental Questionnaire

A: Environment / Resource Linkages:

Aspect	Action
Will environmental considerations, including present human land use pattern in the vicinity, be incorporated into the selection of technology, the location, scale & design of the plant?	Not relevant
Have hydrologic, geologic, seismological, and meteorological studies have been made to anticipate and minimize possible damage to humans, fish & wildlife resources and vegetation?	Pertinent aspects have been studied
Does a comprehensive plan link the project to environmental aspects of raw materials, bye-product utilization, shipping, and processing?	yes

B: Project Design & Construction:

Have alternative sites or locations of the plant been considered in an effort to avoid or mitigate environmental degradation?	yes
What features for environmental protection will be incorporated in the design & operations?	As given in technical feasibility and EIAR
Is there a comprehensive construction plan that takes into account ecological factors?	Yes
Are road patterns, land excavation, fill sites, refuse disposal activities etc., planned to minimize damage to the natural environment?	Yes
What provisions have been made for restoring sections of the construction area	Not relevant
Will construction personnel be exposed to unique local health problem, or will they introduce diseases?	No

C: Operations:

Do offloading & on-loading methods incorporate human & environmental safeguards?	Yes
What are the dangers of an explosion or spill of hazardous material	negligible
Will contingency plans, including manpower & materials, be available to cope with the accidents?	Yes
Has adequate attention been given to the design & construction of safe storage facilities for hazardous materials & refinery products?	Yes. But not relevant
Will floating roof tanks be employed?	No
What types and quantities of effluents or particulate emissions will the plant produce?	No

(Adapted from the EIA Guidelines, Govt. of Pakistan)


Table 4.2d

Environmental Screening Proforma

Sr.	Screening Parameter	Likelihood		Remarks
		Yes	No	
	A. Plant Siting: Is the site adjacent to or within any of the notified environmentally sensitive areas, protected antiquity, wildlife sanctuary, reserve range, wetland, mangrove, estuarine, buffer zone of protected area and or special area for protecting biodiversity?		No	NA
	B. Potential Environmental Impacts Will construction of the plant cause:			
	a) Loss of precious ecological values (e.g. result of encroachment into forests/swamplands or historical/cultural buildings/areas, disruption of hydrology of natural waterways, regional flooding, and drainage hazards)?		No	NA
	b) impairment of downstream water quality and therefore, impairment of downstream beneficial uses of water?		No	NA
	c) dislocation or involuntary resettlement of people?		No	NA
	d) disproportionate impacts on the poor, women and children, indigenous people or other vulnerable groups?		No	NA
	e) Potential social conflicts arising from land tenure and land use issues?		No	NA
	f) Soil erosion?		No	NA
	g) Noise from construction activities		No	NA
	h) Billowing of dust during construction?		No	NA
	i) Water logging and soil salinization due to inadequate drainage and water ponding?		No	NA
	j) Leaching of soil nutrients and changes in soil characteristics due to excessive application of irrigation water?		No	NA
	k) Reduction of downstream water supply during peak seasons?		No	NA
	l) Soil pollution, polluted farm runoff and groundwater, and public health risks due to excessive application of fertilizers and pesticides?		No	NA
	m) Soil erosion (furrow, surface)?		No	NA
	n) Spoiling of watercourses, water channels or water bodies?		No	NA
	o) introduction or increase in incidence of waterborne or water related diseases?		No	NA
	p) dangers to a safe and healthy working environment due to physical, chemical and biological hazards during project construction and operation?		No	NA



	q) Large population influx. During construction and operation that causes increased burden on social parameters?		No	NA
	r) Infrastructure and services (such as water supply and sanitation systems)?		No	NA
	s) Social conflicts if workers from other regions or places are hired?		No	NA
	t) Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?		No	NA
	u) Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project (e.g., irrigation dams) are accessible to members of the affected community or where their failure could result in injury to the decommissioning?		No	NA



5

ENVIRONMENTAL MANAGEMENT & MONITORING PLAN



5. ENVIRONMENTAL MANAGEMENT & MONITORING PROGRAMME

5.1 Objectives of ESMP

The ESMP aims to provide the implementation mechanism for the mitigation and control measures for the potential impacts of the project on environment and people. The specific objectives of the ESMP include the following:

- To provide a mechanism to implement the mitigation and control measures identified during the IEE/EIA.
- To propose institutional arrangements to implement the above-mentioned mitigation and control measures
- To define environmental monitoring requirements to ensure effective implementation of the mitigation and control measures.
- To identify capacity building needs with respect to the environmental and social aspects of the project.
- To specify the documentation requirements with respect to the ESMP implementation.

5.2 Institutional Capacity for ESMP

This section describes the environmental, social and risk management plan (ESRMP) for ensuring smooth environmental and social management of the project at all stages of activities and dealing with an emergency as and when it may occur. The objective of including the ESRMP into this EIA report is to ensure prevention of any situation of emergency and in case of development of such a situation, the steps required to be taken to manage the situation. The section also contains a set of environmental guidelines for avoiding and or preventing the adverse environmental impacts of the project. Besides, institutional setup for implementing the ESRMP, management of hazards and emergencies, importance of the compliance-monitoring programme has also been discussed.

The ESRMP is considered as the core area of an environmental examination. It focuses on environmental protection through minimization of the impending risks and the likelihood of occurrence of hazards. The ESRMP aims to ensure that adverse consequences of an emergency are addressed appropriately at all stages of disaster management from prevention to rehabilitation and resettlement of the affected individuals. The ESRMP also provides a mechanism to reduce likelihood of occurrence of the risks to an acceptable level by adopting the risk prevention strategies. Wherever possible and applicable, the ESRMP provides for avoiding environmental risks and, in case they are unavoidable, then identification of the most direct and the best possible measures for reducing the extent of damage to persons and property. Additionally, ESRMP designates the special risk areas and proposes stringent measures for hazard avoidance at these high risk and sensitive areas. In nutshell, the objectives of the proposed ESRMP would be as under:

- To provide an early warning system for the potential or actual risks
- To provide a systematic and implementable mechanism for risk characterization and risk mitigation
- To test effectiveness of the risk handling mechanism and hence improve upon the weaker areas
- To ensure that operational activities are carried out in sound and secure manner by avoiding the probability of risks occurrence

Safety measures, including appropriate design solutions, onsite handling of the hazardous materials during Construction and resolution of social conflicts during operational phase of the project represent major components of the ESRMP. The ESRMP also aims to ensure that the quality of the life values as well cultural and religious sensitivities are fully preserved all through various stages of the project to avoid social severances and conflicts. Lastly, the ESRMP has been framed in line with the national legislative framework, environmental standards and regulations to ensure environmental compatibility of the project.

The proponent shall setup an Environmental Safety and Health (ESH) Unit for timely appreciation, identification, and reporting of the environmental issues relating to the plant activities and for taking necessary preventive and corrective measures for addressing the issues at various levels of responsibilities. The ESH will be permanent setup and will exist during the operation phase as well but with a little changed composition and mandate. During the operation phase, the ESH may consist of the persons appointed in consultation with the EPA and other relevant agencies. Expenses of the ESHU may be met with from regular budget of the project. The ESHU would be an independent functional unit headed by an ESH Officer, who will



be assisted by an appropriate number of subordinate officers, technical personnel, and others. The ESHU should be equipped all essential equipment for dealing with any situation of emergency and disaster.

5.3 Training Schedule

The prime objective of the trainings and capacity building programmes will be to ensure long-term environmental sustenance of the plant's operations and activities and to keep the ESH Manager and the project management abreast of the emerging issues, troubleshooting strategies, and modern techniques of environmental management and handling emergencies. The efficacy of trainings will be tested from quickness of the response to a crisis as exhibited by the preparedness exercises.

It is recommended to hold at least one training or practice drill session into environmental issues every six months all during the operational life of the plant. The selected personnel and the employees posted on key points may attend these training sessions. These training sessions should focus on issues of practical nature likely to come up during the plant's operations. They should also focus on sensitizing the participants about environmental stakes of the project and its various process operations. The training programmes must cater for managing the on-ground environmental problems and the strategies for implementing the suggested environmental mitigation measures. A comprehensive training session or a training workshop of appropriate duration be held annually with a much wider participation from the project management down to the plant workers. These workshops may focus on the policy issues, sustainable development strategies, and the troubleshooting mechanisms on the basis of the experiences of the preceding years. An external environmental consultancy of eminence and repute will be involved in making these training sessions and workshops meaningful.

5.4 Summary of Impacts & Mitigations

The plant will be one of the many such like units already operational in various parts of the country. The setting-up of the plant will help to ensure safe and secure incineration of all and various types of wastes including the hazardous and biomedical waste, except explosive and radioactive waste. The demand of safe, secure and environment friendly disposal of wastes is rising with every passing day, particularly in the cities. Therefore, construction of the facilities for efficient disposal of the wastes is imperative. The setting-up of the incineration plants, as incineration is the preferred option for disposal of healthcare waste, will help to fulfil this public demand efficiently and effectively.

As mentioned earlier in the Executive Summary, there will not be any potentially negative environmental impacts of either construction or operation of the plant. Hence, no mitigation measures are warranted. As regards, cleanliness of the premises, implementation of the good housekeeping practices will be sufficient to ensure good janitorial profile and hygiene of the premises. Although not any specific mitigation measures are required or recommended, yet implementation of the ordinary environment enhancement measures and compliance of the environmental laws of the country will ensure desirable environmental performance of the plant. Likewise, implementation of the management guidelines, as given in the relevant chapters of the EIAR, is expected to upscale the environmental profile of the plant.

The operation phase, like the construction phase too, is devoid of any impacts. Therefore, not any specific mitigation measures have been proposed. This environmental performance of the project shall be reviewed regularly for early detection of any environmental negativity of the plant's operational activities once it has gone into full operation. In addition to the above, a stringent monitoring regime has been proposed to monitor environmental performance of the project all during its operational life with a view to take up timely corrective and ameliorative measures and address them, if warranted.

In view of the increasing demand of safe disposal of wastes in the country, it is an urgent need of the time to take up establishment of such like projects in order to meet the market demand on the one hand and to provide opportunities of job, employment and economic prospects for the people of the country on the other hand. Nevertheless, this emergent necessity of setting up such like units should not undermine reverence of the environment. It is imperative that likely impacts of such projects on the environment should be well evaluated and addressed in their planning, construction and operation. It needs to be ensured that setting up of such like projects does not affect the environment adversely by bringing about unfavourable land use changes, large-scale exploitation of natural resources, and irreversible pollution of the air, water and soil environments from emissions, effluents, solid wastes and other contaminants, if any might originate from such projects. It is therefore necessary that these projects are subjected to compulsory environmental examination



prior to their implementation, as envisaged under the Punjab Environmental Protection Act 1997 to ascertain their likely adverse impacts of construction and operation well in advance.

Last but not the least, implementation of the mitigation measures should not be taken as substitute of research and development (R&D) which is the keystone to find advanced measures and technologies for addressing environmental issues and concerns. R&D must be recognized as one of the appropriate tools to find solutions for the diverse environmental issues that may crop up during lifespan of a project. It is, therefore, recommended that the proponent may review operations of the project continuously to make them compatible with the applicable environmental quality standards. This will help to improve environmental profile of the project and will improve its socio-environmental outlook as well. **Tables 5.4a** and **5.4b** present activity- and parameter-based mitigation measures.

5.5 Equipment Maintenance

All the machinery and equipment, installed at the plant, is kept clean, tidy, tuned-up and up-to-date, as per the instructions and the operating manuals of their respective manufacturers. The ESH Unit will inspect and verify the monitoring checklists of the upkeep and maintenance, as per their respective schedule. **Fig. 5.5** depicts location placement of emergency handling equipment at the premises.

