ENVIRONMENTAL IMPACT ASSESSMENT

(EIA)

of

Medical Devices Manufacturing Unit

by

Cardiac Care (Private) Limited

CARDIAC CARE

at

Plot # 11-B,
Quaid-e-Azam Business Park, Sheikhupura

Prepared By

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EXECUTIVE SUMMARY

This is the study of Environmental Impact assessment of Establishment of Medical Devices Manufacturing unit by Cardiac Care (Private) Limited.

Title of the Project: Establishment of Medical Devices Manufacturing unit by Cardiac Care (Private) Limited.

Location of Project: Plot # 11-B, Quaid-E-Azam Business Park, Sheikhupura
Coordinates 31°44'28.35"N, 74° 3'1.67"E

Proponent: Cardiac Care (Private) Limited,
Mailing Address: 848-C, Shadman-I, Lahore
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Brief Outline of the Proposal

The demand of medical equipment remains present in the society because of health needs of the people. In the past, Pakistan used to import medical related equipment as such from foreign countries. However, gradually local industrialists have jumped in to manufacture maximum portion of this demanded equipment locally. The proponent Cardiac Care (Private) Limited is also one of such industrialists and proposes to establish a Medical Devices Manufacturing Unit at their owned Plot No. 11-B at Quaid-E-Azam Business Park, Sheikhupura. The manufacturing unit shall be production facility for tubings, catheter/bags, bottles, drainage system for wounds and respiratory systems. The project cost shall be PKR 400 Millions. The annual production capacity shall be 2,00,000 tubings, 100,000 bags, 40,000 bottles, 10,000 drainage system for wounds and 5000 respiratory systems.

Total area of the plot is 144176.93 Square ft. Total covered area of the plot shall be 76198 Square ft. The project shall involve construction of four single story RCC buildings comprising main production hall, godown, canteen/mess, and office block as major components. Guard room and Masjid shall be other parts of the project.

According to Section-12 of PEPA 1997 (Amendment 2012), "No proponent of a project shall commence construction or operation unless he has filed with the Provincial Agency an initial environmental examination or, where the project is likely to cause an adverse environmental effect, an environmental

impact assessment, and has obtained from the Provincial Agency approval in respect thereof." According to Punjab Environmental Protection Review of IEE and EIA Regulations-2022, the project falls under Schedule-II, therefore requires an EIA. In that context, Environmental Impact Assessment has been carried out and is being presented in the form of this EIA Report.

The scope of the EIA study includes environmental assessment of the project including collection of data related to physical, biological and socio-economic environment, assessment of impacts, which may be caused by the project activities and mitigation measures for the abatement of potential environmental impacts. This encompasses all the phases of the project.

Brief detail of the project is as follows:

The Project Area

The proposed project has been planned to be constructed at Quaid-E-Azam Business Park, Sheikhupura. Quaid-E-Azam Business Park, Sheikhupura is located along Lahore-Islamabad Motorway (M2). The project is linked with all major cities, seaports and dry ports of the country through a network of national Highways and motorways. PIEDMC has acquired 1860 acres of land from Government of the Punjab and thereon industrial estate has been established to promote industrialization in Punjab.

Knowledge on the baseline environmental conditions was obtained by collecting and reviewing the available secondary data of the project area. The review process was also helpful in establishing the scope and methodology for collection of field data inside the project area. The EIA team comprising of environmentalists, chemists, civil engineers, architects and surveyors collected area specific primary data.

Facilities

A large number of various industries shall be located here with infrastructure comparable to any modern international industrial estate. Quaid-E-Azam Business Park, Sheikhupura shall have so many facilities which qualify it as an ideal option for the proponent. There shall be road network, underground sewerage system, estate managed underground electricity distribution system, walled industrial estate with limited entry/exit points, high pressure gas pipelines, potable water, telecommunications system, fully equipped fire station (industrial safety unit), computerized weigh station, information signs, technical training facilities, estate-owned security arrangements, hospital, masaajid and petrol stations.

Environmental compliance shall also be ensured by developing and implementing environmental procedures, occupational health, safety, environmental awareness, solid waste management and combined effluent treatment plant. This new project shall avail all of these facilities to achieve their goals towards sustainable development in all of its activities.

Availability of Utilities

Main source of electricity shall be from WAPDA through Quaid-E-Azam Business Park, Sheikhupura's own dedicated Grid station. For adequate water supply, Quaid-E-Azam Business Park, Sheikhupura shall install overhead water tanks fed with tube wells, through which water for all purposes shall be supplied to the project area. Sui gas shall also be available if needed by any industry.

The summarized outline of the report has been described below:

Chapter-1: Introduction

In this chapter, an introduction to this report has been given. A little detail about project has been provided. Project background, purpose of the report, specific objectives of this EIA, identification of the project, details of proponent and consultant, project nature, size and location, extent and scope of study, EIA study team, study methodology, scoping, temporal boundaries of environmental assessment, spatial boundaries of environmental assessment, important issues raised during public consultation have been described.

Chapter-2: Description of the Project

This chapter describes the specifications of the proposed project i.e. screening, objective of the project, alternatives including project alternative, economic alternatives, construction design alternatives, technology alternatives, site alternatives, site selection criteria, environmental alternatives, location and site layout of the project, land use on the site, road access, vegetation features of the site, cost and magnitude of operation, schedule of implementation, description of pre-construction phase, construction phase and operation phase of the of the project, restoration and rehabilitation plans and government approvals required for the project.

Chapter-3: Description of the Environment

This chapter describes the existing environmental conditions around the proposed project area. Information that has been collected from different sources including public, literature, reports of other studies conducted in this area, knowledge with the proponent and the concerned government departments and the first-hand surveys and field measurements has been presented in this chapter. This encompasses all the important aspects of local environment such as physical, ecological and socio-economic resources. Environmental testing has also been carried out through an environmental laboratory certified by EPA-Punjab in the presence of EPA-Punjab officials to know about quality of ambient air, ground water and noise. Suitability of the site for project has also been discussed.

Chapter-4: Screening of Potential Environmental Impacts and Mitigation Measures

This chapter identifies the characteristic potential impacts due to the implementation of project on the physical, ecological and social environment of project area. This chapter also identifies measures that will help mitigate the project's adverse environmental effects and enhance positive impacts. Impact assessment methodology, characteristics of impacts associated with project location, project design, construction phase, operation phase on the environment have been described in this chapter. Potential Environmental Enhancement Measures have also been described. The summary of potential environmental impacts of the project, mitigation measures to be taken and proposed monitoring are summarized below:

Chapter-5: Environmental Management Plan and Monitoring Program

This chapter presents the implementation mechanism in the form of an Environmental Management Plan (EMP) for dealing with the potential environmental impacts identified during EIA and reported in Chapter 4 of this document. This EMP addresses the adverse environmental impacts of the proposed project during its execution, to enhance project benefits and to introduce standards of good practices to be adopted for all project activities.

In this chapter, objectives of EMP, components of EMP, institutional capacity/roles & responsibilities of environmental management team, reporting and reviewing procedures, training needs and schedule, training syllabus contents, equipment maintenance schedule, communication and documentation, environmental management budget and schedule of implementation of EMP have been described.

Environmental monitoring and management have been proposed to be carried out in all stages of the project namely pre-construction, construction and operational phases. EMP will be operational to ensure legal environmental compliance. Environmental Monitoring by a third party will further support operations in environmentally sustainable fashion.

Chapter-6: Stakeholders Consultation

This chapter includes the output of consultations carried out with the stakeholders including people of the project area. These include local residents who also carry out different businesses such as shop keepers, farmers. Some of these include employees of Quaid-E-Azam Business Park, Sheikhupura. Their feedback regarding the project has been recorded through a questionnaire and interviewing them to fill the questions of questionnaire. Mitigation measures proposed for addressing the stakeholder's concerns have been described.

Potential Impact	Magnitude of Impact	Mitigation Measures
CONSTRUCTION PHASE		
Solid Waste Solid waste shall be generated in the form of excavation waste, broken bricks, wasted concrete material etc.	Major/Long term	All types of waste shall be kept segregated. The waste shall never be piled and shall be managed regularly. The construction waste shall be disposed of through construction waste contractors. The recyclable part of the waste shall be sold to recyclers.
Air Pollution Particulate matter may arise due to localized excavation in soil for foundation purpose and due to movement of off-road or on-road automobiles. Transport of construction materials such as sand, aggregate etc. may also cause particulate pollution. Off-road or on-road automobiles may also cause exhaust pollution.	Minor/Short lived	Construction contractor shall be asked to ensure using only well-conditioned and tuned automobiles and equipment. Sprinkling of water on the exposed surfaces. Covering of all trucks loaded with sand, soil and other such loose construction materials. Regular sweeping of roads and parking areas to avoid deposition of dirt. Use of appropriate masks by workers to prevent entry of metal dust in their breathing system.
Water Quality Water shall be needed for making concrete mix, for curing of building structures and for pavement of floor.	Minor/Short Lived	Water consumption shall be kept at minimum. Extra run off will mostly percolate to ground water table thus recharging it.

		Leakage and wastage shall be prevented. Any wastewater shall be channelized to the drainage system of Quaid-E-Azam Business Park for disposal to nearby drain after treatment.
Noise Pollution Operation of construction machinery and equipment may be a source of noise. Movement of off-road or on-road automobiles.	Minor/Short Lived	Maintain all the machinery and automobiles. Lubricate all moving parts of the machinery. Use of ear plugs by workers to prevent entry of noise in their ear.
Traffic Flow There shall be a little increase in the traffic of the area because of movement of transport carrying construction materials.	Minor/Short Lived	The construction material shall be transported during off-peak hours.
Occupational Health & Safety There may be risks associated with work at height. Ergonomic issues due to loading and off-loading of construction materials e.g. cement sacks etc. During hot season, workers may have to suffer from heat stress.	Minor	Construction workers shall be provided with adequate awareness and training about HSE aspects of the project. Work at height shall be performed with appropriate safety arrangements to prevent fall from height. Construction materials should be distributed into small packs during loading and off-loading. Electric earthing shall be done to prevent electric shock to workers. Safety shoes shall be worn by the workers while performing

		jobs related with electric equipment. During hot season, jobs of the workers may be changed during peak hot hours. The work timing may be changed to prevent heat stress. The workers shall also be provided with suitable Personal Protective Equipment. Emergency preparedness and response plan shall be prepared and followed.
Ecology The birds may get scared due to noisy operations. The patch of land is already barren. There is no vegetation on it which is likely to be impacted.	Minor/Temporary	The noise of the equipment shall be kept under control. The construction staff shall be guided not to interfere with the habitat of local biota.
Socioeconomic Disturbance to local population Jobs for the locals	Minor/Temporary	The construction staff shall be guided to respect the local cultural and moral values and behave well. Locals shall be preferred for job so far as possible according to their competence.
OPERATIONAL PHASE		
Solid Waste Solid waste has been estimated to be generated in the form of packing of raw material and finished goods such as plastic resin sacks, plastic	Major/Long term	All kinds of wastes shall be kept in segregated and color coded bins. The municipal waste shall be stored in bins provided by QABP and shall be managed by QABP.

containers and wrappers from operations. Due to workers, municipal waste shall also be generated.		It has been proposed to sell all of the operational waste to contractor for reuse and recycling as may be appropriate.
Air Pollution The plastic injection molding shall involve master batch and plastic resin as major raw material to manufacture plastic parts of the medical equipment. There shall be no sources of air pollution due to these operations. The electric generator may be a source of particulate pollution.	Minor/Long term	Better ventilation system. All exposed surfaces shall be either paved or grassed to prevent particulate pollution. Workers may be provided with masks to prevent entry of particulate pollutants into their breathing system. The environment friendly electric generator shall be used. Preferably it shall be natural gas fired. Moreover, it shall be equipped with air pollution control devices such as catalytic convertor.
Water Pollution Water shall be used only for cooling of products from injection molding machines. Sewerage shall be the main waste water.	Minor/Long term	The cooling water shall be circulated again and again. Thus overall, there shall be only a small amount of water loss due to evaporation. Water wastage shall be prevented. Any wastewater shall be channelized to the drainage system from where this shall be treated by centralized effluent treatment plant of QABP before disposal to nearby drain.
Noise	Minor/Long term	Better maintenance and lubrication of all the machinery may keep the noise under control.

Noise generated by injection molding machines.		Regular monitoring of noise may be carried out every year to check the efficacy of control measures. Enclosure/confinement of the machinery may also decrease the noise levels. Employees shall be provided with ear plugs to prevent entry of sound waves into ear.
Occupational Health & Safety Ergonomics issues because the workers usually shall need to lift raw materials and finished goods. Fire safety management.	Minor/Long term	Load to be lifted by the labor staff shall be distributed in small packs of raw materials. Adequate arrangements for illumination, temperature and ventilation shall be made. Training about OHS aspects may also assist in managing the risk. The workers shall be provided with all of the required personal protective equipment to prevent any harm. Fire extinguishers, electric earthing and sand buckets shall be installed.
Ecology The patch of land is already barren. There is no vegetation on it that is likely to be impacted. Therefore, there shall be no impact on biota due to operations.	Minor	The noise of the equipment shall be kept under control to prevent disturbance to fauna especially the birds. The operation staff shall be guided not to interfere with the habitat of local biota.

		The proponent as part of condition by PIEDMC, shall plant 2000 trees.
Socioeconomic Disturbance to local population Jobs for the locals	Minor/Temporary	The operational staff shall be guided to respect the local cultural and moral values and behave well. Locals shall be preferred for job so far as possible according to their competence.
Traffic Flow There shall be a little increase in the traffic of the area because of movement of raw materials and finished goods.	Minor	The transport shall be scheduled such that it may not cause traffic blockage.

Proposed Monitoring

The purpose of monitoring is to get acquainted with actual quantitative assessment of environmental aspects to verify that their values are within permissible limits as defined by Punjab Environmental Quality Standards. Therefore, in order to remain rational with the help of quantitative assessments instead of merely making assumptions about status of environmental aspects, following environmental monitoring plan has been proposed:

Environmental Aspect	Parameters	Concerned Location	Frequency
Construction Phase			
Ambient Air	CO, SO_x, NO_x, O_3, PM	Project Site	06 Months
Ground Water	All parameters as described in PEQS	Water Connection at site	06 Months
Noise	Industrial Noise	Project Site	06 Months
Solid Waste	Generation Rate according to type of waste	Project Site	Fortnightly
Occupational Health & Safety	Fire, ERP, PPE's	Project Site	Daily

Operational Phase			
Ambient Air	CO, SO_x, NO_x, O_3, PM	Production halls	Annually
Noise	Industrial Noise	Production halls	Annually
Solid Waste	Generation Rate according to type of waste	Solid Waste Bin	Fortnightly
Occupational Health & Safety	Fire, ERP, PPE's	Whole unit	Daily

Chapter-7: Conclusion and Recommendations

This chapter recommends for issuance of environmental approval by EPA-Punjab. Construction and operations of this Medical Devices Manufacturing Unit will be under strict environmental management controls while sticking to the requirements of the Punjab Environmental Quality Standards (PEQS) and Punjab Environmental Protection Act 1997 (Amendment 2012). Therefore, project at the proposed site will have no adverse effects on any segment of the environment or on people of the area.

Conclusion

It is concluded that the project is a need as part of establishment of industries in the country. The project will accelerate socio-economic development and create job opportunities. The site has been examined with respect to the Pakistan Environmental Protection Agency guidelines and found to be in line with the criteria developed.

On the basis of the overall impact assessment, this has been concluded that environmental impacts during its construction and operational phases can be prevented with the mitigation measures included in this EIA report.

CHAPTER-1

INTRODUCTION

1.1 Project Background

Due to increase in health facilities at local level, the demand for allied equipment has increased. In the past, it was a practice to use most of the imported medical devices such as catheters, tubings etc. However, with the passage of time, local industrialists have shown interest in manufacturing these devices locally. The proponent is also one of such investors who is interested in this industry. Easy and sustained access to high quality raw material coupled with availability of skilled labor presents this sub sector as an attractive opportunity for start-ups to venture into medical devices manufacturing in Pakistan. Therefore, the proponent Cardiac Care (Private) Limited proposes to exploit this demand of medical devices by establishing a medical devices manufacturing unit at their owned Plot No. 11-B at Quaid-E-Azam Business Park, Sheikhupura. This unit shall be first of its kind in Pakistan.