	Locations									Others
1	CX area	✓	✓	✓	✓	----	✓	✓	----	----
	Batteries Bunker	✓	✓	✓	✓	In case of handling Soda And Acid	✓	✓	In case of handling Soda And Acid	
	breaker	✓	✓	✓	✓		✓	✓		----
	Sulphate process	✓	✓	✓	✓		✓	✓		----
2	Inside factory gate	✓	✓			----	----	----	----	----

Fig. 5.5: Location Placement of emergency handling equipment at the premises

5.6 Environmental Budget

Funds will be required for efficient performance of the ESH Unit. Apart from expenses on maintenance, payment of utilities, salaries of the staff, external compliance monitoring by an environmental firm will also require allocation of money. It is, therefore, recommended that the project should have suitable environmental budget.

Table 5.6: Tentative Environmental Budget

Sr.	Particulars	Cost (Rs.)
1.	Cost of land	Nil
2.	Land rent (per annum)	100,000/-
3.	Cost of machinery and equipment	30,000,000/-
4.	Plant and building repair and maintenance cost (per annum)	500,000/-
5.	Environmental enhancement (per annum)	500,000/-
6.	Salaries, wages and alike (per annum)	800,000/-
7.	Debt, credit, miscellaneous and contingency	250,000/-
	Total	32,150,000/-


Table 5.4a

ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN / FRAMEWORK (ACTIVITY BASED)

A). Design and Planning Phase

Sr.	Activity	Potential Env. Impact	Likelihood of Occurrence		Frequency, Duration and Span	Suggested Mitigation Measures	Responsibility	Monitoring Requirement	Remarks
			Likely	Unlikely					
1.	Project planning	Improper and imperfect planning may cause wastage of time, energy and resources	Yes	Yes	Nil	Hire a team of experts for doing proper planning and spadework	Proponent	Nil	A well thought over and proper planning of the project is an essential prerequisite for its success and implementation
2.	Site selection	Selection of an unsuitable site may lead to number of social, economic, transportation and environmental issues	Yes	Yes	Nil	Select a site which is suitable for setting-up the project and where majority of civil amenities are available and easily accessible from a major road	Proponent	Nil	Selection of a suitable site is crucial for success and operational life of the project. The site selection should be done keeping in view the various factors such as nearness to a major road, availability of civic amenities (water, electricity, telephone, gas etc.) and proximity to a wastewater drainage channel. The site should be away from human settlements and be preferably in an industrial locality
3.	Architectural design and layout plan	Poor architectural design and layout plan may lead to construction of a faulty, congested and unserviceable structure	Yes	Yes	Nil	Hire the services of a professional and competent architect for preparing layout plan and architectural design	Proponent	Nil	The layout plan and architectural design of the project should be prepared by a professional and competent architect, preferably a team of architect, structure engineer, civil engineer and other
4.	Government approvals	Non obtaining of requisite Government approvals may create number of issues and problems	Yes	Yes	Nil	Ensure obtaining of all requisite approvals prior to implementing the project	Proponent	Nil	The proponent should ensure obtaining of all requisite Government approvals in respect of the project before embarking on its construction



B). Construction and Setting-Up Phase

Sr.	Activity	Potential Env. Impact	Likelihood of Occurrence		Frequency, Duration and Span	Suggested Mitigation Measures	Responsibility	Monitoring Requirement	Remarks
			Likely	Unlikely					
1.	Preliminary and preparatory site visits and inspections	Billowing of drag dust from wheels of the visiting vehicles	Yes		During vehicle movement	- Reduce speed while approaching the site - Apply brakes slowly and gradually - Wait for dust to settle before opening vehicle door - Sprinkle the track before leaving the site - Display signboard instructions at site	- Driver(s) - Visiting person (s) - Proponent	NA	Billowing of drag dust from kacha tracks and even from asphalt roads from fast moving vehicles is a routine observation. However, it can be prevented by implementing the suggested mitigation measures and guidelines
2.	Onsite establishment of labour camp	- Littering of soil and land from irresponsible throwing of food residue waste, open attending of call of nature - Health afflictions from suage of unsafe drinking water	Yes		All during construction span	- Ensure provision of safe drinking water from nearest water source - Provide receptacles for collection of wastes - Ensure proper and safe disposal of wastes - Provide makeshift type sanitary toilets for needs of the camp workers - Carry out regular medical check-up of the workers - Educate the workers in health, sanitation and hygiene - Display signboard at campsite	- Proponent - Construction contractor - Campsite workers	NA	A labour camp is established in routine for a medium to large size construction. It is always the responsibility of the proponent to ensure maintenance and management of the labour camp including care of health and hygiene of the resident labour



Sr.	Activity	Potential Env. Impact	Likelihood of Occurrence		Frequency, Duration and Span	Suggested Mitigation Measures	Responsibility	Monitoring Requirement	Remarks
			Likely	Unlikely					
3.	Onsite receipt, offloading, stacking and storage of building construction materials etc.	- All incoming materials should be stored at designated places preferably away from pedestrian pathways - All the materials should be securely stacked so as to avoid spoiling of the ground underneath - The stored materials should be protected against rainfall to avoid lixiviation - Injuries to material handlers during receipt, offloading, transportation and shifting be avoided by complying with preventive precautionary measures - The unspent materials should be collected and disposed of properly	Yes		All during construction span	- Clearly demarcate and designate the enclosures for receipt and storage of each type of material separately - Display suitably worded preventive and precautionary instructions regarding handling of the materials - Provide and ensure that the workers put on PPEs while handling the materials and on work - Ensure proper collection of spent and unused remaining materials and their disposal - Don't allow passers-by to come near the stacked materials - Only the authorized persons should handle and have access to stacked materials - Maintain a proper inventory register for all types of materials - Prohibit smoking and washing etc.	- Proponent - Site in charge - Construction contractor - Masons - workers	On daily basis by the site in charge	All building and construction materials should be safely and securely received, stacked, stored and handled at the site. The proponent should make the site inaccurate responsible in this respect. A first aid box should always be readily present to cater for any accident, incident or injury. The emergency telephone numbers to be contacted first in case of some eventuality be well displayed at the campsite and other locations.



Sr.	Activity	Potential Env. Impact	Likelihood of Occurrence		Frequency, Duration and Span	Suggested Mitigation Measures	Responsibility	Monitoring Requirement	Remarks
			Likely	Unlikely					
						near the stacked materials - Ensure provision of fire extinguishers near the materials that are likely to catch fire - Erect protective fencing, where required - Provide first aid kit			
4.	Diggings and excavations for laying the foundations	- Billowing of particulate dust from diggings, improper placement of the digged material and improper covering of the digged loose material - Likelihood of injuries to workers	Yes		Only during digging and excavation operations	- Ensure safe and secure diggings, as per the layout plan - Avoid unnecessary diggings and excavations - Stack the digged loose material at a designated place - Cover all digged loose material with impervious sheets to avoid contact with rainfall and exterior - Properly backfill the digged loose material - Properly dispose of the balance unspent excavated material - Provide and ensure that the workers put on PPEs while digging or backfilling - Provide first aid kit at the site	- Proponent - Site in charge - Construction contractor - Masons - workers	On daily basis by the site in charge	The diggings and excavations for laying the foundations is an important activity, as it generates lot of loose materials. If the digged loose material is improperly stored, it can pose number of environmental implications, hazards and risks. It is therefore imperative that all digged loose material is properly placed, covered with impervious sheets to avoid contact with the exterior to prevent its billowing, spread and dispersal through wind and rainfall. The proponent should make the site in charge responsible in this respect. A first aid box should always be readily present to cater for any accident, incident or injury. After laying the foundations, the digged loose material should be properly backfilled. The unspent surplus material be reused where needed or disposed of properly.



Sr.	Activity	Potential Env. Impact	Likelihood of Occurrence		Frequency, Duration and Span	Suggested Mitigation Measures	Responsibility	Monitoring Requirement	Remarks
			Likely	Unlikely					
5.	Construction of building, civil structures and complementary structures	- Billowing of particulate dust from construction activities - Littering of ground from bits and pieces of unspent materials - Likelihood of soil contamination from loose laying of the construction materials - Likelihood of injuries to workers working onsite and on scaffoldings - Unscrupulous water use and unsafe disposal of spent water may cause soil contamination	Yes		All during building construction and other civil works	- Ensure safe handling of all building materials - Ensure safety and security of the scaffoldings and other temporary gadgets - Ensure construction progress under supervision of resident engineer and architect - Isolate the active construction area from exterior by using appropriate shielding material / sheets / curtain - Properly dispose of the surplus and unspent material - Provide and ensure that the workers put on PPEs while on work - Provide first aid kit at the site	- Proponent - Architect - Resident Engineer - Site in charge - Construction contractor - Masons - workers	On daily basis by the site in charge	Construction of the plant's building, civil structure and other components is an important activity from environmental standpoint. The proponent must ensure implementation of safety and precautionary measures as well as recommended mitigation guidelines to avoid and prevent any untoward impacts during this phase. Proper safety and security of all the persons engaged in construction, directly or indirectly, be ensured. Water use conservation be ensured by using water only for essential needs. The active construction zone be shielded off the exterior to avoid blowing of particulate dust through wind and rainfall. The proponent should make the site inaccurate responsible in this respect. A first aid box should always be readily present to cater for any accident, incident or injury. The unspent surplus material be reused where needed or disposed of properly.

C). Operation and Production Phase

Sr.	Activity	Potential Env. Impact	Likelihood of Occurrence		Frequency, Duration and Span	Suggested Mitigation Measures	Responsibility	Monitoring Requirement	Remarks
			Likely	Unlikely					
1.						-	-		

Table 5.4b



ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN / FRAMEWORK (PARAMETER BASED)

Sr.	Parameter/Aspect	Mitigation Measure	Remarks
1.	Land ownership	NA	The site / land should either be in the ownership and possession of the proponent or at least on long term lease with the proponent
2.	Land use change	- Ensure there is no negative land use change - The land use change is for a better and beneficial purpose - The land use change is permissible under the law and prior permission / NOC is obtained from the concerned regulatory authority / body - In case of occupied land, ensure proper resettlement, rehabilitation and welfare of the persons to be displaced - The right of way (RoW) of the neighbours is not affected, restricted or blocked in any way, whatsoever	Using a hitherto unused and uncultivated land for an industrial purpose, which will move the wheel of local economy and will generate opportunities of job, employment and business will be a better and superior land use purpose
3.	Downstream water availability	- Avoid damage, spoiling or blocking of any water line, watercourse or channel passing through or adjacent to the site - Don't throw any debris or waste in the water channel	The construction of the plant, in no way should obstruct the surface water of the adjacent lands
4.	Soil degradation and erosion	- Avoid throwing of wastes, debris and discard on the ground - Provide suitable receptacles at appropriate locations for collection and disposal of solid wastes - If an underground water reservoir is to be constructed, it should be properly lined with impermeable lining to avoid bottom and lateral seepage of water from it - Avoid discharging any wastewater, effluents, chemicals or liquids, as may affect or harm the soil crust	Indiscriminate and unscrupulous disposal of all types of wastes, liquids and wastewater can degrade and damage the surface layer of the soil. This should be avoided
5.	Water degradation and contamination	- Avoid throwing of wastes, debris and discards in the water body - Ensure proper lining of the water channels, where required and necessary - Provide temporary protective fencing around or along a water channel or a water body, wherever required - The drinking water source for the neighbourhood community should be especially protected - Avoid discharging any wastewater, effluents, chemicals or liquids, as may affect or harm to any water channel or water body - Suitably worded warning, instructions and precautions be displayed near water bodies to avoid their littering and contamination	Water channels, water sources and water bodies are most susceptible targets of degradation and contamination from irresponsible throwing of wastes, chemicals, liquids and other items
6.	Local natural flora and fauna	- Avoid damage to local flora and fauna - Do not throw wastewater, chemical laden water or other effluents	Injury, damage and cutting of the local flora and fauna be avoided to the



		in the roots of the green plants or crops - Avoid damage to irrigation source of flora and crops - Avoid cutting of trees for setting-up the plant - If any tree is to be cut, as being unavoidable, then ensure plantation of two new trees as compensatory tree plantation for each tree cut - Select a site that is sited away from a reserved sanctuary or ecologically sensitive area	maximum possible extent
7.	Worksite safety, security and risk avoidance	- Avoid adventurism on the part of the workers employed for construction and other works - Strictly prohibit smoking at the site, particularly near the inflammable commodities - Ensure wearing of protective gears and PPEs by the workers on the job - Always keep a first aid kit ready and updated at the site - Ensure availability of appropriate fire extinguishers and key points - Ensure daily cleaning of worksite toilets, floors and pantry	The proponent must ensure worksite safety, hygiene and wellbeing of the workers and others
8.	Damage to cultural heritage	- Ensure that the site is away from any antiquities - The construction and other activities at the site do not interact or affect or bear upon the nearby graveyard, shrine or a place of religious reverence, in any manner, whatsoever	The proponent must show implementation of the Antiquities Act 1976 and the rules and regulations made under it
9.	Opportunities of job, placement, employment and business	- The locals of the neighbourhood community should be preferred for unskilled job, provided they are otherwise fit for the job - Subject to social norms, womenfolk should also be provided the opportunities of job and employment - Ensure that no child labour is hired or employed at the plant	Construction and subsequent operation of the plant is likely to create number of job opportunities and income prospects for the locals
10.	Sustainability of the plant / scheme	- Ensure conservation of natural and manmade resources	The proponent should ensure long term sustainability of the plant
11.	Social conflicts and frictions with neighbourhood community	- Avoid interaction with the local neighbourhood community - Avoid visiting houses of the neighbourhood community by the labour or other persons - Respect social, cultural and religious beliefs of the neighbourhood community	Avoidance of the friction with the neighbourhood communities is an important issue and the proponent must ensure that no friction takes place