1.2 Purpose of the Report

Section-12 of the Punjab Environmental Protection Act, 1997 (Amended 2012) requires that for any development project to be commenced in Punjab, it is mandatory to obtain Environmental Approval from EPA-Punjab by filing an Initial Environmental Examination or Environmental Impact Assessment, as defined in Punjab Environmental Protection Review of IEE/EIA Regulations-2022 or recommended by EPA-Punjab. This involves impact assessment of such development on the environment. Section-12 reads as follows:

“No proponent of a project shall commence construction or operation unless he has filed with the Provincial Agency an initial environmental examination or, where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Provincial Agency approval in respect thereof.”

According to Punjab Environmental Protection Review of IEE/EIA Regulations-2022, this proposed project of the “Medical Devices Manufacturing Unit by Cardiac Care (Private) Limited” at Plot#11-B, Quaid-E-Azam Business Park, Sheikhupura falls under Schedule-II which requires the proponent to submit an Environmental Impact Assessment (EIA) of the project. Therefore, Environmental Impact Assessment has been carried out to assess various environmental impacts and devise relevant mitigation measures and is being presented in the form of this EIA Report. The EIA report is being submitted to the Environmental Protection Agency (EPA)-Punjab, Lahore.

The purpose of this EIA report is to support an application for environmental approval from the EPA-Punjab. This is in compliance with many other national and international environmental laws besides PEPA 1997 (Amended 2012) for obtaining Environmental Approval (EA) before commencement of the project.

The study has been conducted according to Guidelines issued by Environmental Protection Agency-Government of Pakistan in 1997. Both primary and secondary data has been used to carry out the study. This EIA Report highlights environmental aspects and impacts of the project both during construction and its regular operation. It also provides necessary measures to be adopted to mitigate any adverse environmental impacts. It also gives information used to help decision makers i.e., EPA-Punjab, for issuing the Environmental Approval.

The proponent of the project is environmentally responsible. Therefore, considering environmental obligations in addition to technical feasibility requirements, the proponent has proceeded for environmental feasibility of the construction and operation phase of the project.

The scope of the EIA study includes environmental assessment of the project including collection of data related to physical, biological and socio-economic environment, assessment of impacts which may be caused by the project activities and mitigation measures for the abatement of potential environmental impacts.

1.3 Specific Objectives of this EIA

The EIA study is aimed at promoting environmentally sustainable developmental activities. The specific objectives of this EIA include:

- Collection and scrutiny of data related to physical, biological, and socio-economic environment of the project area before commencement of the project in order to prepare baseline environmental profile
- Identification of environmental aspects of the proposed project area
- Identification, prediction and evaluation of likely environmental impacts of the proposed project
- Quantitative evaluation of the significance of the impacts
- Assess public perceptions and ensure the participation of all stakeholders in decision making
- Evaluation of public participation/consultation and identification of vulnerable groups present in the area
- Propose mitigation measures to keep the impact of the project activities within permissible limits i.e., PEQS
- Preparation of an Environmental Management and Monitoring Plan.
- To assist the proponent in receiving the environmental approval from the agency by fulfilling requirement of EPA-Punjab for EIA.
- To work closely with the project engineers to ensure that the project design includes environmental consideration

1.4 Identification of Project

The proponent Cardiac Care (Private) Limited, proposes to exploit the demand of medical devices by establishing a Medical Devices Manufacturing Unit. Title of the proposed Project is "Establishment of Medical Devices Manufacturing Unit by Cardiac Care (Private) Limited" at their owned Plot#11-B, Quaid-E-Azam Business Park, Sheikhupura." The manufacturing unit shall be production facility for manufacturing of tubing, catheters/bags, drainage system for wounds and respiratory systems. The project will involve construction of 04 single storey buildings and a double storey office block. Total area of the plot is 144176.93 Square ft. Total covered area of the plot shall be 76198 Square ft. Total cost of the project shall be PKR 400 Millions.

1.5 Details of Proponent

The proponent, Cardiac Care (Private) Limited already have well established trade business of import, sales & marketing of such medical accessories as cardiovascular and cardiac, surgical disposables and implantable devices throughout Pakistan.

Cardiac Care (Private) Limited

Project Location: Plot No. 11-B, Quaid-E-Azam Business Park, Sheikhupura
Mailing Address: 848-C, Shadman-I, Lahore
Phone: +92-300-4010955
Email: info@cardiaccare.com.pk, waheed@cardiaccare.com.pk

1.6 Details of Consultant

Altec Engineers
186-N, Model Town, Lahore
Phone: +92-300-9106342
Email: altec.engineers@gmail.com

M/s Altec Engineers are Consulting Engineers, Architects, Turnkey Civil and Pre-Engineered Building Project Development Professionals. They have specialties in industrial, commercial and residential buildings; water and sewage treatment plants, bridges (steel and RCC), roads, public health, housing societies and rotary parking. They are registered with DHA, PHA, LDA, WASA, Lahore Parking Company, Quaid-E-Azam Business Park, Sheikhupura and other industrial estates under PIEDMC, Quaid-E-Azam Industrial Estate and Bahria Town.

1.7 Project Nature, Size and Location

The proponent Cardiac Care (Private) Limited proposes to establish a manufacturing unit for a large range of medical devices such as tubings, catheter bags, drainage system for wounds and respiratory systems etc. at their owned Plot No. 11-B at Quaid-E-Azam Business Park, Sheikhupura

(Coordinates 31°44'28.35"N, 74° 3'1.67"E). Total area of the plot is 144176.93 Square ft. Total covered area of the plot shall be 76198 Square ft. The project shall involve RCC structured construction of 04 single storey buildings and 01 double storey office block. The production capacity of the unit shall be 2,00,000 tubings/year, 100,000 bags/year, 10,000/year drainage system for wounds and 5,000 respiratory systems/year.

Quaid-E-Azam Business Park, Sheikhupura comprises 1860 acres of land, with objective to develop an industrial estate where issues of industrialists are handled and problems solved through 'One Window' operation. Quaid-E-Azam Business Park, Sheikhupura is located at approximately 56 Km from Lahore along Lahore-Islamabad Motorway M2. The purpose of this estate is to promote industrialization in Punjab. Quaid-E-Azam Business Park, Sheikhupura shall have infrastructure comparable to any modern international industrial estate.

After analyzing the needs of entrepreneurs, QABP shall ensure availability of road network, underground sewerage system, estate managed underground electricity distribution system, walled industrial estate with limited entry/exit points, high pressure gas pipelines, potable water, composite effluent treatment plant, telecommunications system, fully equipped fire station (industrial safety unit), computerized weigh station, information signs, technical training facilities, solid waste collection system, estate-owned security arrangements, hospital/emergency medical services, masaajid and petrol stations.

1.8 Extent and Scope of Study

The approach adopted for carrying out the EIA study includes review of the available secondary data, collection of primary data, analysis of collected data, establishing environmental baseline of the project related to physical, ecological & social aspects of the environment. Information relating to the physical, technical and environmental parameters has been collected from the proponent and other agencies. Local inhabitants were interviewed in detail to understand the socio-economic, culture and customs of the area. An extensive literature review was also carried out in this step.

The impacts of the project activities on the physical, ecological and socio-economical resources in the immediate surroundings of the project area during pre-construction, construction and operational phases of the project have been assessed and where applicable mitigation measures have been proposed. Environmental management plan has been prepared for all of the phases so that the impacts can be kept within permissible limits.

The study comprises assessment of impacts on physical, ecological and socio-economical resources in the immediate surroundings of the project area. The impacts of the project on these resources during pre-construction, construction and operational phases of the project have been assessed and mitigation proposed where applicable. Environmental management plan has been prepared for all of the phases so that the impacts can be within permissible limits.

1.9 Persons Performing the EIA Study

The proponent has received consultancy services from M/s Altec Engineers for carrying out environmental study and preparation of this final EIA report. The members of team who carried out EIA study are shown in Annexure-IV. Only main role of the members has been described as they mostly performed multiple tasks related with this EIA study.

1.10 Study Methodology

This Environmental Impact Assessment (EIA) has been carried out to prepare this report according to "Guidelines for the preparation and review of Environmental Reports, October 1997," approved by the Government of Pakistan. The following steps have been followed for carrying out the EIA study of the proposed project:

1.10.1 Scoping

In this step, the limits of the study have been defined. The nature of proposal and its project area has been considered for defining the limits of the study. In order to avoid wastage of resources on unnecessary investigations, the aspects of physical, biological and socioeconomic aspects, assessment of impacts which may be caused by the project activities and mitigation measures for the abatement of potential environmental impacts have been identified. Being located in a well-defined industrial estate, the study of most of the aspects was already covered during EIA of Quaid-E-Azam Business Park, Sheikhupura. The outcomes of that study have been used as secondary data for the purpose of this report according to context of this project.

1.10.1.1 Temporal Boundaries of Environmental Assessment

Temporal boundaries of construction phase of project have been elaborated through Table 2.4. The temporal boundaries for the environmental effects, assessment of traditional land and resource use are defined through following phases. Phase wise time schedule of the project has been elaborated in Table 2.2.

1.10.1.1.1 Preliminary Phase

During this phase, after land acquisition, contouring studies, soil investigations are carried out. Then project designs are finalized. This phase is currently under process. Land has been acquired. Drawings of project design are being submitted to office of PIEDMC along with receipt of application for Environmental approval as this is pre-requisite by PIEDMC.

1.10.1.1.2 Start-up Phase

After getting approval from PIEDMC, the project construction from ground breaking shall be started. Land shall be excavated for installing foundations.

Subsequently proper civil, mechanical and electrical work shall be carried out. Basic infrastructure shall be established.

1.10.1.1.3 Wrap-up Phase

The project construction activities shall be finalized. Finishing activities shall be carried out. This shall be followed by establishment of basic infrastructures such as water supply system, electrical supply etc.

1.10.1.1.4 Commissioning Phase

After completion of all construction and other related activities, the project shall be handed over to proponent/client for desired use.

1.10.1.1.5 Operation Phase

The operation begins when raw material is received and converted to final product. In this case, plastic resins shall be converted into a large range of medical devices components and shall be assembled.

1.10.1.2 Spatial Boundaries of Environmental Assessment

The construction phase shall have potential to cause impacts mostly within boundaries of Quaid-E-Azam Business Park, Sheikhupura and even within few feet away from the project plot. The spatial boundaries of the operation phase of the project shall not be having any impact outside the boundaries of Quaid-E-Azam Business Park, Sheikhupura. Still the study has been composed of area outside of Quaid-E-Azam Business Park, Sheikhupura especially adjoining small villages within radius of about 5 Kilometers of the boundaries of Quaid-E-Azam Business Park, Sheikhupura.

1.10.2 Data Collection

It involves the collection of primary as well as secondary data in order to prepare the baseline profile of the project area. Various departments have been visited to collect relevant data. These include management of PIEDMC, Geological Survey of Pakistan, Pakistan Meteorological Department and many others. The data regarding construction and operations of the project has been obtained through literature review, consultation with civil and structural engineers, architects and also from the proponent. The sources of literature review included web published data as well as various books. Teachers from College of Earth & Environmental Sciences, University of the Punjab, Lahore have also been consulted.

1.10.2.1 Important Issues Raised during Public Consultation

Detailed group discussion was carried out with various classes of people living in the surrounding areas. These were held in the open space available in the village. During the discussion, the relevant responses, opinions were recorded. They were asked about the information of the project. Their

perception and expectations (both positive and negative) about the project were asked.

1.10.2.2 Interviews

Local residents were interviewed. A semi-structured interview was used as a tool for data collection. Personal observations were also included in the methodology in order to collect relevant information about village and people of the community. They were asked about the project and their stakes relevant to it.

1.10.2.3 Primary Data

Quantitative data for baseline of ambient air, ground water and noise has been obtained through real-time monitoring of their samples by EPA-Punjab certified environmental laboratory in the presence of EPA-Punjab authorized officials.

1.10.2.4 Secondary Data

Secondary data was also used to collect important information regarding village, the people and the project. For this purpose, data provided by the project proponent and published data from other relevant sources were used. The previous reports prepared by other environmental consultants have also been consulted. Data published by Pakistan Bureau of Statistics has also been used.

1.10.3 Determination of Significant Impacts

The environmental items from Aldo Leopold matrix have been selected for assessing the impacts of the project on the environmental resources during pre-construction, construction and operational phases of the project qualitatively. This assessment was based on professional judgment.

1.10.4 Mitigations Proposed

A range of cost-effective mitigation measures keeping in view of best available environmental options and best available techniques not entailing to environmental cost, have been proposed where applicable. All the approaches have been considered in order to meet Punjab Environmental quality standards.

1.10.5 Environmental Management Plan

Environmental management plan has been prepared to manage the environmental impacts of the project during construction and operation phase of the project to ensure that impacts of the project remain within permissible limits of Punjab Environmental Quality standards.

In EMP, roles and responsibilities have been defined. Required resources have been defined and their cost have been assessed and defined.

CHAPTER-2

DESCRIPTION OF THE PROJECT

This chapter describes the specifications of the proposed project i.e. type and category of the project, project objectives, project alternatives and reasons for their rejection, project location, project site layout, land use on the site and surroundings, topographic and vegetation features of the site, cost and magnitude of the project, activities involved in construction and operation, processes and materials involved in project, project implementation schedule, details of restoration and rehabilitation plans at the end of project life and government approvals.

2.1 Screening

The proposed project involves construction of the medical devices manufacturing unit. Punjab Environmental Protection Review of IEE and EIA Regulations 2022 classify the projects under two schedules called Schedule-I and Schedule-II. Regulation 3 thereof reads that a proponent of a project falling in any category specified in Schedule I shall file an IEE with the Provincial Agency, and the provisions of section 12 shall apply to such project whereas Regulation 4 reads that a proponent of a project falling in any category specified in Schedule II shall file an EIA with the Provincial Agency, and the provisions of section 12 shall apply to such project.

The project involves plastic injection moulding to manufacture components of medical devices. According to the contents of these regulations, the proposed project falls under Schedule-I, Category C-3 i.e. Synthetic resins, plastics and man-made fibers. However, considering vast scale, the proposed project falls under Schedule II, Category B i.e. Manufacturing.

2.2 Objective of the Project

The proponent Cardiac Care (Private) Limited proposes to establish a medical devices manufacturing unit at their owned Plot No. 11-B at Quaid-E-Azam Business Park, Sheikhupura.

Cardiac Care (Pvt.) Limited shall manufacture a range of disposable medical supplies and consumable products. This unit will be first of its kind in manufacturing the products related to such medical fields and shall include tubing, bags, bottles, drainage system for wounds and respiratory systems. Some of the raw material such as metallic components shall be obtained through outsourced manufacturers according to required specifications. The plastic parts of the products shall be made through proponent’s own plastic injection molding machines. All of these parts shall be assembled here. Easy and sustained access to high quality raw material coupled with availability of skilled labor presents this sub sector as an attractive opportunity for start-ups to venture into medical devices manufacturing in Pakistan.

In recent years, with the technological advancement of medical devices companies and the maturity of the supporting industry chain, as well as the promotion of national policies such as medical reform, graded diagnosis and treatment, and support for domestic equipment, the medical devices industry is expected to enter a period of rapid development. Moreover, during COVID-19, requirement for medical devices was severely felt internationally. The overall demand and local supply gap that prevails in the market remains largely unmet which also provides opportunities for entering in to this business. All of these reasons have motivated the proponent to opt for this nature of business.

With the promotion and popularization of medical products, medical devices companies, industrial design companies have strong competitive advantages. Independent innovation and substitution of imports have become the main theme of the future development of medical devices, so the shape and design of medical equipment has also received more and more attention, pertaining to different manufacturing technique fields.

The use of plastics is increasing all the time as they replace materials such as metal, wood, paper, ceramics and glass in a wide variety of uses. The ongoing development of advanced, high-performance polymers has dramatically increased their usage. Originally plastics were specified because they offered good mechanical properties combined with excellent appearance, including the possibility of self-coloring. Nowadays, the plastics are used mainly because of reduced weight, together with providing durability, corrosion resistance, toughness, design flexibility, resiliency and high performance at low cost.