6

STAKEHOLDERS' CONSULTATIONS



6. STAKEHOLDERS' CONSULTATIONS

6.1 Objectives and Rationale of Consultations

The primary objective of the stakeholders' consultations was to learn and know the apprehensions, concerns, and opinions of the key stakeholders over environmental implications of the project. The consultation sessions also served as a source of first-hand information about expectations of the community and beneficiaries of the project. Dialogue with the stakeholders and recording their concerns at appropriate stages of the project can help to tailor the project in line with stakeholders' aspirations and therefore likely to promote public acceptance of the project and its sub-components.

6.2 Identification of the Relevant Stakeholders

The consultation process began with identification of the most pertinent stakeholders. Efforts were made to identify the relevant stakeholders through a systematic process based on the nature and degree of their actual and perceived stakes in the project. **Tables 6.2a and 6.2b** are the various categories of the stakeholders and the nature of their stakes into the project pertaining to both construction and operation of the plant:

Table 6.2a: Stakeholders of the Project and Nature of their Stakes (Construction Phase)

Category	Stakeholders	Nature of the Stakes
Design & Construction Stage		
Project Funding Agency	▪ Proponent	▪ All those stakes which a funding agency would have i.e., achieving the desired objectives and reaping benefits of investment into the project
Project Sponsoring Agency	▪ Proponent	▪ That the project is carried on smoothly in accordance with scheduled timeline
Project Implementing Agency	▪ Proponent ▪ Machinery Construction Contractor ▪ Sub-contractors and Labour ▪ Vendors of machinery, equipment and various goods and services for the Project	▪ That the project is implemented as per schedule and delays on whatsoever account are avoided ▪ That all bottlenecks and impediments are removed in a timely and effective manner ▪ That the bills are cleared in timely manner and payments are made as per contract agreement
Regulatory Authorities	▪ Environmental Protection Agencies ▪ Local District and the Municipal Administration ▪ Local Building Control Authority	▪ That constructions under the project conform to applicable building codes, rules, regulations, bylaws, and environmental standards
Project Users/Beneficiaries	▪ Proponent ▪ Construction contractors ▪ Persons employed at the project ▪ Goods & Service providers ▪ Others	▪ That the project is completed as per schedule and that they get maximum benefits from the project ▪ That the project structures meet with their needs and requirements
Public and Community	▪ Neighbourhood community, Industrialists, Residents, Vendors, Agriculturists and Land owners	▪ That the project activities do not affect their living, business, and civic rights in an adverse manner ▪ That the project activities are not harmful for their health, hygiene and aesthetic ambience ▪ That the locals are preferred in provision of jobs at the project

Table 6.2b: Stakeholders of the Project and Nature of Their Stakes (Operation Phase)

Category	Stakeholders	Nature of the Stakes
Operation Stage		
Project Funding Agency	▪ Proponent	▪ That the fruits of investment are fully realized to the desired extent and the objectives are achieved to a satisfactory level
Project Sponsoring	▪ Proponent	▪ That the project operates as a successful venture



Category	Stakeholders	Nature of the Stakes
Operation Stage		
Agency		and serves as a role model for replicating similar projects by others
Project Operating Authorities	Proponent	That operational bottlenecks are removed in a timely manner and the project's operations carries on smoothly
Regulatory Authorities	- Environmental Protection Agencies - Local District and the Municipal Administration	That the project remains conformant to the applicable rules, laws and the environmental standards
Project Beneficiaries	- Proponent - Employees and Project Staff - Persons providing services and goods at and for the project - Others	- That the project provides all the services and facilities for which it is to be constructed - That the project is safe and secure from any outside intrusion - That the quality of academics and research at the project university of international standard - The food served at the project facilities (canteens, mess, cafeteria etc.) is of prime standard and quality - That the project activities do not pollute the environment - That appropriate training and capacity building is provided to the project staff - That operation of the project is free from corrupt practices and maladies and is geared to serve its underlying objectives - That payment to suppliers are made in a timely manner without any hassle and problems
Public and Community	- Neighbourhood community - Project beneficiaries	- That the project activities do not affect their living, business, and civic rights in an adverse manner - That the project activities are not harmful for their health, hygiene and aesthetic ambience - That the locals are preferred in provision of jobs at the project

6.3 Consultation Methodology

Onsite consultations were held with representatives of the various categories of the stakeholders as were available during field visits of the site. [Annex-5](#) is a list of the persons consulted and interviewed. Additionally, wherever found feasible, general public in the vicinity were also consulted to know their views and concerns over the plant activities. The majority of these consultations were either one to one meetings or small and focused group discussions.

6.4 Issues Discussed

The points listed below are some of the issues discussed during the consultations:

- Are the Construction being undertaken in accordance with applicable codes, rules, and regulations?
- Are the Construction s commensurate to their usage after completion?
- Are the contractors complying with the environmental requirements?
- Are there any concerns apprehensions, and views of the community and the stakeholders over the project activities relating to design, Construction and operational aspects? What are these?
- What are the likely adverse impacts of the project on the various components of the environment i.e., physical, biological, and social components?
- What could be the possible remedies for the concerns and apprehensions? How they concerns can be effectively addressed?
- Any particular and specific personal or site related concerns.
- What steps would be needed to ensure long-term sustainability of the project and the activities under the project?



- How the project operations can come up to expectations of the users and or the beneficiaries?

6.5 Outcome of the Consultations

The neighbourhood communities did not express any specific or significant concerns. Interestingly, different stakeholders had different perceptions and different concerns about the project. Some of the concerns and apprehensions relating to various aspects of the project are reproduced below:

6.5.1 Design Aspects

- The design aspects need to take into account the relevant engineering codes, byelaws, and the applicable governmental policies.

6.5.2 Construction Aspects

- Delays in Construction and its completion are likely to result into escalation of costs.
- Delays in payments to the contractors, sub-contractors, suppliers and the labour can cause delays in the project implementation.
- Delays in handing over the sites and later changes in the drawings and scope of work result into slow progress of construction of the plant.
- Interferences by the local regulatory agencies and the municipal authorities are also likely to cause delays in completion.
- Disorderly and haphazard placement of materials with its attended consequences could be a nuisance for the labour and other persons working on the project.
- Construction related noise could be troublesome for the neighbourhood community.
- Generation of dust and its deposition on exposed surfaces would require frequent dusting.

6.5.3 Operation Aspects

- There could be disruptions and discontinuations in the supply of the machinery and equipment and other materials for timely completion of the project
- There could be non-payment or delayed payment of wages to the work charge and the temporary employees.
- There could be unsatisfactory cleanliness of the premises due to administrative and supervisory lapses.

6.6 Measures to Address the Concerns

Table 6.6 presents a summary of the concerns and apprehensions of the various stakeholders to the project and the plausible measures to address them:

Table 6.6: Summary of Stakeholders' Concerns alongwith Remedial Measures

Persons Consulted	Concerns/Apprehensions	Remedial Measures
Environment Protection Agency	▪ Environmental and functional compatibility of the project ▪ An institutional setup for addressing the issues and concerns ▪ No or minimal delays at various milestones	▪ The EMP and the Environmental Guidelines as given in this document will ensure environmental and functional compatibility of the project. ▪ Additionally, the Environmental Safety, Health and Social Management Unit (ESHU) will be setup to manage all environmental and social issues of the project during both Construction and subsequent operation
District Executive Authorities	▪ The project carries on smoothly without creation of any serious impediments	▪ The core administration of the project as well as ESHU will ensure smooth functioning of the project without eruption of any unpleasant situation
Project Staff	▪ Wages are paid in time and no deductions are made therefrom on any count ▪ Good quality and hygienic food is served ▪ Social security cover is provided for the project staff and the labour	▪ The core administration and the ESHU will ensure that all apprehensions are allayed in a timely manner
Contractors	▪ Delays in Construction and	▪ The majority of the contractors' concerns



Persons Consulted	Concerns/Apprehensions	Remedial Measures
	completion of the project and resultant escalation in costs ▪ Delays in clearing of the running bills/ payments ▪ Poor coordination between various departments and functionaries ▪ Changes in the drawings and scope of work ▪ Lengthy and tedious procedural requirements ▪ Interferences by the local regulatory agencies and the municipal authorities	relate to procedural and management issues. The institutional setup proposed for environmental and social management of the project will help solve the problems
Office staff and other employees	▪ Non-fulfilment of promises by the project authorities ▪ Disruptions in the supply of essentials like office stationery, diesel for generators, and ink for printers ▪ Non-payment or delayed payment of wages to the work charge and the temporary employees ▪ Unsatisfactory cleanliness of the premises ▪ Lack of appropriate working space for the employees ▪ Lack of space for placing the important record and files ▪ Lack of safe drinking water facility	▪ The majority of the concerns relate to procedural and management issues. The proposed institutional setup will help solve the problems
Neighbourhood community and shopkeepers	▪ Noise pollution ▪ Dust and air pollution ▪ Disorderly placement of materials ▪ Environmental compatibility of the project ▪ Neighbours are not displaced or their business are not affected ▪ Timely completion of the project ▪ Preference in provision of jobs to locals	▪ The ESHU will keep constant liaison with the neighbouring community and will resolve all disputes and differences in an amicable manner through negotiations and consultations ▪ Timely completion of the project is ensured ▪ No person is dispossessed or displaced from his land without paying for due compensation ▪ The proponent will give due preference in provision of jobs to the locals provided they otherwise qualify for the job as per the prescribed qualification and applicable conditions



Fig. 6a: Onsite Stakeholders Consultation



Fig. 6b: Onsite Stakeholders Consultation



Fig. 6c: Onsite Stakeholders Consultation



Fig. 6d: Onsite Stakeholders Consultation



FINDINGS & CONCLUSION



FINDINGS & CONCLUSION

Results of the instant EIAR show that “setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]” by 360 Environmental Solutions [Pvt] Ltd. at a vacant site will be devoid of any serious environmental impacts, whatsoever, interalia for the following reasons:

- ✓ The building will be constructed on a vacant land, leased and possessed by the proponent
- ✓ The machinery will be installed simultaneous with construction of the building
- ✓ There proponent will procure necessary NOC of permissible land use change from the concerned authority
- ✓ The controlled incineration process will be of no environmental bearing, provided the recommended mitigation and pollution control measures are enforced in letter and spirit
- ✓ The proponent will apply to the EPA-Pb for environmental approval by submitting the instant EIAR
- ✓ The layout and architectural design of the plant has been prepared by an expert architect and engineer
- ✓ The waste incineration is a cleaner process operation. The generation of air emissions, wastewaters, effluents, solid wastes or foul smells will be effectively controlled by installation of an efficient pollution control system and implementation of good housekeeping practices
- ✓ All the materials and wastes at the premises will be stored securely and safely
- ✓ There will be conserved and minimal usage of freshwater, as effective water reuse will be practised
- ✓ The usage of water at the worksite toilets and washrooms will be just normal for such like plant
- ✓ The setting-up of the plant will not cause disturbance of any environmental parameter or sensitive bio indicators of the site/area
- ✓ The setting-up of the plant will bring-in opportunities of job and employment for the locals and the neighbouring communities around the site
- ✓ The setting-up of the plant will bring-in market competitiveness and the resultant lowering of the costs of incineration and disposal of the hazardous, healthcare and biomedical wastes from a healthy market competition

The setting-up of the plant will not cause any adverse or negative impacts on the physical as well as the biological environment of the site. The transitory and measly impacts (if there will be any) will be all negligible and of no eventual consequence at all. As per findings of the EIA, there will not be any impacts of construction, as the project building will be constructed on a vacant land, leased and possessed by the proponent Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur. However, if any tertiary impacts (although none) are discovered at some later stage, it is certain that they will be all mitigable in character. Even after conducting a comprehensive examination of the parametric and the non-parametric aspects concerning construction, the Team of Experts could not find any negative impacts of construction and operation of the plant here. The transient impacts of construction, if any, will be all-reversible and can be made good by implementing the recommended mitigation measures and the environmental management and monitoring plan, as given in this EIA report. To conclude, there will not be any environmental and social impacts of setting-up of the plant. However, if any, are discovered later, they all will be mitigable. In nutshell, the impacts of construction and operation of the plant are all positive in nature and beneficial for the environment, economy and the community.

As far as the operation phase is concerned, the emission air will be duly treated in the wet scrubbing system, which will be installed alongside the incinerator furnace. The wet scrubbing system will ensure conformity of the outgoing air emission to the applicable PEQS. The bottom ash, which will be generated as an essential by-product of the waste burning in the furnace, will be collected separately before igniting the next session of incineration. It will be duly dumped and disposed of in an ash disposal trench at one side of the premises. The operation of the plant, particular the incineration of the hazardous biomedical and industrial waste, will be of immense advantage and benefit for the community and the environment. The findings of the EIAR show that there will not be any exhaustive exploitation and consequential depletion of the local natural resources from any of the operational activities of the plant. Similarly, there will not be the generation of any pollutants, contaminants or wastes from any of the operational activities at the plant, because the plant will be fitted with an efficient and effective pollution control system. In view of the calculated scope and well-defined magnitude of the plant's operations, the local resources shall remain conserved and available for sustainable future development. The construction and operation of the plant will therefore bring-in positive and healthy improvements in the socio-economic environment of the area. It will benefit hundreds of people, locally and distantly. In nutshell, the high-end positive impacts of construction and operation of the plant far outweigh all the low-end negative impacts (if there be any), thereby making it an **environmentally sustainable, compatible, feasible and implementable unit.**



REFERENCES



REFERENCES

References

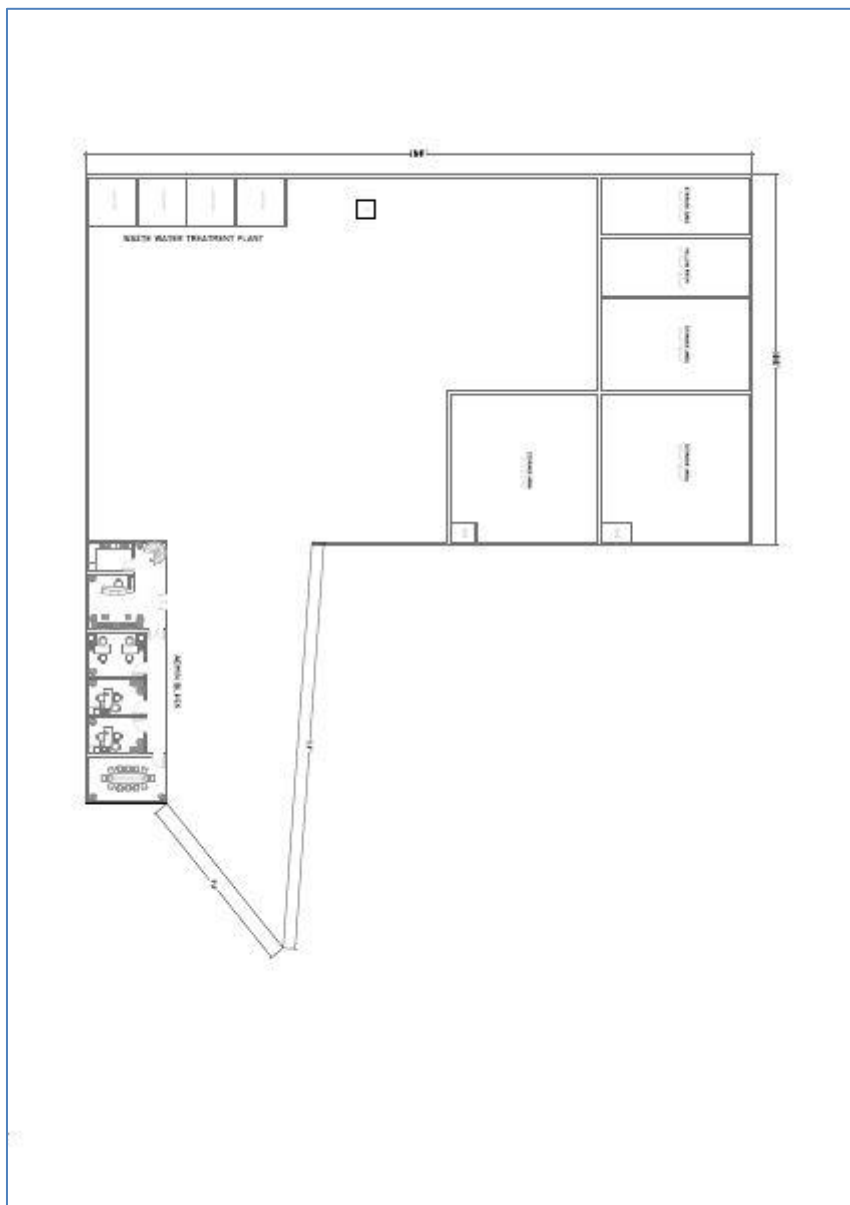
1. Biodiversity Action Plan for Pakistan, Government of Pakistan, IUCN I& WWF, 2000
2. Environmental Assessment Guidelines of the Asian Development Bank, Environment Division, Office of Environment and Social Development, 2003
3. Environmental Assessment in Practice, D. Owen Harrop, and J. Ashley Nixon
4. Environmental Encyclopaedia (2nd Edition), William P Cunningham, and Terence H Cooper
5. Environmental Guidelines for Selected Infrastructure Projects, Office of the Environment, Asian Development Bank, 1993
6. Environmental Impact Assessment Guidelines, Government of Pakistan, Ministry of Housing & Works (Environment & Urban Affairs Division 1986
7. Guidance for Implementing the Environmental Impact Assessment (EIA) Process, Central Environmental Authority, Ministry of Forestry & Environment, Government of Sri Lanka
8. Introduction to Environmental Impact Assessment, Principles & Procedures, Process, Practice and Prospects, John Glasson
9. Management of Air Pollution in Punjab, Environmental Protection Department Laboratories, GoPb
10. National Environmental Conservation strategy, Government of Pakistan
11. Pakistan Environmental Assessment Procedures, Pakistan Environmental Protection Agency, Isl, 1997
12. Pakistan Environmental Laws & their compliance, Dr. Shoaib Qadir & Athar Rafiq Dogar, Lahore Law Times Publications 2022
13. Punjab Environmental Protection Act, 1997
14. Pakistan Environmental Protection Agency, Review of IEE/EIA Regulations 2000
15. Pakistan Standards-Drinking Water (2nd Revision), Pakistan Standards & Quality Control Authority
16. Policy & Procedure for the Filing, Review, & Approval of Environmental Assessment Guidelines, 1997
17. Various Documents of 360 Environmental Solutions [Pvt] Ltd., Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur, 2022
18. Punjab Development Statistics, Bureau of Statistics, Government of Punjab, 2022
19. Punjab Environmental Protection Agency, Review of IEE/EIA Regulations 2022
20. Statistical Pocket Book of the Punjab, Bureau of Statistics, Government of Punjab, 2022
21. Subsoil Water Quality Monitoring in 14 Districts of the Punjab, Provincial Task Force on Subsoil Water, Environment Protection Department, Government of Punjab
22. Water Quality Status in Pakistan, Pakistan Council of Research in Water Resources, Ministry of Science & Technology, Government of Pakistan, Islamabad 2022
23. World Bank-Environmental Guidelines, Environment Department, World Bank 1988