This project is an economic activity which shall not only generate revenue for the owner but also create jobs for the people. Local people of the area shall be preferred for jobs regarding the project.

2.3 Alternatives

2.3.1 Project Alternative

One of the alternatives may be not to establish this project. In that case, the alternative way to meet the demand of medical devices by importing them from foreign countries and sell them as trader or to purchase them from local market through importers and sell them as traders. This is not a viable alternative because of the high demand and less profit margin. Since the labour is expensive in most of the foreign countries, the medical devices shall have to be purchased at expensive rates. Increased demand can also lead to issues of demand-supply gap. Moreover, it shall create comparatively less jobs. Therefore, the option of manufacturing of medical devices locally has more benefits. Government also encourages the industrial development so that exports of Pakistan may be increased and imports may be decreased.

2.3.2 Economic Alternatives

2.3.2.1 Economic Alternative-1

One of the alternatives, which was considered, was to manufacture the metallic components such as needles etc. in-house. This was discussed at all managerial meetings that although this option could save the cost of purchase from outsourced vendor yet installation of such machines shall not be economically feasible. The main function of the unit shall be left behind and major space and other resources shall be consumed by this option. Therefore, alternative to manufacture metallic components was rejected. These shall be purchased and assembled with plastic components here.

2.3.2.2 Economic Alternative-2

Other economic alternative which was considered was to purchase some of the plastic components of the medical devices from outsourced vendor. The economic assessment of this option revealed that installation of domestic plastic injection moulding machine shall meet all requirements of manufacturing medical devices and shall be more economic.

2.3.2.3 Economic Alternative-3

Keeping in view the volume of medical devices, this was decided to dedicate space for warehousing/godown. Otherwise, there could have been additional cost on outsourced warehousing of the finished goods.

2.3.3 Construction Design Alternatives

The alternatives to the kind of structure of building which can be considered include PEB shed. The other option may be double T roof supported by RCC pillars and beams. The proponent is interested in future expansion. Therefore, RCC has been opted. Its benefits have been further elaborated as follows:

2.3.3.1 Benefits of Reinforced Concrete (RCC)

(i)Concrete is basically alkaline in nature, (the principal component being Calcium hydroxide) and this prevents rusting of the steel reinforcement used;
(ii) The bond or ‘grip’ between the steel and concrete is established easily;
(iii) The coefficient of thermal expansion of concrete is almost identical with that of steel. This prevents the risk of cracking due to expansion at different rates.
(iv) It is durable and resistant to fire and other climate changes.
(v) Easily available almost anywhere in the world.
(vi) It can be used in any part of the structure i.e., from foundation to the top roofing.
(vii) It is more economical compared to other materials.
(ix)It has a high compressive strength (due to concrete) and a high tensile strength (due to reinforcement).

2.3.4 Technology Alternatives and Selection Criteria

The technology and equipment proposed for medical devices manufacturing unit shall be updated and state of the art. This has proved to be environment friendly, energy efficient and material efficient as evident for similar kind and size of manufacturing units. The injection moulding machines shall not be generating any air pollution. The electric generator shall be of latest technology such that it shall not liberate harmful emissions and shall have limited noise. There are no liquid effluents. Solid waste in the overall system of production process shall be either recycled in-house or shall be outsourced for recycling.

2.3.5 Site Alternatives

An alternative may be to construct the unit outside Quaid-E-Azam Business Park, Sheikhupura. Reasons described below justify the selection of Quaid-E-Azam Business Park, Sheikhupura as option for the proponent for establishment of the unit:

2.3.5.1 Site Selection Criteria

Quaid-E-Azam Business Park, Sheikhupura is a purpose built industrial estate providing most of the facilities needed by the industrialists. Therefore, the project at the present site is well justified. Economic viability, investment limitations, market volume, ensured availability of raw materials, availability of dependable energy source, availability of project basic support systems and environmental management are the main considerations upon which capacity of the manufacturing unit has been determined. All these factors were taken into consideration while selecting site for the project. These have been summarized below:

i) Raw material

Raw material needed for construction is readily available in the required quantity throughout the year. Raw material needed for operation shall be in the form of plastic resins, imported or locally made metal components of medical devices from local vendors. The raw materials shall be either directly imported, purchased from local manufacturers, or traders who import from other countries.

ii) Basic Infrastructure

The project site is linked with the other parts of the country through a network of roads and rail. This shall facilitate fast, convenient and cost effective movement of the construction materials during construction phases and shall also provide convenience during operational phase of the project.

iii) Availability of water

Water required for project construction is plentifully available at the project site. For operations, water shall be needed only for cooling of the product.

This shall also be needed for and drinking, cooking and sanitation purposes. This amount of water can be met with ground water supply from Quaid-E-Azam Business Park, Sheikhupura.

iv) Environment

The surrounding environmental conditions are congenial for the project. Both the construction as well as operation phases will not adversely affect the environment. All of the aspects will be kept strictly within the limits defined under Punjab Environmental Quality Standards (PEQS) and the project shall comply with Punjab Environmental Protection Act 1997 (Amendment 2012).

v) Utilities

All utilities such as electricity, gas, water, telecommunication including telephone and internet are conveniently available at the project site. In future, there shall be an industrial safety unit by QABP with very good facilities for all emergencies.

vi) Labor

Labor is easily and at cheaper cost available in the project area.

vii) Site Availability

The proponent purchased Plot No. 11-B, Quaid-E-Azam Business Park, Sheikhupura. Total area of the plot is 144176.93 Square ft. The site is fully owned by the proponent. This is under the administration of Quaid-E-Azam Business Park, Sheikhupura and is available for industrial use. Government of the Punjab has established Quaid-E-Azam Business Park, Sheikhupura to facilitate industrial development. Therefore, the site is available for this project.

viii) Site Access

The Plot No. 11-B is situated inside Quaid-E-Azam Business Park, Sheikhupura and is accessible through Lahore-Islamabad Motorway M2. This can also be accessed through Lahore-Sheikhupura Road via Joiyyan Wala Morr.

ix) Energy availability

The power source during construction and operation will be from Water and Power Development Authority (WAPDA) through Quaid-E-Azam Business Park, Sheikhupura own Grid station. Usually, the supply of electricity shall be continuous without any load shedding.

Of all the alternatives examined on basis of above required criteria, the present option merited on all others for project. Accordingly, the present site was selected and purchased.

2.3.6 Environmental Alternatives

The proponent could drain cooling water from plastic injection moulding machine as waste water. However, the proponent has opted for circulating through cooling tower to use it again and again.

Separate drainage lines shall be installed for storm water and sewerage. Thus, waste water load on drainage system shall be reduced. This saved water can be used directly for irrigation of green belt or it can be used for washing purpose after minimal treatment.

2.4 Location and Site Layout of the Project

The proposed site for the construction of project is located at Plot # 11-B, Quaid-E-Azam Business Park, Sheikhupura. The Google Earth coordinates are 31°44’28.35”N, 74° 3’1.67”E. The project plot is surrounded by industrial plots at its north with a 61m main boulevard and south with 40m wide road of Quaid-E-Azam Business Park facing Motorway M2, and at east and west with industrial plots. The map showing location of project area, Google map and site layout is annexed as Annexure-VI.

Figure 2.1: Project Plot # 11-B, Quaid-E-Azam Business Park, Sheikhupura

2.5 Land Use on the Site

The project site is located within the premises of Quaid-E-Azam Business Park, Sheikhupura. All the area of Quaid-E-Azam Business Park, Sheikhupura is purpose built for industrial use by Government of the Punjab. Supporting documents are attached as Annexure-IX. Quaid-E-Azam Business Park, Sheikhupura is surrounded by residential and agricultural areas including Sahu Ki Malliyan, Chichoo Ki Malliiyan and Sheikhupura City. No agricultural activity has been observed at the project site. However, some agricultural patches can be found outside of the Quaid-E-Azam Business Park, Sheikhupura.

2.6 Road Access

The Plot No. 11-B is situated inside Quaid-E-Azam Business Park, Sheikhupura and is accessible through Lahore-Islamabad Motorway M2. This is situated along main boulevard of Quaid-E-Azam Business Park, Sheikhupura and connected with arterial road at south side. All roads inside Quaid-E-Azam Business Park, Sheikhupura shall be made of asphalt connecting them with M2. This is also accessible from Lahore-Sheikhupura Road through Joiyyan Wala Morr.

2.7 Vegetation Features of the Site

Land is clear and there are no significant plants or vegetation present on site. Only spontaneous wild growth is present which is not of ecological importance. Quaid-E-Azam Business Park, Sheikhupura has been developed on an infertile/barren patch of the land.

Different vegetation species that are found in the vicinity of project area includes the big trees, middle size trees, ground covers, shrubs, bushes, seasonal plants and climbers including Kandiari, Akash Bel, Peeli Booti, Datura and Dahlia etc.

2.8 Cost and Magnitude of Operation

The estimated capital cost of the project shall be PKR 400 Million comprising construction cost (100 Million), land cost (100 millions) and machinery cost (200 millions).

The project shall involve RCC construction of 04 separate buildings for main production hall, godown, office and mess. The operations shall constitute manufacturing of a large range of medical devices. The annual production capacity shall be as follows:

Table 2.1: Estimated Annual Production Capacity

Sr#	List of Products	Estimated Production Capacity
1	Tubings	200,000

2	Bags/Catheter	100,000
3	Bottles	40,000
4	Drainage system for wounds	10,000
5	Respiratory systems	5,000

2.9 Schedule of Implementation

The estimated period required for the implementation of project is 24 months. The implementation schedule is given in Table 2.2. The exact dates for each of the phases cannot be mentioned because of ambiguity about dates of issuance of various approvals. The construction schedule has been separately elaborated in Table 2.4. This schedule also serves to describe the temporal boundaries of the construction phase of the project.

Table 2.2: Implementation Schedule

Project Phases	Details	Expected Completion
Preliminary Phase	The land for project is acquired.	Already purchased
Start-up Phase	Start-up of construction.	Immediately after getting submission approval.
Wrap-up Phase	Completion of Construction Phase	22 Months
Commissioning	Commissioning	01 Month
Operation phase	Start up	01 Month

2.10 Description of the Project

2.10.1 Pre-Construction Phase

The following activities will form part of the pre-construction stage:

- Conducting necessary feasibility studies including the cost benefit analysis and the expected internal rate of return.
- Preparation of the project documents, layout/master plan, architectural & engineering designs and the cost estimates.
- Conducting investigative studies such as geo-technical studies, environmental impact assessment, and economic feasibility studies.
- Obtaining registrations, approvals, and NOCs from different departments of the Government for business purpose.
- Selecting the appropriate and the best suited machinery and equipment for fast track implementation of the project and completion of construction within the scheduled timeframe.
- Signing the contracts for construction, procurements, installations, and implementation of the project facilities.

2.10.2 Construction Phase

Complete project layout is attached as Appendix-VI. The project shall be accomplished according to bye-laws of PIEDMC. For this purpose, approval for construction is being applied which is a pre-requisite for the project.

The project shall comprise four single story buildings, a double story office block building and a single story building for masjid. Schedule of areas is as shown in drawings attached herewith under Annexure-VI. Construction work of all buildings shall be RCC slab supported by RCC pillar and beams. According to the requirement of PIEDMC bye-laws, 20' wide passage shall be left along the northern and eastern boundary and 50' wide passage shall be left along the southern and western boundary of the plot in order to facilitate movement of emergency rescue vehicles. Emergency exits shall also be designed. Separate drainage lines shall be laid for sewerage and storm water drainage. The project construction shall be completed in about 24 months. The project construction cost shall be PKR 100 Million.

Table 2.3: Brief Description of the Project

Parameter	Description
Proponent & Owner	Cardiac Care (Private) Limited
Main Operations	Medical devices manufacturing
Operational Hours	08 Hours/day
Plot Area	144176.93 Sq. ft
Project Covered Area	76198 Sq. ft.
Cost of the Project	PKR 400 Million
Annual Production Capacity	2,00,000 tubings 100,000 bags 40,000 bottles 10,000 drainage system for wounds 5000 respiratory systems
Source of Raw Material	Local as well as imported through vendors.
Solid Waste Management	Empty sacks of raw materials. Empty cans/containers. Proposed to be sold to the approved contractor.
Air pollution control	Air conditioners. Exhaust fans. Provision of masks to workers. Local exhaust where necessary.
Wastewater Management	The wastewater shall not be generated from production process. Sewerage shall be temporarily held in septic tank for settling of solid contents. Then allowed to flow to reach composite effluent treatment plant of Quaid-E-Azam Business Park, Sheikhupura. Here this shall be treated before ultimate disposal.

Table 2.4: Temporal Boundaries of Construction Phase

S#		M1+M2	M3	M4	M5	M6	M7	M8	M9	M 10	M 11	M 12	M 13	M 14	M 15	M 16	M 17	M 18	M 19	M 20	M 21	M 22
1	Excavation for foundation																					
2	Pouring of lean concrete																					
3	Pouring of foundation, columns upto plinth level																					
4	Pouring of columns upto ground and 1st floor ceiling level																					
5	Pouring of ground, and 1st floor slabs & beams																					
6	Plastering of ground and 1st floor walls, slabs, beams & columns																					
7	Flooring of roof																					
8	Finishing of building including tile fixing, wood & etc.																					

2.10.2.1 Workforce Required

During construction phase of the project 25 persons will be required that will include site engineer, masons and labors.

2.10.2.2 Power Supply

Electricity requirement during construction phase shall be 10 to 15 KW through temporary connection. The main source of power will be from QABP fed by WAPDA.

2.10.2.3 Water Supply and Water Balance

During construction phase of the project, ground water through water supply line of QABP will be used. 30% Water shall be used for masonry work. Concrete mix shall not be prepared on the site. Ready mix concrete shall be brought on the project site. This shall need 60% water. 10% of the total needed water shall be consumed for sanitation purposes.

2.10.3 Operation Phase

The manufacturing of medical devices shall involve plastic injection molding as major operations. The manufacturing of metallic components shall be outsourced. The plastic components shall be made through proponent's own plastic injection molding machines followed by assembly with metallic parts.

2.10.3.1 Raw Materials

1) PVC
2) Silicon rubber
3) Latex
4) Nylon
5) Thermoplastic elastomers
6) Metallic components such as needles etc.

2.10.3.2 Machinery Details

The machinery shall cost PKR 200 Million:

- Tubing Machine made by Italy & Germany
- Moulding Machine
- Sterilization & Packing Machine
- Printing & Labelling Machine
- Dye Making Machine
- Dye Cutting Machine

2.10.3.3 Proposed Products

Cardiac Care (Pvt.) Limited shall manufacture a range of disposable medical supplies and consumable products as shown in Figure 2.2, 2.3, 2.4, 2.5 & 2.6.

This unit will be first of its kind in manufacturing these kind of products related to medical fields and shall include tubing, bags, bottles, drainage system for wounds and respiratory systems.

Figure 2.2: Range of products proposed to be manufactured

Figure 2.3: Range of Drainage products proposed to be manufactured

2.10.3.4 Manufacturing Process Description

2.10.3.4.1 Screw Profile

The standard metering screw has three zones with a ring plunger assembly. The feed zone, where the plastic first enters the screw and is conveyed along a constant root diameter, the transition zone, where the plastic is conveyed, compressed and melted along a root diameter that increases with a constant taper, and the metering zone, where the melting of the plastic is completed and the melt is conveyed forward along a constant root diameter reaching a temperature and viscosity to form parts.

2.10.3.4.2 Moulds

The mould system consists of tie bars, stationary and moving platens, as well as moulding plates (bases) that house the cavity, sprue and runner systems, ejector pins and cooling channels. The mould is a heat exchanger in which the molten thermoplastic solidifies to the desired shape and dimensional

details defined by the cavity. A mould system is an assembly of platens and moulding plates typically made of tool steel. The mould system shapes the plastic inside the cavity and ejects the moulded parts. The stationary platen is attached to the barrel side of the machine and is connected to the moving platen by the tie bars. The cavity plate is generally mounted on the stationary platen and houses the injection nozzle. The core plate moves with the moving platen guided by the tie bars. Occasionally, the cavity plate is mounted to the moving platen and the core plate and a hydraulic knock out (ejector) system is mounted to the stationary platen.