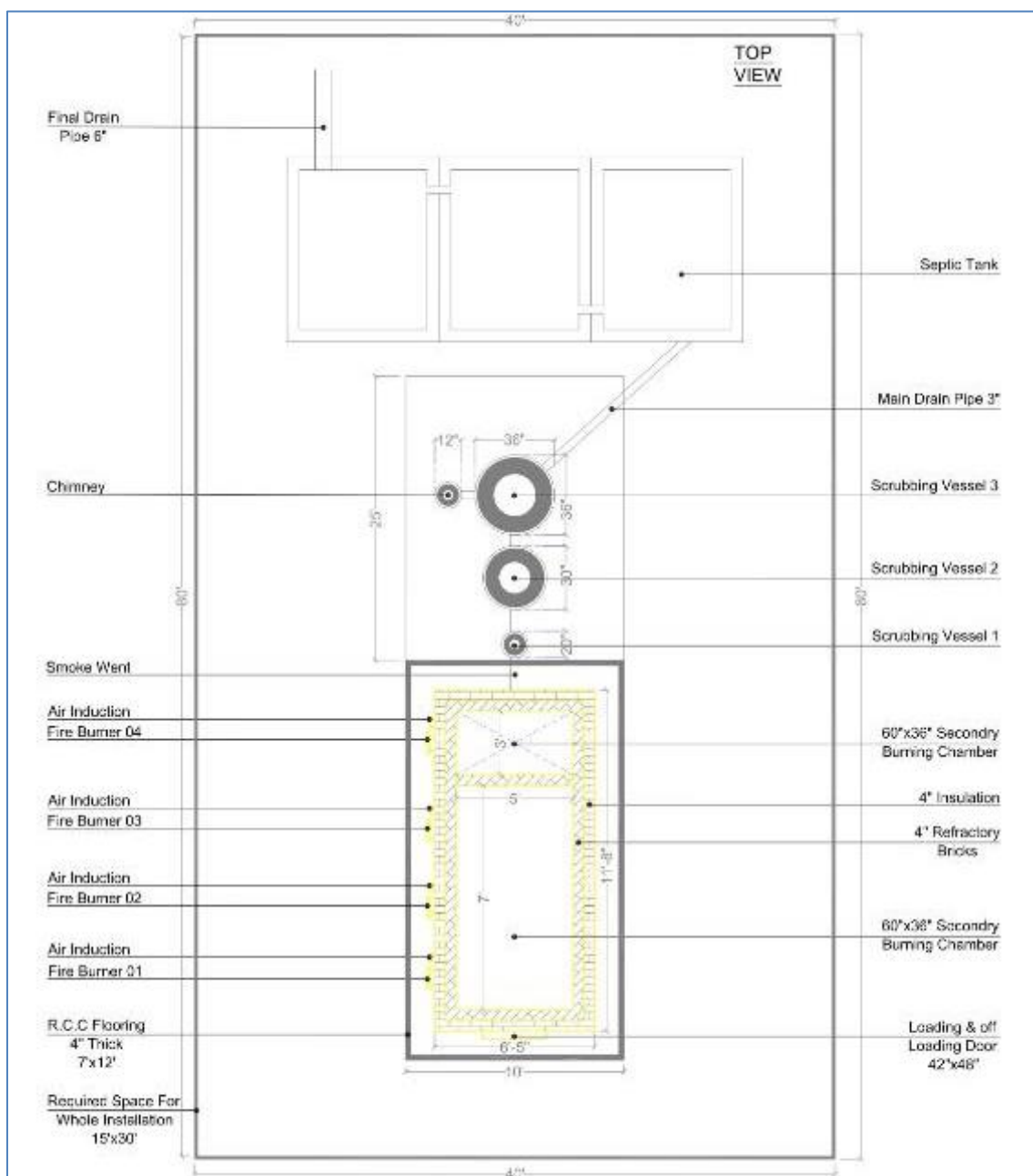
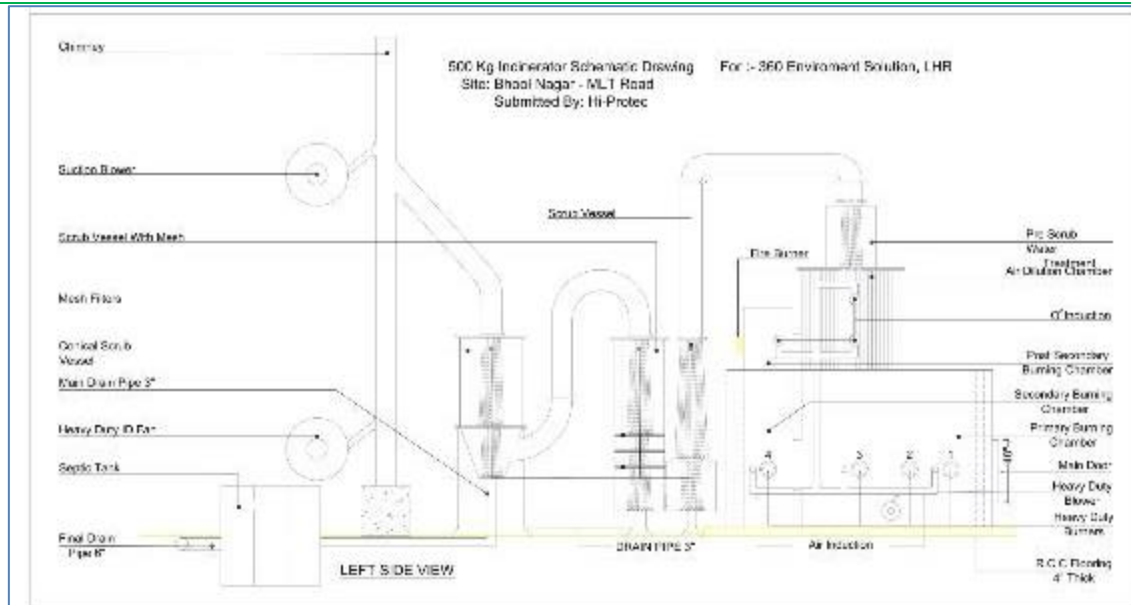
ANNEXES



Layout Map & Other Documents



Layout Map



Layout Map





Project Related and Other Documents

NOC for Wastewater Disposal



NOC for Wastewater Disposal



NOC for Land Use Change



CNIC of proponent I

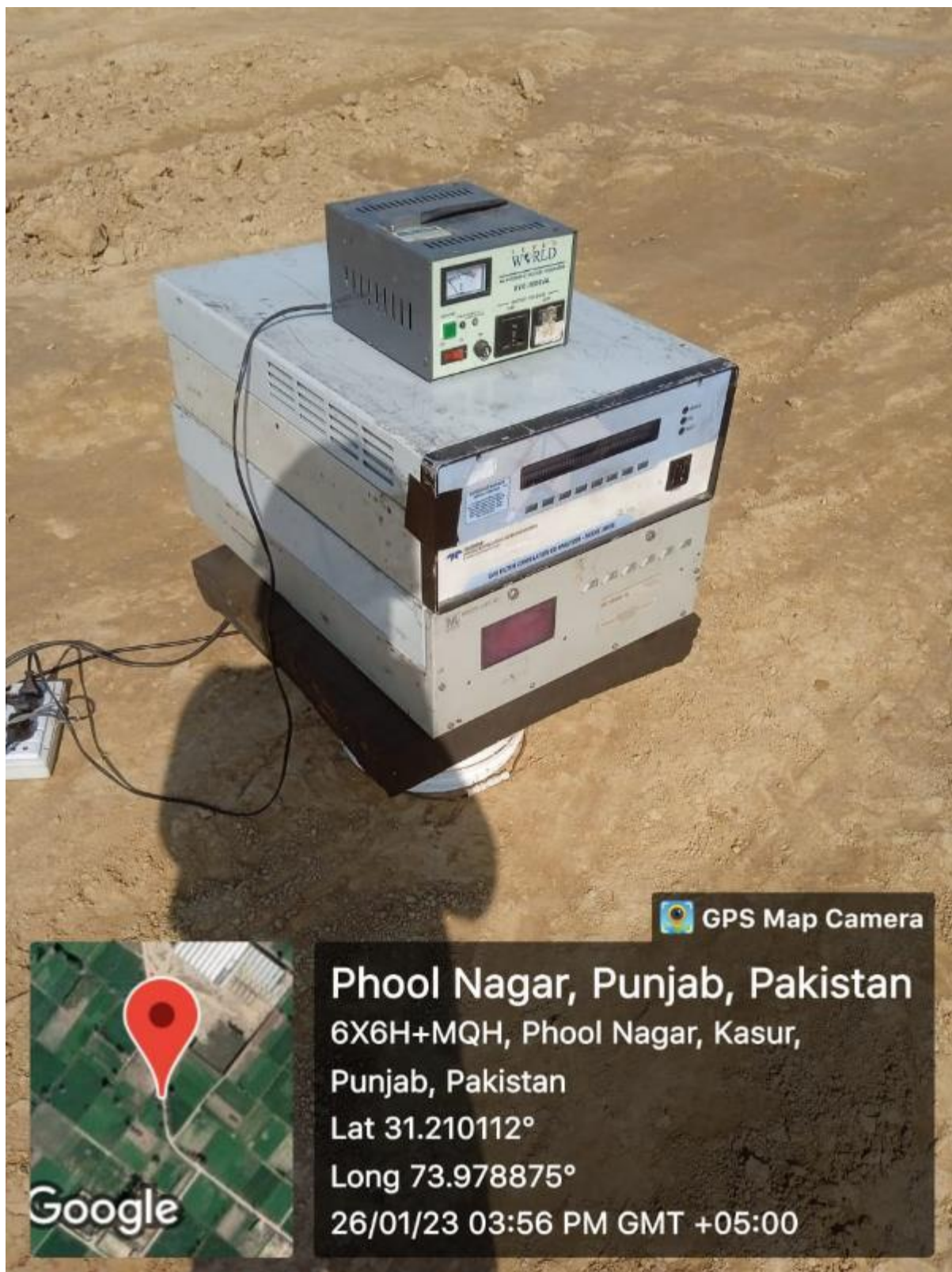
Payment of EIA review fee



Laboratory Analysis Reports and Pics of Environmental Parameters













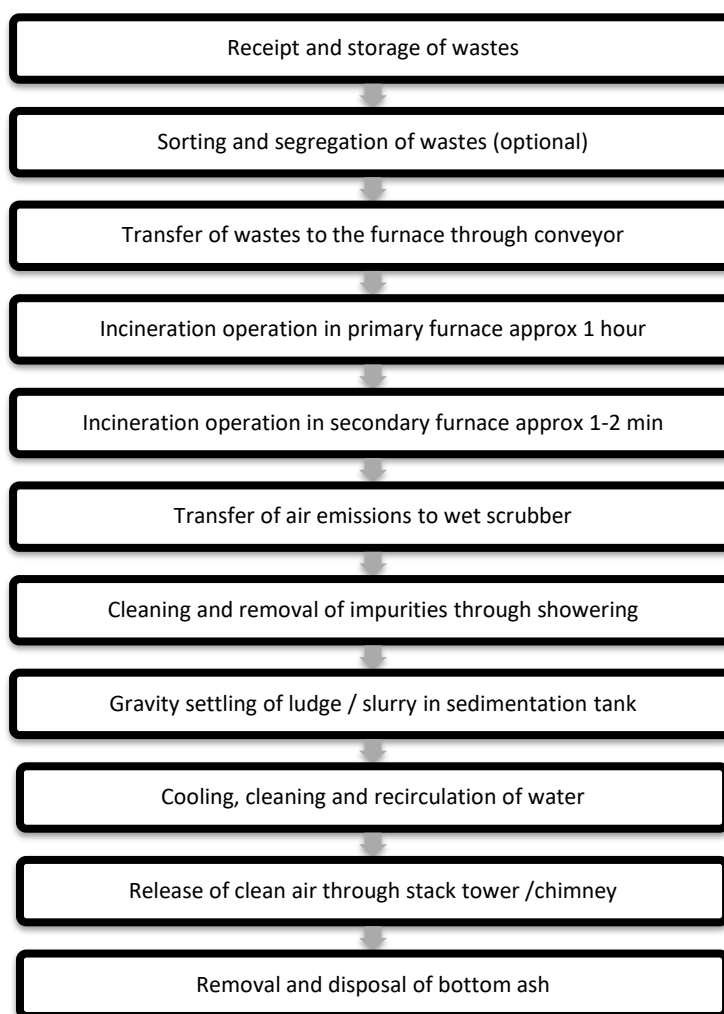




Drinking Water Quality Report



Sound Level Report

**Process Flowchart**

**Persons Interviewed & Consulted**

Sr.	Name and Designation
1.	Mazhar Hussain Proprietor/Proponent 360 Environmental Solutions [Pvt] Ltd. Phoolnagar Bypass Road Mauza Behramke, Tehsil Pattoki, Distt Kasur
2.	Zeshan Ali General Manager 360 Environmental Solutions [Pvt] Ltd. Phoolnagar Bypass Road Mauza Behramke, Tehsil Pattoki, Distt Kasur
3.	Naeem Akbar Production Manager 360 Environmental Solutions [Pvt] Ltd. Phoolnagar Bypass Road Mauza Behramke, Tehsil Pattoki, Distt Kasur
4.	Assistant Director (Environment) Kasur
5.	Neighbouring industry owners/operators/employees/staff
6.	Neighbouring residents
7.	Local NGOs
8.	Local public representatives
9.	Others

**Annex-6****Internal Monitoring Proforma**

Sr.	Activity / Parameter				Yes	No
1.	Last clean-up of the drinking water tank?	1 month	3 months	6 months	1 year	Never
2.	Last water quality testing?	1 month	3 months	6 months	1 year	Never
3.	Is the emergency alarm system functioning properly? Any faults?					
4.	Any air borne emissions?					
5.	Any spillage of oils, lubricants, chemicals etc.					
6.	Is septic tank working well? Any overflows?					
7.	Are materials stored squarely?					
8.	Was tree plantation carried out during last plantation season?					
9.	Are diesel, chemicals, and other liquid items stored well and away from water / rain?					
10.	Any littering of floors / premises with solid waste?					
11.	Any smell from the storage compounds?					
12.	Are general parameters being followed?					
13.	Are the mitigation guidelines being followed?					
14.	Any other information? Please describe.					

Name	
Designation	
Signature	
Date	



Terms of Reference (ToR)

The following Terms of Reference (ToRs) were agreed between the project proponent and the environmental consultant for carrying out the EIA of the project titled, ““setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]” by 360 Environmental Solutions [Pvt] Ltd. at a vacant site at Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur.

Being an environmental impact assessment report, the EIA is limited in its extent and scope to the ToRs agreed to between the proponent and the environmental consultant. The EIA was conducted in accordance with international practices and the guidelines, rules, and regulations issued by the Government of Pakistan. The format and mode of environmental impact examination/ assessment shall be kept, to the extent possible, in conformity to the national and international practices in the field of IEE/EIA. The EIAR shall contain examination of the essential baseline conditions, likely or foreseeable disturbances or impacts to the baseline conditions, and the necessary mitigation measures/recommendations in respect of the environmental impacts of the project both during Construction and during subsequent functioning. This, of course, will include examination of the potential and actual positive or negative impacts on the physical (tangible) & abstract (non-tangible) environments. The EIA shall cover all aspects of the proposed developmental activity including architectural-, civil-, mechanical-, electrical-works and the spectrum of services concerning its operations as a plant for storage and disposal through incineration of all and various types of waste materials [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]. The terms of reference (ToR) and scope of the EIA will include, though shall not be limited to the following activities:

- Carrying out a detailed assessment and evaluation of the likely or foreseeable environmental impacts of the project and preparing the Environmental Impact Assessment Report (EIAR) for and on behalf of the project proponent
- Formal submission of the report to the concerned agency for its review in compliance with the mandatory provisions of the rules on the subject
- Reviewing the project activities in context to all pertinent environmental perspectives and examining whether the project is environment friendly or otherwise
- Preparing the EIA Report in the light of the guiding principles, international practices, and the rules set forth in the Pakistan Environmental Protection Agency’s Regulations on the subject of IEE/EIA
- Using the best-suited environmental examination and impact assessment methodologies, i.e., those that are most appropriate for the identification, screening and assessment of the possible negative or positive environmental impacts, in line with special nature of the project
- Identifying, investigating, examining, and preparing a comprehensive profile of the foreseeable impacts on the physical, biological, hydrological, economical, and socio-cultural environments likely to emanate from implementation of the project in the area and beyond
- Provision of any other advice and or technical expertise before, during, and after completion of the EIA and even thereafter, if so required by the proponent and covered by the scope of the MoU for the job.

Being an EIA, the report is limited in its extent and scope only to the pertinent environmental parameters as defined in the Environmental Assessment Guidelines of the Government of Pakistan 1997 and the checklist proforma and guidelines of the EPA-Pb. The report shall begin, first by establishing the baseline or the existing environmental profile of the site in particular and the project district in general (wherever and whenever relevant), followed by identification of the adverse or the potentially negative impacts of the project. Besides identification of the potentially adverse or negative impacts, the following shall constitute a few other important aspects of the EIAR:

- Assessment of the spatial, temporal and social dimensions (such as extent, quantum. magnitude and time of occurrence) of the adverse as well as the beneficial impacts
- Assessment of the degree of disturbances to the baseline profile, if any
- Identification of the best-suited measures for mitigating the adverse impacts
- Presenting a workable environmental management plan for ensuring long-term environmental and socioeconomic sustainability of the project



The EIA shall take a stock of the project's potential of consuming the natural resources, particularly the building construction and other input materials required for construction and operation of the plant with reference to the rate of consumption and their sustainable availability in the future. Ascertainment of the extent, quantum and magnitude of the adverse impacts on the existing environmental profile of the area, identification of the best-suited measures for mitigating the identified adverse impacts, and finally the presentation of a practicable environmental management and monitoring plan for ensuring long-term sustainability of the project also form part of the scope of the EIA. The EIAR shall present a review of consumption of natural resources and the resultant impacts of their consumption on the environment, particularly of the freshwater and energy. The EIAR shall also review the short-term and long-term effects of the groundwater abstraction for various project operations on the environment.

Additionally, the EIA Report to be prepared by the consultant shall comprises the following components:

- Description of the existing environmental settings or the baseline profile of the project's zone of social and environmental influence (the zone of influence has been taken only with respect to the extent of the spatial and temporal impacts of the project)
- Assessment and examination of the social and environmental implications of an adverse land use change emanating from implementation of the project
- Assessment of the most likely disturbances to various environmental parameters emanating from Construction and other related activities to be taken up by the project proponent, if any, following allotment of the land
- ESRMP containing guidelines for the proponent for avoiding and mitigating the predicted adverse impacts on the physical, biological, and socio-cultural environment

Survey Form at Project Location

**Survey of the Area and Public Consultation Questionnaire
Regarding Project in the Context of Environmental Impact Assessment**

360 ENVIRONMENTAL SOLUTIONS [PVT] LTD
Phoolnagar Bypass Road, Mauza Behramke Tehsil Pattoki, District Kasur

- | | |
|---|--|
| 1. Name of the person interviewed: | Ali Hasasn S/o Majid Muhammad |
| 2. Age: | 40 |
| 3. Marital Status: | Married |
| 4. If Married No. of Children: | 4 |
| 5. Designation / Profession : | Labour |
| 6. Qualification : | Middle |
| 7. Address: | Pattoki |
| 8. Do you know this project : | Yes, by my friend |
| 9. What do you thing about the project: | Yes, its good project and will create job opportunity |
| 10. What do you think would be the positive/negative effect of the project? | Positive effect of uplift the economy of the country |
| 11. What will be Health and safety issue due to this project in your point of view? | No health issue in my opinion, as it is simply the construction work |
| 12. Would you like to add anything else? | Nothing |

**Survey of the Area and Public Consultation Questionnaire
Regarding Project in the Context of Environmental Impact Assessment**

360 ENVIRONMENTAL SOLUTIONS [PVT] LTD
Phoolnagar Bypass Road, Mauza Behramke Tehsil Pattoki, District Kasur

- | | |
|---|--|
| 1. Name of the person interviewed: | Malik Nasir Mehmood S/o Malik Allah Buksh |
| 2. Age: | 36 |
| 3. Marital Status: | Married |
| 4. If Married No. of Children: | 3 |
| 5. Designation / Profession : | Guard |
| 6. Qualification : | Middle |
| 7. Address: | Pattoki |
| 8. Do you know this project : | Yes, by my relative |
| 9. What do you think about the project: | Yes, its good project and it will benefit workers |
| 10. What do you think would be the positive/negative effect of the project? | Positive effect of uplift the economy of the country |
| 11. What will be Health and safety issue due to this project in your point of view? | No health issue in my opinion, as it is simply the construction work |
| 12. Would you like to add anything else? | Nothing |

**Survey of the Area and Public Consultation Questionnaire
Regarding Project in the Context of Environmental Impact Assessment**

360 ENVIRONMENTAL SOLUTIONS [PVT] LTD
Phoolnagar Bypass Road, Mauza Behramke Tehsil Pattoki, District Kasur

- | | |
|---|--|
| 1. Name of the person interviewed: | Muhammad Asif S/o Abdul Sattar |
| 2. Age: | 35 |
| 3. Marital Status: | Married |
| 4. If Married No. of Children: | 5 |
| 5. Designation / Profession : | Guard |
| 6. Qualification : | F.A |
| 7. Address: | Pattoki |
| 8. Do you know this project : | Yes, by my colleague |
| 9. What do you thing about the project: | Yes, its good project and it will benefit workers |
| 10. What do you think would be the positive/negative effect of the project? | I don't know much, but it will provide jobs |
| 11. What will be Health and safety issue due to this project in your point of view? | No health issue in my opinion, as it is simply the construction work |
| 12. Would you like to add anything else? | Nothing |

**Survey of the Area and Public Consultation Questionnaire
Regarding Project in the Context of Environmental Impact Assessment**

360 ENVIRONMENTAL SOLUTIONS [PVT] LTD
Phoolnagar Bypass Road, Mauza Behramke Tehsil Pattoki, District Kasur

- | | |
|---|--|
| 1. Name of the person interviewed: | Zaheer Aslam S/o Muhammad Aslam |
| 2. Age: | 28 |
| 3. Marital Status: | Married |
| 4. If Married No. of Children: | 1 |
| 5. Designation / Profession : | Labour |
| 6. Qualification : | Primary |
| 7. Address: | Pattoki |
| 8. Do you know this project : | Yes, by my relative |
| 9. What do you think about the project: | Yes, its good project and it will benefit workers |
| 10. What do you think would be the positive/negative effect of the project? | Positive effect of uplift the economy of the country |
| 11. What will be Health and safety issue due to this project in your point of view? | No health issue in my opinion, as it is simply the construction work |
| 12. Would you like to add anything else? | Nothing |

**Survey of the Area and Public Consultation Questionnaire
Regarding Project in the Context of Environmental Impact Assessment**

360 ENVIRONMENTAL SOLUTIONS [PVT] LTD
Phoolnagar Bypass Road, Mauza Behramke Tehsil Pattoki, District Kasur

- | | |
|---|--|
| 1. Name of the person interviewed: | Muhammad Shoaib S/o Muhammad Shafiq |
| 2. Age: | 35 |
| 3. Marital Status: | Married |
| 4. If Married No. of Children: | 1 |
| 5. Designation / Profession : | Guard |
| 6. Qualification : | Middle |
| 7. Address: | Pattoki |
| 8. Do you know this project : | Yes, by my friend |
| 9. What do you think about the project: | Yes, a good project, as it will provide job opportunity |
| 10. What do you think would be the positive/negative effect of the project? | Positive effect of uplift the economy of the country |
| 11. What will be Health and safety issue due to this project in your point of view? | No health issue in my opinion, as it is simply the construction work |
| 12. Would you like to add anything else? | Nothing |

**Survey of the Area and Public Consultation Questionnaire
Regarding Project in the Context of Environmental Impact Assessment**

360 ENVIRONMENTAL SOLUTIONS [PVT] LTD
Phoolnagar Bypass Road, Mauza Behramke Tehsil Pattoki, District Kasur

- | | |
|---|--|
| 1. Name of the person interviewed: | Muhammad Akram S/o Muhammad Majid |
| 2. Age: | 30 |
| 3. Marital Status: | Married |
| 4. If Married No. of Children: | 4 |
| 5. Designation / Profession : | labour |
| 6. Qualification : | Primary |
| 7. Address: | Pattoki |
| 8. Do you know this project : | Yes, by my relative |
| 9. What do you thing about the project: | Yes, its good project and it will benefit workers |
| 10. What do you think would be the positive/negative effect of the project? | Positive effect of uplift the economy of the country |
| 11. What will be Health and safety issue due to this project in your point of view? | No health issue in my opinion, as it is simply the construction work |
| 12. Would you like to add anything else? | Nothing |

**Survey of the Area and Public Consultation Questionnaire
Regarding Project in the Context of Environmental Impact Assessment**

360 ENVIRONMENTAL SOLUTIONS [PVT] LTD
Phoolnagar Bypass Road, Mauza Behramke Tehsil Pattoki, District Kasur

- | | |
|---|--|
| 1. Name of the person interviewed: | Muhammad Shaban S/o Khalid Pervez |
| 2. Age: | 33 |
| 3. Marital Status: | Unmarried |
| 4. If Married No. of Children: | |
| 5. Designation / Profession : | Guard |
| 6. Qualification : | Middle |
| 7. Address: | Pattoki |
| 8. Do you know this project : | Yes, by my relative |
| 9. What do you think about the project: | Yes, its good project and it will benefit workers |
| 10. What do you think would be the positive/negative effect of the project? | Positive effect of uplift the economy of the country |
| 11. What will be Health and safety issue due to this project in your point of view? | No health issue in my opinion, as it is simply the construction work |
| 12. Would you like to add anything else? | Nothing |

**Survey of the Area and Public Consultation Questionnaire
Regarding Project in the Context of Environmental Impact Assessment**