Figure 2.4: Range of Catheter & Tube proposed to be manufactured

Figure 2.5: Another Range of products proposed to be manufactured

2.10.3.4.3 Plastic Injection Molding Process

The process shall start with mixing of raw plastic grains with additives in a mixer. The mixing shall homogenize the additives and the plastic grains. Some binding agents shall also be added. The additives shall include color pigments in masterbatch form.

Plastic granules for the part shall be fed via a hopper into a heated barrel, melted using heater bands and the frictional action of a reciprocating screw barrel. The plastic shall then be injected through a nozzle into a mould cavity where it shall cool and harden to the configuration of the cavity. The mould

tool shall be mounted on a moveable platen – when the part has solidified, the platen shall open and the part shall be ejected out using ejector pins.

Mixing of Additives and Binders with Raw Grains
↓
Hopper of Extruder
↓
Injection Process
↓
Molding
↓
Cooling Line
↓
Drying
↓
Collection and Storage

Figure 2.6: Plastic Injection Molding Process Flow

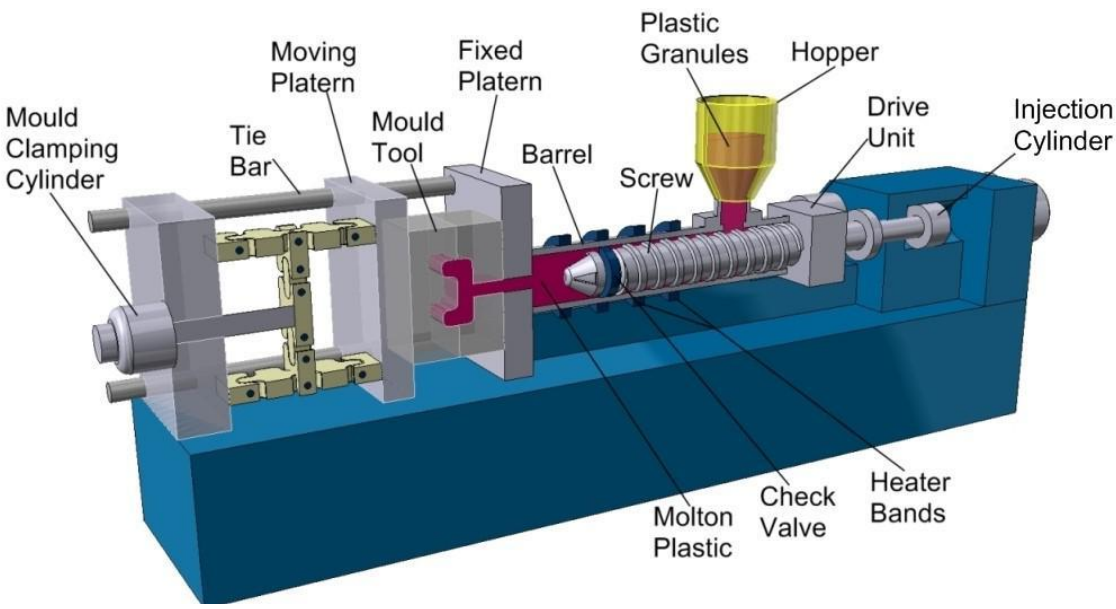

Figure 2.7: Injection Molding Machine

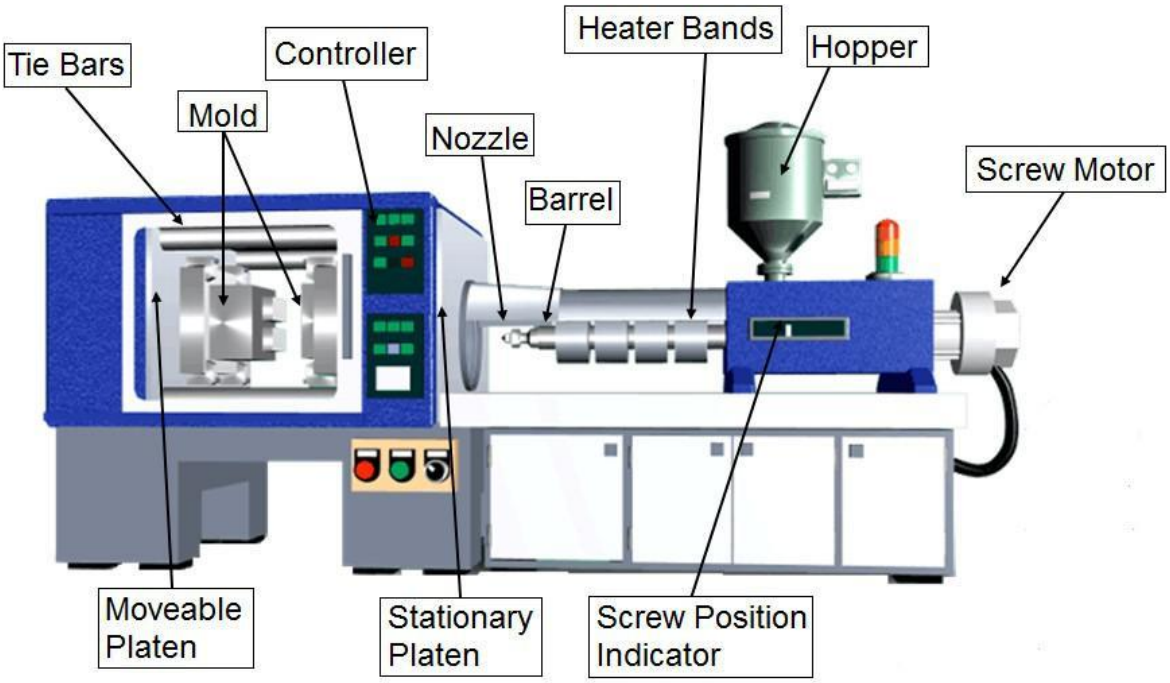

Figure 2.8: Screw Profile

2.10.3.5 Operational Hours

The manufacturing unit will remain operational 8 hours/day.

2.10.3.6 Water Requirement and Water Balance

7500000 liters = 2000000 liter (Machine Cooling) + 1000000 liter (Cooking & washing) + 1000000 liter (Gardening) + 3000000 liter (Hygiene) + 500000 liter (drinking)

Water shall be conserved by circulating with the help of cooling in cooling tower. This cooling water from machines shall be sent to cooling tower from where this shall be returned to machines again. Thus overall consumption of water shall be saved. Only the water evaporated from cooling water shall be lost. Otherwise the amount of water shall remain conserved.

1000 LPH RO Plant shall be installed for treatment of water used for drinking purpose.

Water shall also be needed for hygiene purposes in toilets or for irrigation of lawns. The requirement of water will be met from ground water supply by QABP which is in installation stages.

2.10.3.7 Electricity Requirement

The estimated electricity required during operational phase of the project shall be 830 KVA met through connection from QABP. This will be met from QABP own grid station which shall be fed by WAPDA. Stand by electric generator with capacity 100 KVA shall be installed.

2.10.3.8 Gas Requirement

The estimated gas required during operational phase of the project shall be 8 pounds $Hm.^2$

2.10.3.9 Man Power Involved in the Operation

Other than CEO, 150-200 employees shall be involved in the project operation. Administration shall involve CEO and General Manager. The staff shall be a mix of skilled and un-skilled manpower. These shall comprise Plant Manager, Supervisors, Machine Operator, Technician/Electrician and Helper. Receptionist, Sales staff, purchase personnel and accountant shall be among others. With gradual growth of business, manpower has been estimated to be increased at the rate of 25 personnel per year during next 5 years.

2.11 Restoration and Rehabilitation Plans

The project site is owned by proponent and does not possess any environmentally sensitive areas which may need rehabilitation. However, after completion of construction activities, all kinds of waste either recyclable or non-recyclable has been proposed to be managed according to procedure laid down in Bye-Laws of PIEDMC and in line with legal provisions of district government laws. The surroundings shall be cleared out of all kinds of debris from construction activities. The site is located inside Quaid-E-Azam Business Park, Sheikhupura which already has been dedicated by government for establishment of such kinds of units as proposed by the proponent.

Once the useful life of this unit of Cardiac Care (Private) Limited and its components will be over, a comprehensive mechanical and civil structural overhaul will be carried out. The old parts and equipment will be sold in the market for reuse and/or recycling. These shall be replaced with new and updated ones. Thus the life time of the unit shall be increased. In case of decommissioning of the unit, the civil structure shall be demolished under all required environmental controls. This will be done conforming to avoid any damage to environment or human health.

2.12 Government Approvals Required for the Project

Environmental Approval from the EPA-Punjab, Lahore is the major requirement to start work on the project. For seeking approval from Environmental Protection Agency-Punjab, this Environmental Impact Assessment Report is being submitted. Subject to this approval, permission from PIEDMC (which is part of Government) shall be granted.

CHAPTER-3

DESCRIPTION OF THE ENVIRONMENT

3.1 General

This chapter describes the existing environmental baseline conditions in the proposed project area. An environmental baseline study is intended to establish a database against which potential project impacts can be predicted and managed later. The existing environmental conditions around the proposed project have been considered with respect to physical, biological and socio-economic aspects. For this purpose, only those environmental items from Aldo Leopold's master checklist of environmental items have been considered which pertain to this project. Mitigation measures have been proposed in next chapter according to these physical, biological and socio-economic aspects defined in environmental baseline. The described information has been collected from foot survey, public consultation, literature, previous studies about project area, knowledge with the proponent and the concerned government departments. A site visit was conducted to survey the field area and to collect environmental data on physical, biological and socio-economic parameters. Real-time monitoring of samples of ambient air, noise and ground water has also been carried to know the baseline conditions.

3.2 Baseline Physical Environment

3.2.1 Topography

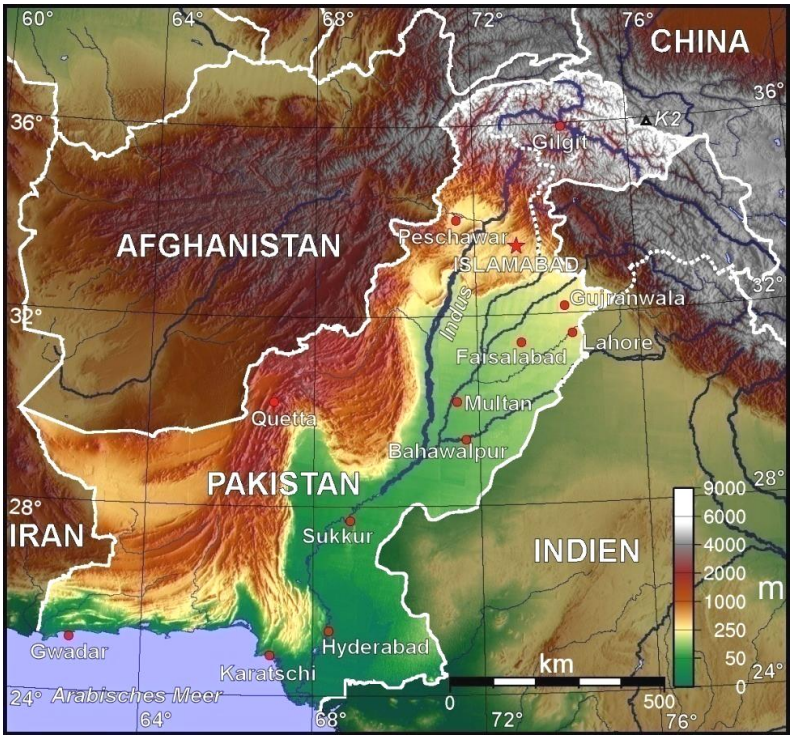

Figure 3.1: Topography of the Project Area

The topography of the project area is flat. The ground elevation varies between 204 and 211 m above sea level. The area is a part of Rechna Doab and consists of Sub-recent sediments brought by spill channel from the Chanab River. There are some old channel levees remnants and old basins filled up with clay materials. The material is probably of Late Pleistocene age derived from mixed calcareous sedimentary and metamorphic rocks of Lower Himalayas.

3.2.2 Geography

Jahangir Abad turned Sheikhupura is situated in Ravi-Chenab corridor and fast turning from a market agricultural town to an industrial city. Adjacent to Lahore, the town is surrounded by old places like Sangla Hill (old Sakala), Nankana Sahib (birth place of Baba Guru Nanak) and Jandiala Sher Khan (last resting place of Waris Shah).

Sheikhupura is situated at a distance of about 36 Km from Lahore, the provincial headquarters. Sheikhupura lies 31°42'51.16"N latitude and 73°59'3.49"E longitude. The city is well connected with its surrounding big urban areas like Faisalabad 94 Km, Sargodha 143 Km and Gujranwala 54 Km. Sheikhupura is bounded by 6 other districts of Punjab which include Lahore, Sargodha, Nankana Sahib, Narowal, Hafizabad, and Gujranwala. To the east is the international boundary of Amritsar - Indian Punjab. Project site at Quaid-E-Azam Business Park, Sheikhupura can be traced by the coordinates 31°44’28.35”N, 74° 3’1.67”E.

Figure 3.2: Sheikhupura in Punjab Province

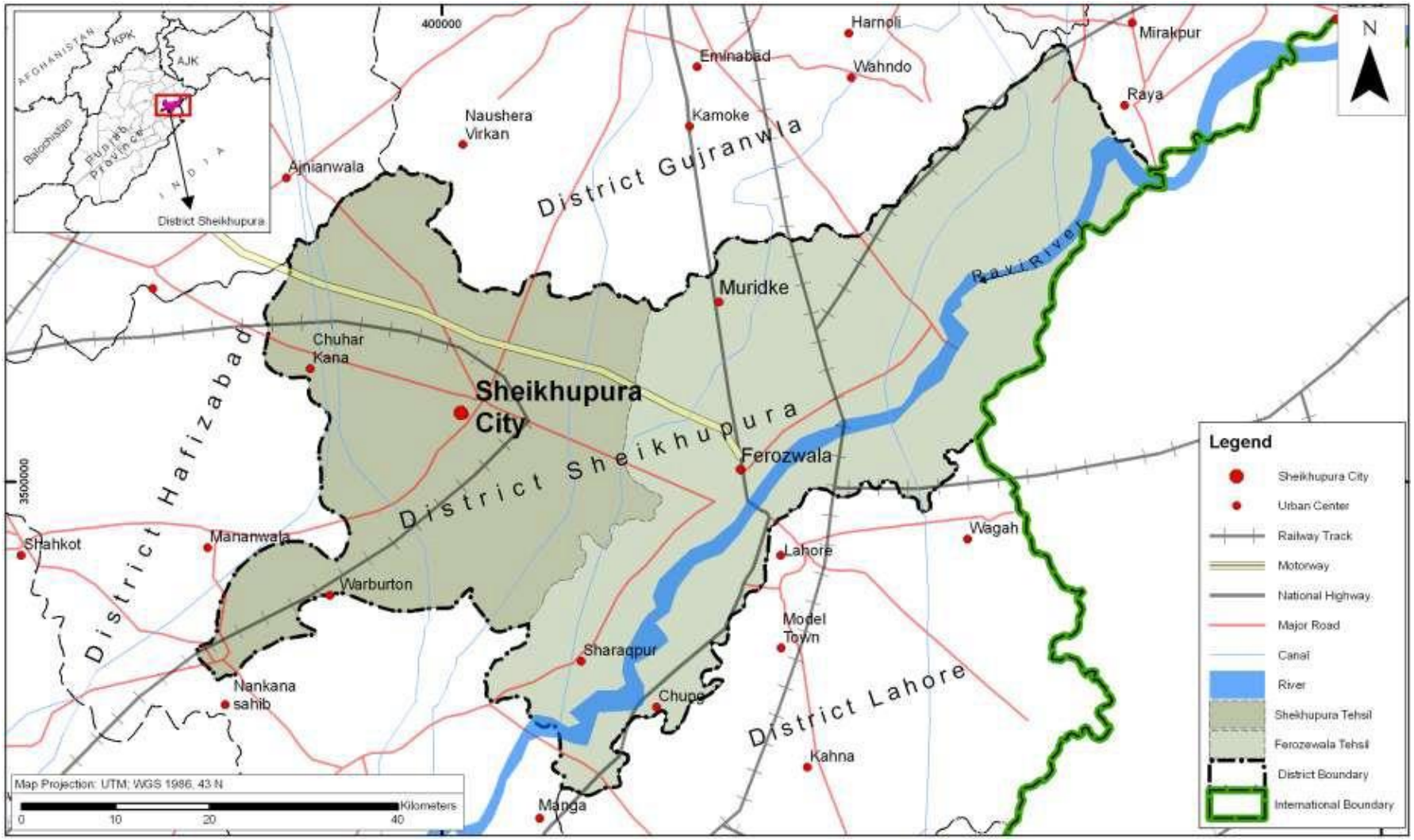

Figure 3.3: Map of District Sheikhupura

3.2.3 Regional Geological Conditions

The project is located at Quaid-E-Azam Business Park, Sheikhupura which is a part of the upper Indus plain. The project area is a part of Rachna Doab and consists of some recent sediment brought by spill channel from Chenab Canal. There are some old channel levee remnants and old basins filled up with clay materials. It is probably of late Pleistocene age derived from mixed calcareous, sedimentary and metamorphic rocks of the lower Himalayas.