360 ENVIRONMENTAL SOLUTIONS [PVT] LTD
Phoolnagar Bypass Road, Mauza Behramke Tehsil Pattoki, District Kasur

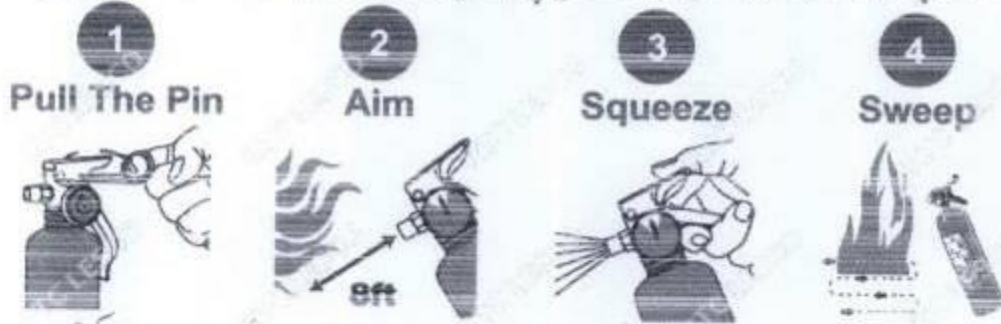
- | | |
|---|--|
| 1. Name of the person interviewed: | Asim Mehmood S/o Malik Muhammad Asif |
| 2. Age: | 56 |
| 3. Marital Status: | Married |
| 4. If Married No. of Children: | 4 |
| 5. Designation / Profession : | Tea Stall Owner |
| 6. Qualification : | Middle |
| 7. Address: | Pattoki |
| 8. Do you know this project : | Yes, by my relative |
| 9. What do you think about the project: | Yes, its good project and it will benefit workers |
| 10. What do you think would be the positive/negative effect of the project? | Positive effect of uplift the economy of the country |
| 11. What will be Health and safety issue due to this project in your point of view? | No health issue in my opinion, as it is simply the construction work |
| 12. Would you like to add anything else? | Nothing |

Firefighting Arrangement & System

USE OF FIRE EXTINGUISHER

آگ بجھانے والے آلے (FIRE EXTINGUISHER) کا استعمال

آگ بجھانے والے آلے کو استعمال کرنے کے لیے پاس کا کلیہ (PASS METHOD) استعمال کریں۔



پین کو کھینچیں ہینڈل کو دبائیں آگ کے نچلے حصے پر نشانہ بنائیں آگ پر پیرے کریں

فورا ایمر جنسی نمبر 1122 پر رابطہ کریں۔

Public Consultation and Information Disclosure Socio-economic Survey of the Area

Consultation with the stockholders is a tool for managing two-way communication between the sponsors and the public. Its goal is to improve decision – making and build understanding by actively involving individuals, groups and organizations which have a stake in the project. This involvement will increase project's long-term viability and enhances its benefits to locally affected people and other stakeholders. The public consultation was thus conducted, while keeping in view the above theme.

Methodology

Identification of stakeholders

Stakeholders in this project were identified keeping in view the Guidelines for Public consultation published by Pakistan EPA, 1997. The stake holders were identified from the following groups.

- Local people
- Affected Communities
- Proponents
- Management
- Government Agencies
- NGO
- Influential people
- Technical persons
- Poor People

Techniques for Public Consultation

The following principals were kept to select the techniques or public consultation

- Provision of material / information in easy language
- Providing sufficient time to understand
- Providing discussion to understand the information in a friendly way
- Portraying the actual issues relating to the project
- Discussion at the place which has easily access to the people
- Selection the time when maximum people are available Selection of influential people of area
- Including of poor people
- Selection of people who give true presentation of community make up Including technical people who has clear knowledge of on the issues relating to unit.
- Concerned government departments were selected who had liaison with the execution of the project and environmental approval.

Public Meetings and Group discussions

The surrounding area is agricultural and rural in nature, therefore we decided to hold physical contact instead of using print or electronic media. The group discussion is the way of opinion making used in the Punjab since hundreds of years. It is reliable and unbiased way to get opinion of the people. The seminar or public gathering was avoided as the poor people cannot attend and unable to express his views without duress or influence of Chaudry or wadera of the area or village.

Convenient Time and Place

The people in villages do not move away from village except in case of urgency. We went to them on their residences or work places. In this way no time and money of the people was spent and we got indiscriminate access to the concerned people. In this way the people who do not have money to travel to go to government departments got access to information and had opportunity to express his opinion in a liberal way.

Non-Government Organization

NGO are working in the area which are mostly exploiting

Limitations of the Public Consultation

We tried our best to include all segments of life in to account according to education and professions as per local distribution of the social formation. But we could not include the enough women in public consultation process due to closeness of the society for women exposure to alien people and social taboo.

Questionnaire

After review of the available information a questionnaire was developed containing all necessary information and question covering positive and negative aspects of the unit. The questionnaire comprised of two parts. First part has brief description of the project and part II was divided in the following parts:

- Socioeconomic background
- Positive impact of the project
- Acceptance level of the project

Public Consultation

The following stake holders were identified and meetings were held with them to inform them about the project design and know their response.

- Management
- Nobles of the area.
- Shopkeepers
- Farmers

Laborers

The socio-economic information was gathered through different techniques and methodologies and is derived from primary and secondary sources. Primary data were collected through following data collection tools: (i) Village profiles; (ii) Socio economic survey; Village profiles were carried out for all villages/settlements falling in the area. An introductory leaflet about basic information of the project was prepared in Urdu and distributed among the people at public places. This helped the people to understand about the project's pros and cons. Leaflet is attached. After one week the area was revisited by the team of experts and again asked the opinion of the people about the project in the form of well-designed social survey questionnaire.

Public consultations were also conducted in the area.

Issues Discussed

Following issues were discussed during the stakeholder consultation: Personal information

- Education status
- Income level
- Residence status
- Information about project
- Possible impacts on natural vegetation, land and properties;
- Beneficial factors and involvement
- Opportunities for the local people.
- Adverse effects of the project
- Scope of the report
- Acceptance of the project by the people of the area
- Scope of the environmental assessment report

Different segments of the society were included to reflect the true and unbiased opinion. From numberdar to labour all segments of the area were interviewed. The offices at district level were approached to have their verdict on the project. The people who were interviewed through a questionnaire which showed the following results:

Gender:

Male	49
Female	1

Education level:

Primary	15	30%
Under matric	20	40%
Matric	10	20%
F.A.	2	4%
Graduation	3	6%
Post Graduate	0	0%

Occupation:

Farmer	20	40%
Labour	15	30%
Shopkeeper	10	20%
Government Service	5	10%

Water Pollution Problem:

Concerned about water pollution	0	0%
Don't show any concern about water pollution.	50	100%

Employment chances Direct and indirect:

Yes	50	100%
No	0	0%

Consent on project implementation:

Yes	50	100%
Conditional (Yes)	0	0%
No	0	0%

Apprehensions of the people of the area

- Low employment offer to local people during operation phase
- Social work in the area
- Health dispensary

Mitigation of the Peoples Apprehensions

- No resettlement in involved
- Waste water will be treated before disposal
- Big opportunity for the local people during construction phase and small-scale chances of job during operational phase.
- Parking of trolleys and trucks will be done in the parking lots at the premises.
- It will create employment opportunities.
- Project management will give priority to local people for employment
- Social welfare work through community uplift.

Emergency Preparedness and Response Plan

SOPs will be prepared to combat with any emergency, according to risk assessment carried out during site visit; the potential emergency scenario might be fire, first aid and security event.

In case of Fire

Fire safety management plan has been provided above.

In case of external threats or site Security:

The proponent will arrange 24/7 two-armed security staff.

Goals of Disaster Management

Following are the aims of Emergency preparedness plan: Reduce, or avoid, losses from hazards Assure prompt assistance to victims Achieve rapid and effective recovery.

Fire and Evacuation

In the Event of a Fire, Pull the Fire Alarm and Call 1122. If you see smoke or flames: Use CARE:

- Contain the fire by closing all doors as you leave
- Activate the nearest Fire Alarm pull station (Pull stations are located near building exits)
- Report the fire by dialing 1122
- Evacuate or extinguish (In most cases, it is best to Evacuate)

Use a Fire Extinguisher only if:

- You have been trained
- You have your back to an unobstructed exit
- You have a fully charged and proper type of resources for the fire you are fighting
- The fire is contained, and you have reported the fire by Fire-Alarm or activation
- Everyone else has left the area
- There is little smoke or flames

Never fight a fire if:

- It has left its source of origin
- You are unsure of the type of extinguisher you need or have
- If you can't control the fire within 30 seconds, abandon your efforts, close the door(s) and evacuate immediately

Building Evacuation

You should familiarize yourself with the evacuation routes. If an evacuation order is issued for your building, or if it were necessary to evacuate due to an emergency, fully cooperate with Safety and Security/Emergency personnel and:

- Take only keys, wallets and essential belongings with you
- If possible, wear weather appropriate clothing
- If you are the last one to exit your room close, and lock doors Leave the building immediately
- Do not investigate the source of the emergency Walk, don't run, to the nearest exit
- Use stairs, not elevators
- Assist people with special needs
- If there is no immediate danger, persons with disability/mobility limitations should shelter in place and call Safety and Security at phones to report location and number of people needing assistance
- If there is imminent danger and evacuation cannot be delayed, the person with a disability should be carried or helped from the building in the best and fastest manner (the person with the disability is the best authority as to how to be moved out of the building)
- If you are unable to evacuate, call Safety and Security at and report your location
- As you make your way out, encourage those you encounter to exit as well
- Follow instructions of the Department of Safety and Security or other identified emergency personnel
- Wait for instructions before returning to your building after an evacuation

Medical Emergency

- If someone is injured or becomes ill:
- Stay Calm
- Dial 1122 and explain the type of emergency, the location, condition, and number of victims
- Let the dispatcher know of any safety hazards – chemical spill, fire, fumes, etc. Do not hang up unless told to do so by the dispatcher
- Do not move the victim unless there is danger of further injury if s/he is not moved. Render first-aid or CPR only if you have been trained
- Do not leave the injured person except to summon help. Comfort the victim until emergency medical services arrive
- Have someone stand outside the building to flag down the ambulance and/or Safety and Security when they reach the vicinity

Bomb Threat

If you receive a bomb threat, remain calm and:

- 1) Obtain as much information as possible:
 - Write down the number from where the call is coming
 - Write down the exact time of the call
 - Write down as accurately as possible the statements made
 - Listen to the voice to determine the sex, age, accents, lisps, tone, etc. (Note any distinguishing feature)
 - Listen for background noises
 - Try to signal for someone else to also listen on the telephone line, if possible
 - Do not hang up and stay on the line as long as possible; wait for the caller to hang up
- 2) Keep the bomb threat caller talking, and ask as many questions of the caller as you can:
 - When will the bomb go off? How much time remains?
 - Where is the bomb located?
 - What does it look like?
 - What kind of bomb is it?
 - How do you know about this bomb?
 - Why was it placed here?
 - Who are you?
 - What is your name?
- 3) Call to Department of Safety and Security

Utility Failure and Natural Disaster

These may include electrical outages, plumbing failure/flooding, gas leaks, steam line breaks, ventilation problems, elevator failures, etc.

- Remain calm
- If the building must be evacuated, follow the instructions on Building Evacuation. Unplug all electrical equipment (including computers) and turn off light switches. Use a flashlight: Do not light candles or use other kinds of flames for lighting
- If worker is trapped in an elevator, advise them to stay calm and tell him you are getting help, use the Call Button of Phone to call for help

Earthquakes

Earthquakes are more common in Pakistan. In the event of an earthquake:

- Stay away from large windows, shelving systems, or tall room partitions
- Get under a desk, table, door arch, or stairwell
- If none of these is available: move against an interior wall and cover your head with your arms
- Remain under cover until the movement subsides
- After the shaking stops, survey your immediate area for trapped or injured persons and ruptured utilities (water, gas, etc.)
- Do not evacuate until instructed by emergency personnel
- After an earthquake:
 - Put on enclosed shoes to protect against broken glass
 - Evacuate if the building seems unsafe or if instructed to do so

Water Management Plan

Construction Phase

To prevent degradation and to maintain the quality of water sources, adequate control measures have been proposed to check the surface run-off, as well as uncontrolled flow of water into any water body. Following management measures are suggested to protect the water quality during the construction phase.