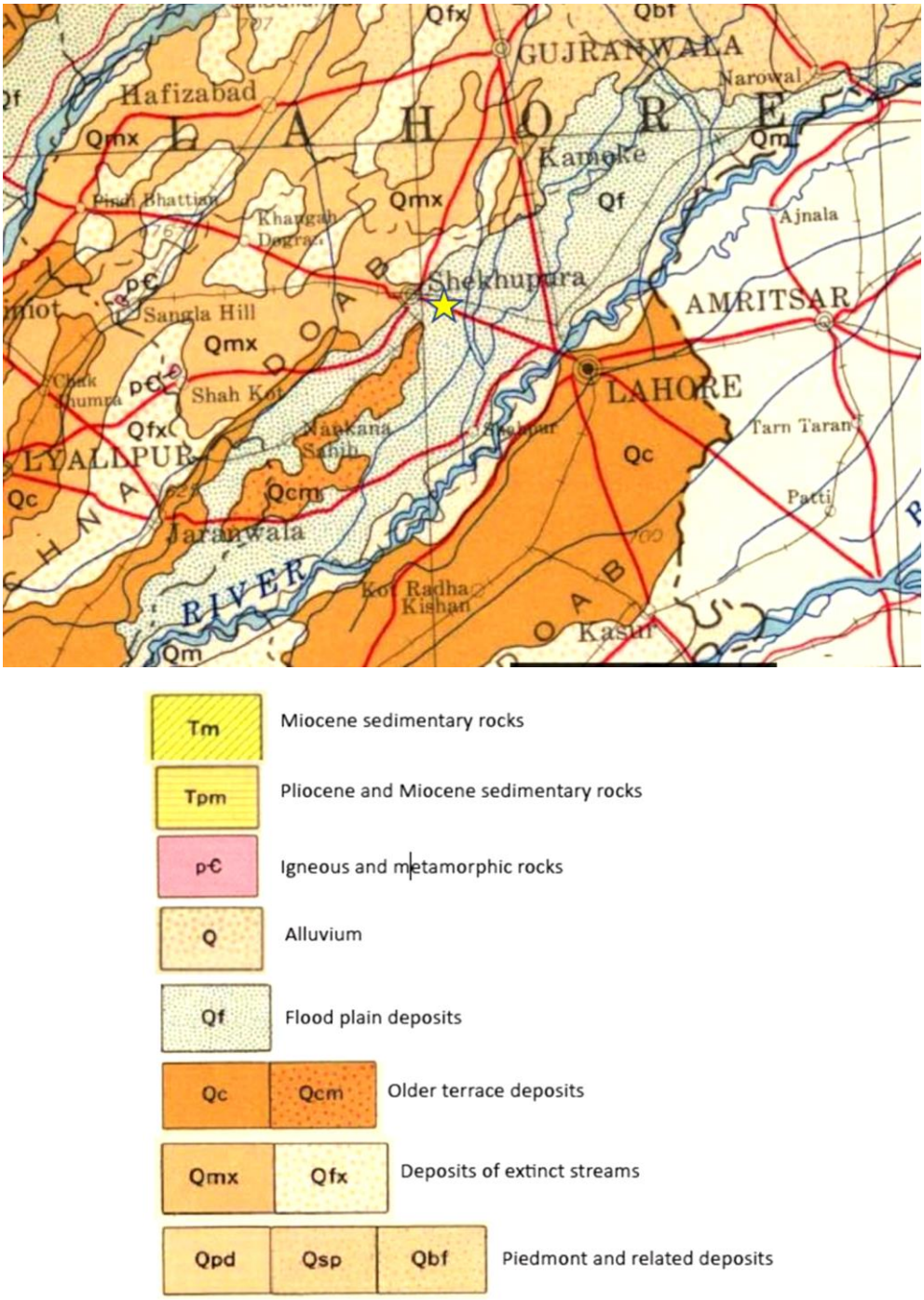

Figure 3.4: Geological Map of the Project Area

The only mineral products of the district are Kankar and Kallar. The small particles of Kankar may be burnt into lime. These are the features of all bare lands and are found on the surface or a little below it. Kallar is found on mounds, which are sites of old ruined habitations, and is used for the manufacture of crude saltpeter. The Kallar earth is collected and spread over filter beds, which are copiously watered from unlined wells sunk immediately along-side the filtered solution is then run down to cement-lined floors, where it is dried by the natural heat of the summer sun. The project area lies in plain field and is mainly confined with agricultural land at North West and South West location. According to Agro Ecological Zone of Pakistan, the project site falls under Zone-IV (b); the zone generally comprises sandy loam, and clay loam.

The project area has the soil consists of clay loam in texture having Bare soil i.e., popularly known as Missie. The worst type of this soil are the sand hillocks met with here and there in all tracts, and known as Tibba. The Missie lands are the most fertile, but these are not fit for rice cultivation, as they absorb moisture. The central portion, which is the Deg valley, has stiff soil. Stiff soil is either Rohi or Kallrathi according to the presence of Jess or more salts (Kallar) in it.

3.2.4 Soil

The vegetation carried by these soils is influenced by moisture and aeration. The soil in the project area is cohesionless and is of alluvial type deposited by Ravi River. Various soil layers below the ground level includes: silt, silty clay, silty sand, poorly graded sand with silt, lean clay etc. Soil Map of the project area is given in Figure 3.5. The soil is different in character and generally inclined to be dry. However, it is rich in potential plant nutrients. Soil is rich in potential plant nutrients.

Alluvium is soil or sediments deposited by the river or other running water. Alluvium is made up of variety of materials including fine particles of silt and clay and larger particles of sand and gravel. A river is continually picking up and dropping solid particles of rock and soil from its bed throughout its length. Where the river flow is fast, more particles are picked up than dropped. Where the river flow is slow, more particles are dropped than picked up. Areas where more particles are dropped are called alluvial or flood plains and the dropped particles are called alluvium.

The soil of the project area is fertile. Wheat and corn are the major crops. Rice at some places where water is available is also grown. However, vegetables, pulses legumes and fodder are the other crops.

Irrigation is largely dependent on the canals. Tube wells have also been sunk at the greater depths in the project area where fresh water is available.

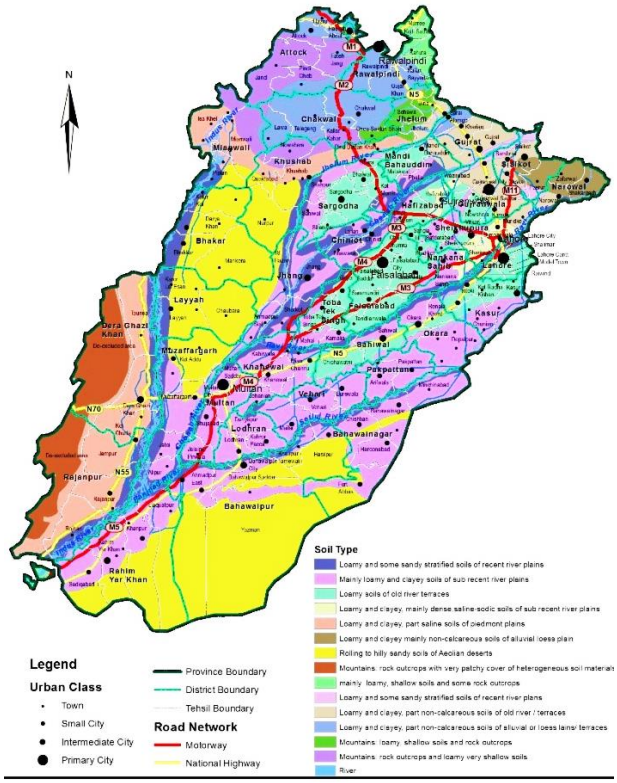

Figure 3.5: Soil map of the project area

3.2.5 Climate

The factors which influence the climatic conditions are air, humidity, precipitation, temperature and evaporation. Seasonal climatic conditions must be considered for the design and execution of project. These factors influence the construction of plant and other engineering structures. The project site, like other major parts of the province of Punjab, observes winter, summer, autumn and spring during yearly seasons. Overall effect of the climatic stresses can be determined from daily and seasonal temperature changes, site altitude, direct solar radiation, and precipitation. The project area has extreme climate, it has hot summers and cold winters.

The summer starts from April and lasts till October. May, June, and July are hottest months. The mean maximum and minimum temperature ranges from 40.4ºC and 27.3ºC respectively for these months.

The winter season lasts from November to March. December, January, and February are the coldest months. The mean maximum and mean minimum temperature ranges from 19.8ºC to 5.9ºC in January. Temperatures in the project area vary from 5.9ºC to 40.4ºC.

The project area receives rain in all the seasons but monsoon rain is pronounced and constitutes a definite rainy seasons between the months of July and September. The monsoons are at their peak during June and July,

and during these two months there is more than half of the annual rainfall. October and November are the driest months.

Pressure winds during January move from North to South-East and during July they go along South-East to North. The project area does not have any previous records of flooding.

The dust storms occur occasionally during the hot season, during June, July and August. Rainy weather alternates with oppressive weather. The rainfall is 500mm per year. The mean minimum and maximum humidity during winter is 37% and 84%.

Table 3.1 summarizes month wise temperature, precipitation, and relative humidity.

Table 3.1: Annual Meteorological Data of Project Area during 2021 (Source: Pakistan Meteorological Department, Lahore)

Month	Monthly Total Rain (mm)	Mean Max. Temp ^{o}C	Mean Min. Temp ^{o}C	Mean Humidity		Mean Wind Speed (Knot)	
				0800 PST	1700 PST	0800 PST	1700 PST
Jan	66.9	16.1	5.5	87	60	1.9	4.5
Feb	15	22.5	8.8	80	43	1.6	5.8
Mar	85.2	24.7	13.1	77	50	4.1	5.4
Apr	34	32.2	19	62	33	4.5	7.1
May	35	37.4	23.1	51	30	8.0	10.1
Jun	60.2	37.8	26	62	43	8.7	9.0
Jul	174.5	36.4	26.7	73	55	7.9	10.3
Aug	368	34.6	26.5	79	66	6.5	6.0
Sep	131.8	36.1	26	75	50	1.6	5.0
Oct	0.0	33.8	18.1	70	33	0.1	3.5
Nov	27	24.9	10.7	80	44	1.3	2.7
Dec	16.8	19.1	6.6	90	60	1.0	2.2

3.2.6 Seismicity

The area falls in Low Hazard Seismic Zone with Seismic Factor Ground Acceleration of factor ≤0.03 showing Negligible Possible Damages. According to the building code of Pakistan, it is located in the seismic zone 2A of Pakistan. Zone 2A represents peak ground acceleration (PGA) from 0.08 to 0.16g.

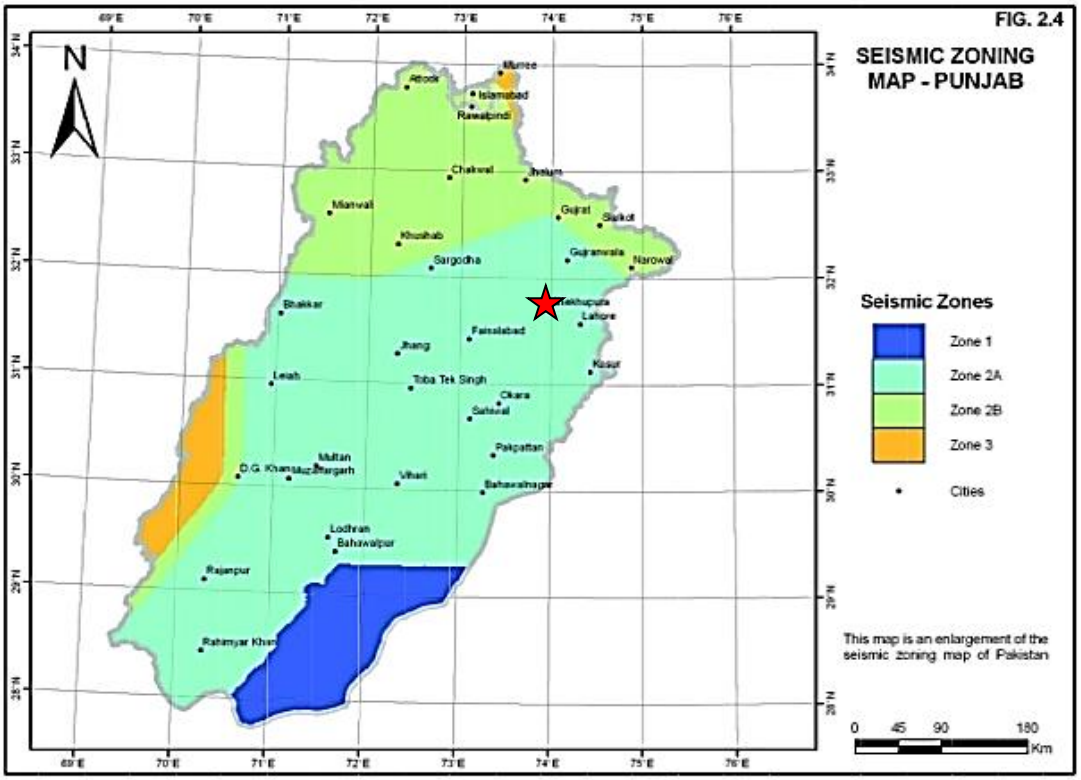

Figure 3.6: Seismic Zoning of Punjab

3.2.7 Water Resources

Seepage from the canals in the area has considerably raised the water table resulting in water logging and salinity. The tube wells installed by the WAPDA have however considerably brought down the water table.

Major surface water body of the district is Farooqabad canal which flows throughout the year and irrigates maximum agricultural area of Sheikhupura District.

In Sheikhupura, groundwater is the major source of drinking water which is available at the depth of 80 to 120 feet. The chemical contaminants pose serious health problems. The groundwater reservoirs are polluted through industrial, agricultural and different sewerage effluents.

In the project area, however the main source of water is Farooqabad Canal, and those who afford to drill bore holes up to 400–500 ft. to acquire water from the ground. Bore water and hand pumps are used to fulfill water requirements for potable purposes.

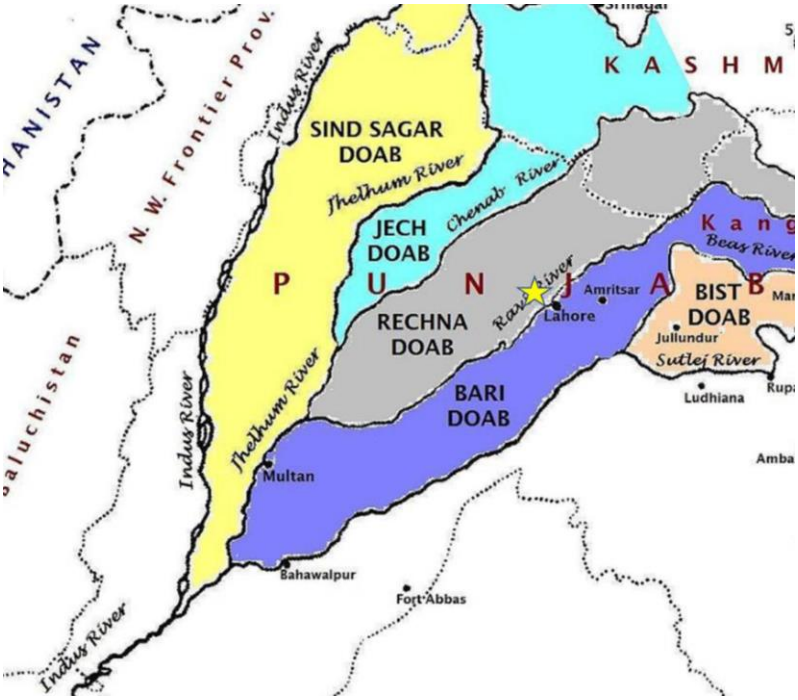

Figure 3.7: Hydrology of the project area

3.2.7.1 Municipal Water Supply

The town of Sheikhupura is supplied in municipal water by the Tehsil Municipal Administration (TMA). The water is sourced from groundwater. The municipal supply is only supplying the urban area. Outside the city, in more rural area like the project area, potable supply is sourced from individual private borehole wells.

3.2.7.2 Domestic Water Supply

In the project area, most of the potable supply is sourced from shallow individual wells, often equipped with hand pumps or small pumps. The total population (urban and rural) was estimated at about 694,853 inhabitants in the study area (census 2017 with a normal growth rate of 2.1%). In average, it can be considered that a person is using 200 l/day. As most of the households have livestock in the area, an estimate of 220 l/day can be considered. Using this rate (estimate only), the total annual groundwater abstraction for domestic use is estimated at 55.8 Mm^3 per year.

3.2.7.3 Agricultural Water Supply

The two canals, Upper Chenab Canal (UCC) and Upper Gugera Branch Canal (UGBC) are feeding the Sheikhupura region and are the main source of water for the irrigation. The canals are a main source of groundwater recharge via seepage. The total agriculture land in the study area is about 250 km^2. About 60% of the agricultural land is supplied by surface water (estimated at

8.2 Mm^3/year) and the remaining 40% is sourced from groundwater wells. The groundwater abstraction for agriculture is estimated at 4.9 Mm^3/year.

3.2.7.4 Site Area Water Supply

Specifically for Quaid-E-Azam Business Park, Sheikhupura and its surrounding areas, the ground water is drawn with tube wells for drinking as well as irrigation purposes. Due to over draft caused by increased population density, the quality and quantity of ground water is degrading. Therefore, people are gradually switching to use of treated bottled water for drinking purposes.

Table 3.2: Result of Chemical Analysis Test Report (Ground Water)

S#	Parameters	Units	PEQS	Result
1	pH	--	6.5-8.5	7.22
2	TDS	mg/l	<1000	572
3	Chloride	mg/l	<250	104.81
4	Fluoride	mg/l	≤ 1.5	BDL
5	Taste	Object./Unobject.	Unobject.	Unobject.
6	Hardness	mg/l	<500	51.04
7	Odor	Object./Unobject.	Unobject.	Unobject.
8	Color	TCU	1.5	0.2
9	Turbidity	NTU	<5 NTU	0.1
10	Lead	mg/l	0.05	BDL
11	Zinc	mg/l	5	0.35
12	Aluminium	mg/l	0.2	BDL
13	Chromium	mg/l	0.05	0.014
14	Cadmium	mg/l	0.01	0.0
15	Copper	mg/l	2	0.13
16	Boron	mg/l	0.3	0.022
17	Barium	mg/l	0.7	0.025
18	Nitrate (NO_3)	mg/l	≤ 50	1
19	Nitrite (NO_2)	mg/l	≤ 3	BDL
20	Antimony	mg/l	0.02	BDL
21	Arsenic	mg/l	0.05	0.002
22	Cyanide	mg/l	0.05	0.004
23	Mercury	mg/l	0.001	BDL
24	Nickel	mg/l	0.02	0.006
25	Residual Chlorine	mg/l	0.2-0.5	0.31
26	Total Coliform	Number/100ml	0/100ml	0
27	Thermo Coliform	Number/100ml	0/100ml	0
28	E. Coli	Number/100ml	0/100ml	0

For the project area, the ground water is the main source of water for meeting all kinds of requirements of units established in Quaid-E-Azam Business Park,

Sheikhupura. There shall be a well-planned uninterrupted water supply to all the units of QABP through overhead water tanks. These water tanks are under installation phase. Till then, borehole water pump shall be installed. The quality of this supplied water has been tested through EPA-Punjab certified environmental laboratory validated by EPA-Punjab officials. According to the data (annexed under Annexure-VII), all the parameters of water are within ranges as provided by Punjab Environmental Quality Standards.

3.2.8 Flood Control

The project area although situated near to river Ravi. However, this area has never been flooded even when Ravi gets surplus water from upstream areas.

3.2.9 Ambient Air Quality

The main sources of air pollutants are gaseous emissions from the industries and traffic on road. Environmental Protection Department of Punjab has issued Punjab Environmental Quality Standards for criteria pollutants, i.e. Particulate Matter, Ozone, Oxides of Nitrogen, Sulphur Dioxide and Carbon Monoxide. For assessing the current status of these air pollutants in the study area, these pollutants have been monitored through EPA-Punjab approved laboratory validated by EPA-Punjab officials. Results have been described in Table 3.3. The monitoring reports of Environmental Testing Laboratory have been attached in Annexure-VII. All of the parameters are already within permissible limits of Punjab Environmental Quality Standards.

Table 3.3: Result of Chemical Analysis Test Report (Ambient Air)

S#	Parameters (µg/m^3)	Time	PEQS	Results
1	Carbon Monoxide (CO)	8 hours	5 mg/m^3	2.15 mg/m^3
2	Nitrogen Oxides (NO_X)	24 hours	120 µg/m^3	34.52 µg/m^3
3	Respirable Particulate Matter (PM_{10})	24 hours	150 µg/m^3	104.14 µg/m^3
4	Respirable Particulate Matter ($PM_{2.5}$)	24 hours	35 µg/m^3	12.5 µg/m^3
5	Sulphur Dioxide (SO_2)	24 hours	120 µg/m^3	43.84 µg/m^3

3.2.10 Noise

Area is in industrial as well as in commercial use. Current levels of sound have been monitored. Monitoring reports annexed in Annexure-VII. Results have been described in Table 3.4. The result shows that noise levels are already within PEQS.

Table 3.4: Noise Levels of project area

S#	Time	PEQS	Range of Noise Levels dB(A)
1	Day Time	75 dB (A)	50.4-61.1
2	Night Time	75 dB (A)	46.1-54.7
3	Day Time	75 dB (A)	60.7-62.6

3.2.11 Liquid Effluents

The sewerage system covers 20% of the city and serves 30% of the population. Waste water is generally disposed of through open drains to the nearby sewer system, which is noticed to cause environmental contamination and water borne diseases. The residential area is expanding continuously on all sides of the town without any proper planning, which has reduced the coverage of facility. No plans are being developed to address these issues.

Various kinds of industries at Quaid-E-Azam Business Park, Sheikhupura shall release various kinds of effluents. The Quaid-E-Azam Business Park, Sheikhupura takes responsibility of management of some of the pollutants through its combined effluent treatment plant. Others shall have to be managed by the industrial unit itself.

3.2.12 Solid Waste

Each industry inside the estate shall be responsible for management of its process/industrial waste. For management of municipal solid waste, color coded plastic bins shall be placed in front of every industrial unit. The waste in these containers shall be managed by Quaid-E-Azam Business Park, Sheikhupura.

Generally, the solid waste management outside the project area is poor. This may be attributed partly to lack of awareness among people and partly to the poor management of authorities. There is no proper waste disposal service in the area so the villagers dispose waste in an open/vacant area. and burn it.

The existing solid waste management system of Sheikhupura is being managed by the Tehsil Municipal Administration (TMA), but its performance is not up to the mark and even the waste collection bins are not available. In study area, there is no proper waste collection system and the waste is thrown by people along the road side which is seldom picked up by TMA. Major issues of the solid waste management system in Sheikhupura are, non-availability of landfill site, shortage of sanitation staff, lack of competent professionals, inadequate planning capacity, poor information and weak financial management system.

3.3 Baseline Ecological Environment

The fauna and flora of the area include: Kikar, Piple, Bohar, Eucalyptus, Popular and Sharin. There is very little of wild life in the area.

3.3.1 Fauna

The project site is surrounded by urban and agricultural area. There is very little of wild life in the area. Wild boar is found within the riverine track. Jackals and hares play havoc with crops.

3.3.1.1 Aquatic Fauna

The project site is situated near a canal wherein aquatic life such as fish may be found.

3.3.1.2 Mammals

Commonly found mammals in the area include porcupine, stray dogs, cats, house rats, wild rats and bats. However Small Indian Mongoose and Indian Palm Squirrel are also found in the area. Common domestic animals include buffalos, cows, goats, sheep, camels and donkeys, horses, cats, dogs and hare.

3.3.1.3 Birds

Water fowls are found everywhere in the Degh valley particularly after good rains. Black partridges are found along the Ravi and gray ones all over the district. Falcon, eagle, quail and Starling. Jungle pigeon, Russian Sparrow, all doves, all ducks and egrets, king fisher, all snipes, parrot, and local sparrow. Crow are also found in the district.

Doves, quails, House sparrow (Passer domesticus), House crow (Corvus splendens) and Mynah (Acredotheres tristis) are commonly found in the area. Along with these some of other birds were also found such as Nightingale (Pycnontus cafer), Bank Myna (Acridotheres ginginianus), Parrot (Psittacula krameri), Pigeon (Columba livia), Common Koel (Eudynamys scolopacea) and Hoopoe (Upupa epops).

3.3.1.4 Reptiles

Lizards such as Spiny tailed lizard (Uromastyx hardwickii) and fingered toed lizard (Acanthodactylus cantoris) are found in the area. Goh (iguana) and snakes are also found. The snake requires to be specially noted. The Deg valley is notorious for its poisonous variety-the Karees or the Viper. It is short, thin and of the colour of the earth. It is extremely poisonous and its bite is always fatal.

3.3.1.5 Amphibians

The amphibians found in the area include common frog (Rana tigrina) and Indus valley toad.

3.3.1.6 Critical Habitats

No wild life sanctuary or game reserve (critical habitats), exists near the project area or the study area.

Black Drongo (*Dicrurus macrocercus*)	Snipe (*Gallinago gallinago*)
Indian Palm Squirrel	Bank Myna
Small Indian Mongoose	Asian Koel

Figure 3.8: Fauna of the project area

3.3.2 Forestry

The Bar jungle has almost disappeared owing to colonization and extension of canal irrigation. Karil (Capparis aphylla) is commonly met with but is no-where bigger than shrub. Jand a much prized tree for its firewood and charcoal is becoming a variety. Van which has also become rare is kept for its shade. Shisham, Kikar along canal banks has developed into fine big trees. There is no locality without a rich growth of trees mainly Bohar, Eucalyptus, Popular and Sharin.

3.3.3 Flora

The vegetative resources around the location of the project are typical of the plains and include Kikar (Acacia arbica), Shisham (Dalbergia sissoo), Pipal (Ficus religious), Mulberry (Mourus alba), Aam (Mangiferra indica), Siris (Albizzia lebbek), Jamolan (Engenia jambolana), Amaltas (Cassia fistula) and Saffaida trees. They are the most useful and provide hard wood for construction, agriculture implement manufacture and for a variety of many other purposes like furniture manufacturing. The main tree composition in the project vicinity includes Neem, Dhrek, Eucalyptus and Shisham. These trees are not present on the project site.

Wild grasses and horny shrubs are also found mostly as wild growth on especially small patches of land, which is out of use. The flowering plants include Sunflower, Rose, Motiya (Jasminum sambac), Shoe flower (Hibiscus rosa). The trees include Alstonia, Arjun, Gul-e-Nishtar, Neem, Ashoke, Kanair, Sukh Chayn, Bottle brush. Herbs and grasses of some types; Calotropis procera, Cynodon dactylon, Petuma sp., Nicotiana plumbajinifolia, and Poa sp. are also found.

Dalbergia sissoo	Ficus religiosa

Figure 3.9: Flora of the project area

3.3.4 Endangered Species

There are no endangered species of plants or animals in the project area.

3.3.5 Agriculture

The surrounding area of the project is predominated with agricultural use. The wheat, rice, maize, berseem, brassica (Sarson), legumes and pulses and animal fodder are among the major crops grown on the agricultural land surrounding the project area.

3.4 Baseline Socioeconomic Environment

Socioeconomic baseline has been developed for the project through a review of secondary data as well as primary data collected using checklists and discussion with locals (residents, farmers, shopkeepers, students, pedestrians, drivers) in the project area. Social survey was conducted to assess the present socio-economic and socio-cultural conditions of local population of the project area. The availability of basic amenities of life to community living in the project area is indicator of its socio-economic condition. Secondary data used include census report and previous research carried out in the area.

3.4.1 Population and Communities

The project site is situated in agricultural and industrial zone and the nearest community is present at a distance of about 5 Km. According to census of 2017, the population of Sheikhupura is 34,60,004. The average annual growth rate according to 2017 Census is 2.22%. The surrounding villages of Quaid-E-Azam Business Park, Sheikhupura are Bhamb Kalan, Sahu Ki Maliyan, Chichoo Ki Malliyan and Sheikhupura District. All these villages are nearest from the project site. Basic needs of life like electricity are present. However, natural gas, water supply and basic infrastructure like roads and drainage system are not present in these villages.

3.4.2 Political and Administrative Set-up

The project is located in Quaid-E-Azam Business Park, Sheikhupura district, one of the 42 districts of the Punjab province. The latest survey (2017), recorded a population of 3.46 million inhabitants in the Sheikhupura district, covering a surface of 5,960 km². The population density was recorded at 580 inhabitants per km². This district is divided into 5 tehsils (administrative sub-division of a district). These are Sheikhupura, Muridkay, Sharaqpur, Ferozewala and Safdarabad. The project is located in the Sheikhupura tehsil, with the city of Sheikhupura being its headquarter. It has Tehsil Municipal Administration. Under TMA, lower tiers of local government such as union councils function. Other than TMA, there are different departments involved in Municipal Services. i.e. includes Public Health Engineering Department, Provincial Highway, District Housing Department (PHATA), District

Environment Department, Traffic Police and District Transport Department, District Road Department.

Sheikhupura district was created in 1919 primarily to reduce the extensive boundaries and to remove the administrative difficulties of Gujranwala district. After that Sheikhupura town got some importance and started developing, and the building of District Court was constructed. The District Headquarter Hospital building was built in 1922; College for Boys was established in 1957. M.C. Girls school building was constructed on Jandiala Road in 1957. The building of the Girls College was constructed in 1968. Bus Stand was established in 1972. In 1973 the Area Development Housing Scheme along Sheikhupura-Lahore Road was initiated by Provincial Department of Housing and Physical Planning.

Quaid-E-Azam Business Park, Sheikhupura is managed by Punjab Industrial Estate Development and Management Company PIEDMC. The facility is located in the Upper Rechna Doab, one of the main regions of the Punjab province delimited by the Chenab and Ravi rivers.

3.4.3 Industries

The project site is located in Quaid-E-Azam Business Park, Sheikhupura. The city of Sheikhupura is an industrial center. Large number of industries is present in the vicinity of the project site.

Industrial sectors that have been established are Pharmaceuticals, Food Processing, Engineering, Textile/Garments, Carpet, Paper & Board, Plastics, Electronics, Chemicals, fertilizers, paints, steel, auto parts, wood products, warehouse and fertilizer etc.

Major industrial units at Lahore Road near City Sheikhupura include ICI polyester, Tariq glass, Ghani float, Nestle, Mian Tyre, Punjab Feed, Ayesha Textile, Shaheen Shahzad Textile, Prime paper mill, Win/hard board, National flour mill, Fatima Fertilizers and Atlas Honda.

3.4.4 Infrastructure

The QABP shall be a purpose built industrial estate. Therefore, it shall provide all essential facilities to all of the investors of the estate in order to encourage further industrial development. Roads, natural gas and electricity shall be available. QABP is situated along Motorway M2.