- Avoid excavation during monsoon season.
- Wastewater channels from the site would be connected to septic tank during construction and operation.
- To prevent surface and groundwater contamination by oil grease, leak proof containers should be used for storage and transportation of oil/grease. The floors of oil/grease handling area should be kept effectively impervious. Any wash off from the oil/grease handling area or workshop shall be drained through impervious drains, clarifiers or oil/water separators shall be constructed and effluent should be treated appropriately before releasing it.
- Construction activities generate disturbed soil, concrete fines, oil and other wastes. Onsite collection and settling of storm water, prohibition of equipment wash-downs, and preventive of soil loss and toxic releases from the construction site are necessary to minimize water pollution.
- All stacking and loading areas should be provided with proper garland drains equipped with baffles to prevent runoff from the site

Operation phase

In the operation phase of the project, water conservation and development measures need to be taken including all possible potential for conservation of water, reuse, rainwater collection in reservoirs, and recycling of water. These could be in the following form:

- Water source development
- Minimizing water consumption
- Promoting reuse water after treatment
- Water source development shall be practiced by installation of well-designed water extraction pumps.

Minimizing water Consumption

Implementing water efficient fixtures such as 3 litres WC flushing cistern will minimize water consumption, sensor operated urinals and taps to minimize the wastage of water together with other water conservation measures. Furthermore, to ensure ongoing water conservation, an employee education and awareness program will be introduced for the employee of the unit. Dry type urinals will also be selectively.

Domestic usage

Use of water efficient plumbing fixtures uses less water with no marked reduction in quality and services. To install water less W.C. and urinals, this will help in conserving sufficient quality of water.

Leak detection and repair techniques

- Sweep with a broom and pan where possible, rather than hose down for external areas;
- Awareness campaign to disseminate knowledge on strategies and technologies that can be used for water conservation.
- Standard water information packet may be prepared and distributed. The information should include water conservation plans, methods being adopted in the complex and a list of essential and non-essential water uses.
- As new conservation efforts are implemented, the manager will communicate these changes accordingly.
- Paper methods of water use will be placed in the toilets and other areas of water consumptions
- Promoting reuse of water after treatment and development of closed loop systems.

Following section details the wastewater scheme suggested for the project.

- Wastewater management
- Sanitation infrastructure shall comprise of wastewater collection and conveyance system. The wastewater will be collected in the septic tanks

Noise Management Plan

No residential colonies are present near the site. Only source for noise pollution will be generator, it is recommended to place generator 100 ft. away from workers work place. Noise levels were measured with noise meter. Noise levels at site are presented below.

Construction phase

To mitigate the impact of noise from construction equipment during the construction phase and other machinery (generator) during operation phase the following measures are recommended for implementation:

Job rotation and hearing protection

Workers employed in high noise areas will be rotated. Earplugs/muffs or other hearing protective wear will be provided to those working very close to noise generating machinery.

Operations Phase

To mitigate the impact of noise from diesel generator sets during the operational phase, following measures are recommended for implementation:

- noise emission control technologies
- Greenbelt development

Noise emission control technologies

All the diesel generator will be housed in suitable acoustics enclosure so that noise level at a distance of 6 to 7 meter do not exceed 75 dB (A). The diesel generator will be equipped with walls and ceiling lined with glass wool to acoustically treat the noise levels.

PPEs

Workers will use Ear muffs during their working hours

Diesel Generator Set Emission Control Measures

The most important pollutant requiring control is NOX, as the impact of SO2 emission is minimal because of the use of low (-0.05%) sulphur in diesel as fuel. All the DG set would be provided with emission control equipment's. The following mitigation measures are proposed for NOX reduction:

- Add-on emission control technologies;

Exhaust Gas Recirculation (EGR) technology will be used to reduce diesel nitrogen oxide (NOx) emissions. It is one of the principal methods used to reduce nitrogen oxide emissions from diesel engines. EGR technology will be used to reduce diesel nitrogen oxide (NOx) emissions by taking a carefully controlled portion of the inert exhaust gases, cooling it and re-introducing it to the combustion chamber when conditions are right to do so. This reduces the high concentration of Oxygen and the high temperatures in the combustion chamber, both of which are causes of NOx formation

Dust Control Plan

Earth moving

For any earth moving, conduct watering as necessary to prevent visible dust emissions from exceeding 50m in length in any direction.

- Apply dust suppression in sufficient quantity and frequency to maintain a stabilized surface.
- Areas which cannot be stabilized as evidenced by wind driven dust, must have an application of water at least twice per day to at least 80% of unstabilized area.

Distributed surface areas

Apply water to at least 80% of all inactive accessible distributed surface areas on daily basis when there is evidence of wind driven fugitive dust.

Unpaved road

Water all roads used for any vehicular traffic once daily and restrict vehicle speed 25km/h

Health Safety and Environment Plan

The purpose of this field HSE plan to identify the potential Impacts and to develop a mechanism for better management of health, safety and environment (HSE) issues to related to the project. The HSE objectives include but are not limited to the following:

- Relevant safety devices like belts, gloves and testers should be strictly used by the Labor at the work site
- Observance construction and safety codes to avoid all possible injuries during construction of the project.
- To ensure all personnel employed on the project are competent to carry out their designated tasks.
- Implement training programs that support the achievement of the unit's staff and personnel's competency in relation to health, safety and environment. Implement a hierarchy of communication forums that ensure that HSE concerns are raised and addressed at all levels of the organization. Introduce methodology of motivating good safety and environmental performance; Continuous monitoring to improve HSE performance HSE orientation sessions before starting work, Wearing of personal protective equipment
- Follow the messages and instructions displayed on HSE notice boards installed in the premises of the unit.
- Beware of emergency assembly points and escapes routes.
- Promptly reporting all accidents to the concerned environmental manager. Do not smoke or produce flame in NO Smoking areas.
- Regular medical check-ups will improve the working condition and efficiency of workers.
- Relevant safety devices like belts, gloves and testers should be strictly used by the operators at the work site.
- Safety of management, workers and visitors must be ensured.
- Observance operational safety codes.

Internal Monitoring Proforma

Sr.	Activity / Parameter				Yes	No
1.	Last clean-up of the drinking water tank?	1 month	3 months	6 months	1 year	Never
2.	Last water quality testing?	1 month	3 months	6 months	1 year	Never
3.	Is the emergency alarm system functioning properly? Any faults?					
4.	Any air borne emissions?					
5.	Any spillage of oils, lubricants, chemicals etc.					
6.	Is septic tank working well? Any overflows?					
7.	Are materials stored squarely?					
8.	Was tree plantation carried out during last plantation season?					
9.	Are diesel, chemicals, and other liquid items stored well and away from water / rain?					
10.	Any littering of floors / premises with solid waste?					
11.	Any smell from the storage compounds?					
12.	Are general parameters being followed?					
13.	Are the mitigation guidelines being followed?					
14.	Any other information? Please describe.					

Name	
Designation	
Signature	
Date	

Persons Interviewed & Consulted during IEE

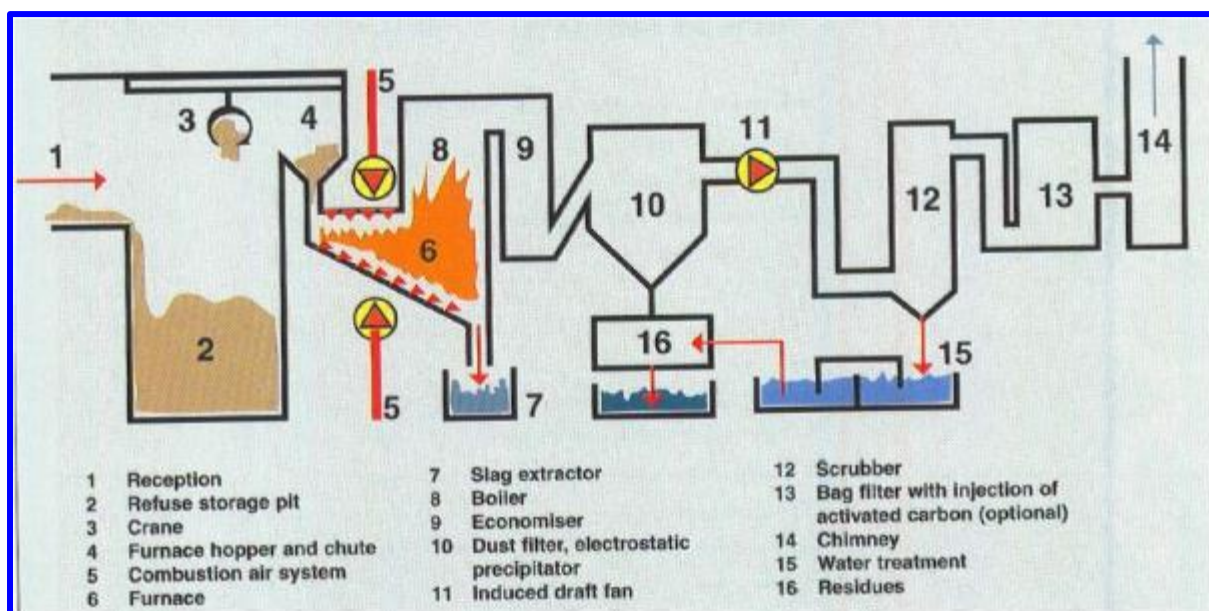
Sr.	Name	Designation	Contact No.
1.	Malik Mudassar Mubeen Khan Chandia	Proponent/Managing Director Al-Janat Housing Scheme	
2.		Director Al-Janat Housing Scheme	
3.		Director Al-Janat Housing Scheme	
4.	Mr. Muhammad Riaz	Manager [Technical] Al-Janat Housing Scheme	
5.	Mr. Imran Saeed	Manager [Admin] Al-Janat Housing Scheme	
6.		Assistant to Manager Admin	
7.		Legal Advisor Al-Janat Housing Scheme	
8.		Neighbouring Residents	
9.		Office Bearers of Local NGOs	
10.		Local Public Representatives	

CONCLUSION

After carrying out an in-depth and extensive EIA of the probable present and the future impacts (both positive and negative) of the project, named ““setting-up of a plant for receipt, storage and disposal through incineration of all and various types of wastes [including, but not limited to, industrial, commercial, institutional, domestic, biomedical, hazardous, non-hazardous and all other solid and liquid wastes etc.]” by 360 Environmental Solutions [Pvt] Ltd. at a vacant site at Phoolnagar Bypass Road, Mauza Behramke, Tehsil Pattoki, Distt Kasur; it is concluded confidently that setting-up of the plant will not cause any adverse impacts on the environmental profile of the area. The setting-up of the plant will rather bring-in healthy and positive improvements in the social, cultural, developmental, agricultural, and employment sectors of the area and the district. As per findings of the EIAR, there will be hardly any noticeable environmental effects from construction of the plant. The whatsoever little impacts, as are likely to come in the wake of setting-up of the plant, can be mitigated by implementing the mitigation measures, as suggested in the instant EIAR.

The EIAR reveals that the impacts of setting-up of the plant on the physical and biological environment will be all negligible and without any bearing on the environmental profile of the site/area. The EIAR further shows that there will not be any exhaustive exploitation of the local natural resources, which will remain conserved and available for sustainable future development. The setting-up of the plant will rather bring-in positive and healthy improvements in the socio-economic environment of the area.

In nutshell, the high-end positive impacts of setting-up of the plant and installation of machinery and pollution control equipment will far outweigh all the low-end negative impacts, thereby making the plant an environmentally sustainable, compatible, feasible and implementable project.



360 ENVIRONMENTAL SOLUTIONS [PVT] LTD

Prepared by



GREEN REVOLUTION

Environmental Management and Legal Consultants

Tel: 03334222232

greensul101@gmail.com