3.4.4.1 Potable Water Supply

The water supply in Sheikhupura is collected from ground water through a network of 41 tube wells, which covers 33% of the town and 40% of the population. The distribution system consists of 4 overhead reservoirs with a combined capacity of 290000. To rest of the areas of Sheikhupura, water supply is through bore hole. However, in village areas, people draw water

through manual pumps. No plans are currently being developed to improve public water supply mechanisms.

Inside Quaid-E-Azam Business Park, Sheikhupura, consistent and adequate ground water supply shall be made available through overhead water storage tanks. These tanks shall be fed with ground water draft through tube wells.

3.4.4.2 Sanitation and Drainage

PIEDMC has issued Industrial Building Regulations containing section for sanitation and drainage. The details have been attached in Annexure-IX. Every unit shall establish septic tank, which shall dispose-off industrial as well as sewerage wastewater of the unit to wastewater system of QABP. QABP shall establish composite effluent treatment plant, which shall treat water before ultimate disposal. However, sewerage system in the surrounding villages is very poor. This is old 'Naali' system ultimately reaching open areas and drains. The project area does not have a proper sewerage network. In the Dhantpura Village and Bhamb village, open sewerage channels are commonly found, polluting open lands. But due to lack of proper sanitation people have no other choice.

Figure 3.10: Sanitation & Drainage in the project area

The sewerage system is only available in 20% of the city area which serve about 30% of population. The total length of sewer is 30Km. The waste water is generally disposed off through open drains to the nearby sewer system, which are not only polluting the environment but also causing many waterborne diseases. The residential area is expanding continuously on all sides of the town without any proper planning, which have reduced the coverage of facility to approximately.

3.4.5 Land Use Planning

Sheikhupura was originally a planned town. Grain and vegetable markets and retail shops were established in the centre, and the “Civil Line” of public and administrative buildings was placed to the west in the form of a rectangular grid. After 1947, development in the southern and eastern parts of the city was haphazard and lacked proper planning. Uncoordinated growth continues to the present day.

As a result, Sheikhupura has lost the character of a planned City. There is a total area about 5160 acres with the municipal limits of the city. In addition, there are about 414 acres of contiguous development outside the municipal limits which have been included for future planning of the city. Based on Land use survey the city can broadly be divided into the following three zones:

North Zone: The area to the north of the central parts of the city beyond the railway line constitutes the Northern Zone. This zone is mainly under the residential use.

Central Zone: The areas falling between the railway line and Aziz Bhatti road could broadly be taken as central Zone. In fact, the commercial and administrative activities are mainly concentrated in this area. The Grain market and main bazar s from the commercial zone through built on regular pattern but presents a picture of confusion and chaos during the day.

Southern Zone: The whole area lying to the south of the “Central Zone” has been included in this zone. According to an estimate about 50% of the total population of the city is residing in this zone. The Degree College for Boys and Girls as well as a number of High and Primary School are located in this area.

Under the present Government system, the District Government is responsible for all land use planning according to the provincial laws. The land occupied by Quaid-E-Azam Business Park, Sheikhupura has been dedicated for industrial use only. The relevant documents have been attached in Annexure-IX. Quaid-E-Azam Business Park has plots of various sizes with ownership rights.

3.4.6 Power Sources and Transmission

WAPDA shall be the source of all electricity in QABP. QABP shall have its own separate dedicated grid station. Transmission of power to industrial units

of QABP from this grid station shall be through underground electric transmission lines.

Electric supply is also available to all of the surrounding areas through overhead transmission lines.

3.4.7 Agricultural Development

Local residents earn their livelihoods from agriculture and livestock. However, with time, the areas are getting urbanized and converted into residential societies. The major crops include wheat, rice, fodder plants and some vegetables.

Figure 3.11: Agricultural fields across the road of the project area

3.4.8 Quality of Life Values

3.4.8.1 Main Occupations

Survey of the project area reveals that agriculture is the main source of income for people of the area. Majority of the people around the project site belongs to poor section of the society. They have elementary occupations followed by skilled agricultural and fishery workers, service workers, shopkeepers and market sales workers, brick kiln workers, craft and related trade workers. A very small group belongs to affluent portion of the society including industrialists, bankers, politicians, educationists, medical professionals, businessmen and real estate business owners.

3.4.8.2 Family Life

The elders themselves strictly follow the old traditions in every walk of life while living in the affluent society. Their children are trying to follow the life style of the affluent society. In spite of all the modernized lifestyle, virtually elders are responsible to make decisions and their decisions are valued by the family members. Print and electronic media are influencing almost all walks of life of the people. There is a lot of awareness about education. Rich or poor all families are trying hard to get their children educated. Mostly joint family system prevails. Most of the families are quite coherent. There is a rising trend in the society to change their old traditional socioeconomic pattern of life.

Figure 3.12: Labour class also work at these Brick Kilns

Figure 3.13: Livestock is also source of income for people of project area

3.4.8.3 Religion

Predominant religion of the area is Islam with some percentage of Christian community.

3.4.8.4 Transportation

The transport infrastructure in Sheikhupura is generally inadequate for existing requirements. There is no signal on any Chowk and no urban bus or van services are available. On all roads, mostly motorcycle rickshaws or auto rickshaws are being used as urban transport services.

3.4.8.4.1 Roads

Sheikhupura City is connected with Faisalabad through newly constructed Lahore-Faisalabad Road and also by M2 and M3 Motorway. There is a reasonable network of roads connected by small roads in the area. Most of the villages are connected with each other through these roads. Public transport is available in the form of vans, buses and railways. Due to motorway, we can find movement and stationing of goods transport trucks. Inside QABP, there shall be asphalt arterial roads. The condition of streets inside the surrounding villages is not that much good. These are paved either with bricks or with RCC. These have been found in much damaged condition. Due to poor sewerage system, the water becomes stagnant on roads during rainy season causing inaccessibility to these villages from main road.

Figure 3.14: Condition of roads inside Sheikhupura City

3.4.8.4.2 Railways

Sheikhupura serves as a railway junction. Trains coming from Lahore take these routes for Faisalabad and Shorkot. Chicho Ki Malliyan Railway station is located at a distance of 8 Km and Sheikhupura Railway Station is located at a

distance of 10.6 Km from the project area which connects it to other parts of the country for movement of public, raw materials and finished goods.

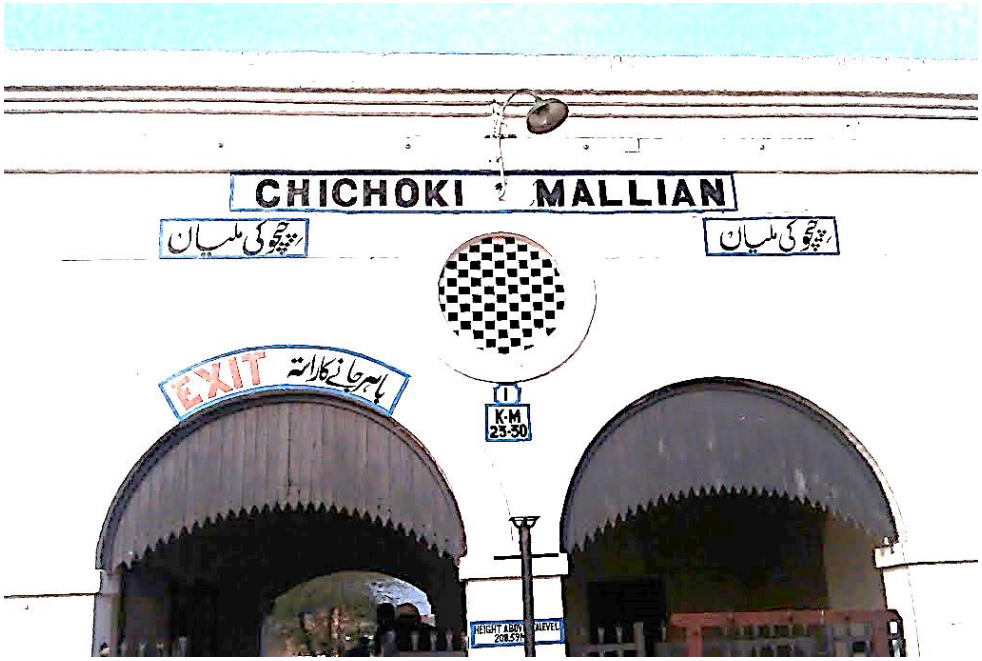

Figure 3.15: Chicho Ki Malliyan Railway station

3.4.8.4.3 Airport

Allama Iqbal International Airport, Lahore is situated at 68 Km from QABP.

3.4.8.5 Housing

Most of the people have built pacca houses. Recent development in housing sector has also influenced Sheikhupura area. We can find mushroom growth of a large number of housing societies in the area. These housing societies have upgraded the living standards of people of the area. However, we can also find migrants from other parts of the city and country coming to reside in the area of locals. This migration has both positive and negative impacts on the life of the local people.

3.4.8.6 Public Health

Sanitation facilities are very poor. Old naali system still exists. These overflow even in case of light rain. These cause muddy bumps on the roads. Drinking water supply is through bore hole pumps. WASA supply is present only in few areas surrounding the project site. Only small scale dispensaries are available at some villages of the area. There is THQ hospital in public sector. DHQ Hospital and basic health units are present all around the city.

3.4.8.7 Education

Mostly people are illiterate. They used to earn their livelihood as farmers. However, with passage of time, literacy rate is rising up. Small schools are present in the nearby villages mostly up to middle level. For government owned higher education institutions, students have to go to Lahore. TEVTA approved Technical Training Institutes has also been established with an objective to train local people to meet the needs of industrial units.

Figure 3.16: A primary school at Bhamb Ki Mallian Village

3.4.8.8 Recreational Resources

Hiran Minar is main recreational place present at a distance of about 10 Km from the project site. Additionally, a sports complex has also been made inside Sheikhupura city where there are grounds for hockey, football and volley ball. People are establishing some other sources of recreation.

3.4.8.9 Aesthetic and Cultural Values

Because of limited income, most of the common people live marginalized status of life. They had completely rural standards of living. Gradually the people are getting urbanized. However, old traditional and simple life typical of the Punjab villages is the prevailing cultural and aesthetic characteristic of life style of majority of the people. Old people prefer to live conservative life style. Decades old culture and customs in every walks life are dominant. General attitude to visitors is quite welcoming.

Figure 3.17: Sheikhupura Sports Complex

Figure 3.18: Hockey Ground at Sheikhupura Sports Complex

3.4.8.10 Language

Punjabi is the main language. Many dialects of Punjabi can be found in practice.

3.4.8.11 Ethnicity

The main castes and groups of Sheikhupura district are Bhatti, Arain, Kashmiri, Jutt, Rajput, Malik, Pathan, Mughal, Sheikh, Komboh, and Gujjar.

3.4.8.12 Role of Women

Women of the area are mostly illiterate. However, they do assist their male family members in all of their activities. We can find women milking the cattle, managing the livestock, working at crop fields, selling the fruits and such other activities to support earning livelihood.

3.4.8.13 Archeological and Historical Treasures

Sheikhupura is a city of Punjab, Pakistan. The name of Sheikhupura is derived from a nickname of Prince Jahangir, who was known as Sheikhu by his father King Akbar. The present city of Sheikhupura was built by Mughal Emperor Jahangir in 1607. Sheikhupura is an industrial city. Old names of Sheikhupura are Kot Dayal Das, Qila Shaikhupura and Singhpuria. It is also named as Jahangirpura in Tuzk-e-Jahangiri. Sheikhupura name was changed by Mughal Emperor Jahangir from the name of this area, Virk Garh. Sheikhupura was founded by Mughal Emperor Jahangir. Nearby Important and Famous Cities and Places are Lahore, Nankana Sahib, Narowal, Hafizabad, and Gujranwala.

In old days the surroundings of Sheikhupura abounded in wild life and the Emperor used to go there regularly for hunting. In 1619 A.D, a fort was built by Jahangir. This fort served as a resting place for him. The town was named after Emperor Jahangir. When he was still prince Saleem, he was called Shekhu by his father Akbar the great, in reverence to saint living in the vicinity who blessed the young prince.

Sheikhupura has a number of historical places in the city, attracting a sizable tourist population. These attractions include the Sheikhupura Fort Hiran Minar, Sheikhupura Fort (Qila Sheikhupura); Company Bagh, Shrine of Shah Jamal, Muqadssa-e-Mariam, Sacha Sodha and the Tomb of Mian Sher Muhammad Sharaqpuri.

3.4.8.13.1 Hiran Minar

Hunting grounds were an important part of the physical environment of Mughal emperors. The place where the town stands today was one of Jahangir’s (Prince Salim) princely dominions during his father Akbar’s reign. The town was founded by Jahangir, near village Sahu Malli, during his rule in 1607. The king declared the barren jungles adjoining the place as royal hunting ground.

Apart from arts, Jahangir had interest in hunting also. 'Hiran Minar' is an example of his love for the Royal deer. This monument is unique in its design. setting and architecture. This wonderful Mughal monument was constructed at a hunting reserve used by the Mughal royals. The reserve was built in a scrub forest and allowed Mughal emperors to experience a sense of semi-wilderness near the imperial city of Lahore. The game-reserve was used as a park where visitors could enjoy the sport of hunting. The minaret itself was built in 1606 C.E. as a monument to Emperor Jahangir's beloved pet

antelope, Mansiraj, or "Light of the Mind", who had been trained to lure wild animals to the tank in order to be hunted.

Figure 3.19: Hiran Minar

Figure 3.20: Pond at Hiran Minar

Hiran Minar is a high cylindrical structure built symmetrically opposite to the royal hunting pavilion. The hunting pavilion on the other side is an impressive three-story octagonal structure standing in the middle of a huge water tank. It is accessible by a beautifully arched bridge. There is a central chamber on the ground floor, surrounded by several antechambers. Two narrow staircases lead to the first floor which offers an excellent view of the pond and a vast area surrounding the complex, through its arched corridors. The second floor

is mostly open roof except for an exotic canopy in the middle which gives the building its crown and offers a magnificent view of the area. The only ground floor of the pavilion is open to the public.

3.5 Lab Reports of Environmental Analysis

For assessing the current status of baseline quality of environmental parameters including ground water, ambient air and noise in the study area have been monitored through Punjab-EPA approved laboratory in the presence of Punjab-EPA officials. The monitoring reports of Environmental Testing Laboratory containing the results have been annexed in Appendix-VII.

According to the data, all the parameters of water are within ranges as provided by Punjab Environmental Quality Standards.

The main sources of air pollutants are gaseous emissions from the industries and traffic on road. Environmental Protection Department of Punjab has issued Punjab Environmental Quality Standards for criteria pollutants, i.e., Particulate Matter, Ozone, Oxides of Nitrogen, Sulphur Dioxide and Carbon Monoxide. Results have been described in Table 3.3. According to the data, all the parameters of air are within ranges as provided by Punjab Environmental Quality Standards. These may be subsequently monitored for knowing impact of project construction and operational activity on the value of these pollutants.

Area is in industrial as well as in commercial use. Current levels of sound have been monitored. Results have been described in Table 3.4. The result shows that Noise levels are already within PEQS.

3.6 Suitability of the Site

The proposed project site for the construction of project is located at Plot # 11-B, Quaid-E-Azam Business Park, Sheikhupura. The Google Earth coordinates are 31°44’28.35”N, 74° 3’1.67”E. The project plot is surrounded by industrial plots at its east and west, at north with a 61m wide main boulevard road of QABP, at south with 40m wide road. The map showing location of project area and Google map is annexed as Annexure-VI.

The purpose of QABP is to promote industrialization in Punjab. All the area of QABP is dedicated for industrial use by Government of the Punjab. Supporting documents are attached as Annexure-IX. Even the commercial use of the area shall be discouraged. QABP has been purpose built for establishment of such kinds of units as proposed by the proponent. QABP is surrounded by residential and commercial areas. No agricultural activity has been observed at the project site. However, some agricultural patches can be found outside QABP. The project site is owned by proponent and does not possess any environmentally sensitive areas. These facts support suitability of the site for this project.

CHAPTER-4

SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.1 General

This chapter identifies the potential impacts due to the implementation of project on the physical, ecological and social environment of project area. The chapter also identifies measures that will help mitigate the project's adverse environmental effects and enhance positive impacts. This shows the environmental responsibility on the part of the proponent.

The proponent is submitting an undertaking on stamp paper with EPA-Punjab that they shall ensure that the project shall be executed throughout all of its phases strictly in compliance with all applicable legal and regulatory obligations regarding environment. Therefore, we can say that the project activities shall not have significant negative environmental impact on any aspect of the environment.

4.2 Impact Assessment Methodology

Following methods have been used for impact assessment:

4.2.1 Checklists

The environmental aspects of the project during all stages namely pre-construction, construction and operation have been selected from Aldo Leopold's master list of environmental items which is widely used world over for this purpose. The extent of qualitative and quantitative impacts has been described and mitigation measures have been proposed to keep them within permissible limits.

The systematic strategy developed to provide an assessment of the potential impacts on the environment of the project area included:

- Considering general guidelines
- Surveying, environmental baseline monitoring and stakeholders consultations to identify potential environmental impacts
- Situational analysis to know magnitude and significance of impacts
- Proposing best available and cost effective mitigation measures for environmental management

4.2.2 Thinking through Stages of the Project

The project stages have been defined as pre-construction, construction and operation phase. The actions and likely impacts of each stage of the project

have been described on the basis of professional judgment. Environmental monitoring of selected parameters shall also be carried out. The best available techniques not entailing to environmental costs and best practicable options have been recommended to mitigate the negative impacts.

4.3 Impacts Associated with Project Location

The project envisages the construction of medical devices manufacturing unit at Plot#11-B, Quaid-E-Azam Business Park, Sheikhupura. The site location is already a clear land situated at Quaid-E-Azam Business Park, Sheikhupura which is purpose built for industrial purpose. Government of the Punjab has dedicated this location for industrial use. Therefore, it supports establishment of such kinds of projects.

This project site has other establishments of almost similar size in its immediate surroundings. The establishment of this medical devices manufacturing unit is not expected to cause any significant negative impact in the location of the project because all the environmental aspects shall be kept under strict controls with the help of stringent mitigation measures incorporated in PIEDMC Industrial & Commercial Buildings Regulations.

4.4 Impacts Associated with Project Design

Design stage is the most important stage where environmental consideration can comfortably be incorporated without any financial and environmental damages. Subsequent modifications in order to bring the project in compliance with legal requirements after the initiation of the project often causes wastage of valuable natural and financial resources.

The construction shall be composed of four single story buildings, a double story office block and a single story masjid building. All buildings shall have RCC structure. The RCC slabs shall be supported by RCC pillars, beams and masonry walls. Underground water tank, above ground water tank, septic tank and guard room shall be among other structures. Total area of the plot is 144176.93 Square ft. Total covered area of the plot shall be 76198 Square ft. The civil work will be excavation for foundations, erection of pillars and beams. This shall be followed by installation of RCC slabs and masonry walls shall be made subsequently. Localized drilling shall be done to excavate for foundations. The localized drilling shall keep the impact of construction within limits.

The project has been designed to adhere to all standard technical as well as environmental requirements in order to avoid impacts on environment. The design of the project shall be implemented only after approval by PIEDMC.

Besides technical details according to its industrial and commercial building regulations, PIEDMC shall review whether environmental aspects of the project have been given due consideration. PIEDMC Industrial and Commercial Building Regulations themselves contain environmental provisions (attached herewith under Annexure-IX). After giving due

consideration to environmental aspects of the design, the submission drawings shall be approved by PIEDMC. The construction contractors will be selected from among contractors who have significant experience in similar construction developments. These contractors shall have competence to care about environmental aspects of the project.

4.5 Characteristics of Impacts Associated with Construction Phase and their Mitigation Measures

The project shall be established inside Quaid-E-Azam Business Park, Sheikhupura. All the steps of construction shall be performed according to PIEDMC Industrial and Commercial Building Regulations which already contain environmental provisions. Therefore, the impact of construction shall be controlled.

4.5.1 Noise and Vibration

During construction activities, continuous, intermittent and instant noise and vibration may be caused by the operation of earth moving and excavation equipment, welding plant, cutting operations, concrete mixers, cranes and lifters for the transportation of equipment, materials and people. Loading and off-loading of materials and equipment shall also be a source of noise.

4.5.1.1 Duration

On the whole, the duration of the noise shall be temporary. The construction activities shall be performed only during day light hours.

4.5.1.2 Extent & Location

The noise and vibration shall remain restricted within 40-50 ft. of the project plot and within boundaries of Quaid-E-Azam Business Park, Sheikhupura.

4.5.1.3 Reversibility

As soon as the construction phase is complete, the noise and vibration due to construction activities shall cease to exist.

4.5.1.4 Likelihood (Risk)

The noise levels shall be mostly within acceptable limits. Only construction staff shall be at risk. If they adopt following mitigation measures, their risk shall be managed. Residential areas are very far away from the project site. Thus, these shall not be impacted due to noise and vibration.

Mitigation Measures

- Activities with the greatest potential to generate noise to be planned during periods of the day that will result in least disturbance.

- Such equipment shall be used which has been designed by default with noise control elements.
- Using noise control devices, such as temporary noise barriers and exhaust muffling devices for combustion engines.
- Proper lubrication and maintenance of all construction equipment shall prevent unwanted sounds leading to noise.
- Operation of noise producing machinery shall be kept limited.
- Ear plugs shall be provided to workers during construction.

4.5.2 Impact on Soil

Initially the soil shall be disintegrated to a little extent due to excavation for foundation pillars. Soil disintegration may also be caused by exposure of soil surfaces to rain and wind during site clearing, earth moving, and excavation activities. The mobilization and transport of soil particles may result in sedimentation of surface drainage networks.

4.5.2.1 Duration

After construction phase, the soil particles shall settle down and get consolidated. Therefore, the duration shall be temporary.

4.5.2.2 Extent & Location

The excavation for foundation pillars shall cause only local disintegration of soil. The soil disintegration shall be within the project plot and within boundaries of Quaid-E-Azam Business Park, Sheikhupura.

4.5.2.3 Reversibility

The land of project plot shall be covered with the established project. Bare soil shall be vegetated. Deep soil shall not be disturbed as such except holes for filling foundation pillars with concrete.

4.5.2.4 Likelihood (Risk)

The disintegrated soil shall be immediately replaced with some filling material such as concrete and replacement soil. Therefore, there is no likelihood of any risk.

Mitigation Measures

- Excavation shall be done for foundation with the help of vertical drilling thus restricting its area of impact only to the specified points of the site
- Compacting the surfaces properly
- Preventing the movement of soil particles into the water lines
- Vegetating exposed areas after construction promptly

4.5.3 Impact on Air Quality

Initially construction activities may generate emission of dust caused by a combination of on-site excavation, ground leveling, filling, movement of earth materials, contact of construction machinery with bare soil, and exposure of bare soil and soil piles to wind. A secondary source of emissions may include exhaust from combustion engines of earth moving equipment on-site.

Use of uncovered vehicles for transportation of building materials such as gravel, sand and cement as well as their storage on the construction site can lead to inadvertent dispersal of materials during heavy rains or high winds during dry periods. This may have a little negative impact on the surroundings the form of particulate matter (PM). The principal air pollutants may be particulate matter (PM), CO_2, CO, NO_X, SO_X, and to a little extent VOC's.

4.5.3.1 Duration

Temporary. At the end of construction phase, the above stated sources of air pollution shall cease to exist.

4.5.3.2 Extent & Location

The air pollution shall spread only upto radius of about 50 feet from the boundaries of project plot. However, if precautions not taken, movement of material carrying vehicles can cause dispersion of particulate matter in the surrounding areas.

4.5.3.3 Reversibility

At the end of construction phase, the above stated sources of air pollution shall cease to exist. Therefore there shall not be any air pollution due to above mentioned sources after completion of construction phase. Thus environment shall get reversed.

4.5.3.4 Likelihood (Risk)

The air pollution shall comprise particulate matter as major component. This may lead to cough and problem in comfortable breathing if precautions not taken.

Mitigation Measures

- Restricting the excavation only to the specified points with the help of drilling excavator
- Covering the stockpiles of construction materials and/or watering where possible
- Minimizing dust from open area sources, including storage piles by installing enclosures.

- Covering all haul-trucks carrying earth, sand, aggregate and other materials with tarpaulin to help contain construction materials being transported within the body of each carrier.
- All contracted vehicles shall be ensured to remain tuned and maintained so that unburnt hydrocarbons may not be released into the environment in the form of VOC's beyond permissible limits.
- Use of such construction equipment and vehicles which uses environment friendly fuels shall be preferred
- Daily sweeping of all the surroundings where possible.
- Good housekeeping should be observed at the site generally.
- Provision of PPE's to workers to prevent entry of air pollutants in their breathing system.

4.5.4 Solid Waste

Solid waste expected to be generated from construction activities may include broken bricks, left over of sand and cement, excess fill materials, concrete waste, sanitary wares, electricity wires, wooden cuttings, scrap metals, cement packaging, empty cartons/containers, glass waste etc. Municipal solid waste will also be generated due to worker's activities. Overall, the solid waste shall be combination of biodegradable and non-biodegradable kinds.

4.5.4.1 Duration

Temporary. At the end of construction phase, the above stated sources of solid waste shall cease to exist.

4.5.4.2 Extent & Location

The sources of solid waste shall be restricted to the project plot. It shall not be causing any impact on the surrounding areas. The recyclables shall be sold to junk handlers.

4.5.4.3 Reversibility

At the end of construction phase, the above stated sources of solid waste shall cease to exist after completion of construction phase. Thus environment shall get reversed.

4.5.4.4 Likelihood (Risk)

The solid waste shall not cause any harm to the environment. However, this shall depend on the maintenance of rate of removal of solid waste according to the generation rate.

Mitigation Measures

- PIEDMC bye-laws contain provisions for solid waste management. These shall be followed (attached herewith under Annexure-IX).

- Waste management hierarchy of reduce, reuse and recycle shall be ensured for all of the construction activities.
- A comprehensive solid waste management plan will be devised and adhered to collect, segregate and dispose solid waste.
- Recyclable and non-recyclable waste will be segregated, stored separately at source.
- Segregated recyclable waste will be sold to contractors in recycling market and the non-recyclable construction debris waste will be sold to contractors who usually dump the construction waste debris in pits.
- Solid waste shall be kept covered especially during rainy season.
- No on-site burning of wastes will be allowed at any time.
- All employees shall be trained regarding proper waste management
- Collection schedule of waste will be according to the rate of generation
- Management of municipal solid waste shall also be according to solid waste management hierarchy of reduce, reuse and recycle. It will be properly disposed-off to prevent the chances of its attraction by scavengers. On the site, the color coded bins for collection of municipal solid waste shall be available. Waste from these containers shall be managed by Quaid-E-Azam Business Park, Sheikhupura.

4.5.5 Impact on Water Resources

There are no surface water resources which are expected to be impacted by the project activities. The construction activity shall use water for making concrete mix for making beams, pillars, foundations and pavement of the floors. For this purpose, ready mix concrete shall be used. Therefore, water shall not be collected from the site for their preparation. There shall be a little additional load on ground water resources. The water from this source shall also be used for sanitation purposes.

Construction activities may cause the generation of sanitary wastewater discharges in varying quantities depending on the number of workers involved. This wastewater shall be channelized to join sewerage system of Quaid-E-Azam Business Park, Sheikhupura.

4.5.5.1 Duration

At the end of construction phase, the need for above stated extraction of water shall cease to exist.

4.5.5.2 Extent & Location

The local water table shall be impacted. The project plot shall get meet its need of water from borehole pump getting water from ground right beneath it within Quaid-E-Azam Business Park, Sheikhupura.

4.5.5.3 Reversibility

The quantity water extracted out for use during construction phase shall not be recovered to the aquifer. The quality of water shall be changed. Therefore

the impact shall be permanent. However, water run off in case of rain shall recharge the ground water table.

4.5.5.4 Likelihood (Risk)

Although the impact shall be permanent, yet there is no risk of extensive depletion of water due to this project construction.

Mitigation Measures

- All kinds of wastewater shall be segregated.
- PIEDMC bye-laws (attached herewith under Annexure-IX) contain provisions for water and waste water management. These shall be followed.
- Water usage shall be kept as minimum as possible.
- Water reuse and recycling shall be ensured where possible.
- Storm water shall be drained separately to join storm water drainage system of QABP and its mixing with solid waste and other wastewater shall be prevented so far as possible.
- Storm water can be allowed to percolate through exposed soil to recharge water table.
- Efforts shall be made to prevent entry of solid waste into the water.
- Adequate portable or permanent sanitation facilities serving all construction workers shall be provided.
- Sewage from construction camps should be disposed of by development of on-site sanitation systems i.e. septic tanks.
- The contractors shall be instructed to ensure that their machinery and equipment is properly tuned and serviced and there is no leakage or spillage of oil or oily products from the construction equipment and machinery which may pollute ground water.

4.5.6 Impact on Ecological Environment

The construction activity will be carried out in the proposed site which is situated within already established industrial estate and does not have significant flora and fauna. Therefore, no adverse impact on fauna and flora is anticipated due to the proposed activity. There will be no cutting of any trees. There will be removal of grass and weeds from the location of proposed plant site.

4.5.6.1 Duration

At the end of construction phase, the sources of particulate pollution from this project shall cease to exist.

4.5.6.2 Extent & Location

The birds and some other animals (mostly rodents) shall feel noise and vibration and may migrate in immediate local surroundings of few feet from project plot within Quaid-E-Azam Business Park, Sheikhupura.

4.5.6.3 Reversibility

The impact during construction shall be reversible.

4.5.6.4 Likelihood (Risk)

There is no risk of loss of or damage to any biodiversity due to this project construction.

Mitigation Measures

- The construction activities should be performed in such a manner that it does not impact vegetation of the project area.
- Tree plantation shall be carried out after construction to improve the ecological condition.

4.5.7 Impact on Socio-economic Conditions

The project area is part of already established industrial estate. The implementation of the proposed project will not involve dislocation or involuntary resettlement of people. Positive impact is anticipated in terms of employment opportunity as many skilled, semi-skilled and un-skilled personnel will get direct and indirect employment during construction phase. Construction activities, particularly movement of haul trucks and machinery may affect the workers as well as the residents.

4.5.7.1 Duration

The mason, labor and other skilled and unskilled workers shall get temporary employment during construction activity. At the end of construction phase, their jobs will be terminated.

4.5.7.2 Extent & Location

The construction staff may be from immediate surrounding locality or it may be hired from outside.

4.5.7.3 Reversibility

After construction phase, the staff shall lose their jobs from this project. They may get jobs at some other projects. Thus the impact during construction shall be reversible.

4.5.7.4 Likelihood (Risk)

There is only risk of loss of jobs after this project construction.

Mitigation Measures

- This should be ensured that local people be preferred for all kinds of jobs during construction phase.
- The contractor will select specific timings for heavy machinery operation so as to cause least disturbance to the adjoining community by considering their peak movement hours.

4.5.8 Occupational Health and Safety

Work at height shall be involved which needs safety management. Moving machinery shall also have potential of injuries to the workers. Plus, there may also be electric hazards.

Handling of construction materials usually causes skin problems. Due to interaction of people from different backgrounds and health conditions, allergies may be caused if precautions not taken.

Due to only day time construction activity, there are less chances of night fatigue.

During hot season of the summer, there may be chances of heat stress.

4.5.8.1 Duration

The construction activity will be performed only 08 hours a day and additional time for lunch break. The risk of injury shall exist only when performing certain hazardous activity.

4.5.8.2 Extent & Location

The impact shall be restricted within site of the project plot.

4.5.8.3 Reversibility

After construction phase, the occupational health and safety impacts due to construction activity shall cease to exist. Thus the impact during construction shall be reversible.

4.5.8.4 Likelihood (Risk)

There are risks of injuries from work at height, electrical hazards, musculoskeletal disorders due this project construction.

Mitigation Measures

- Adequate scaffolding and shuttering should be established and used for all kinds of construction activities.
- Work at height should be performed only after permit to work by HSE staff who shall issue such permit to work at height after taking all appropriate measures.
- Work site layout shall be designed to minimize the need for manual transfer of heavy loads.
- Electrical cords should be located in common areas and marked corridors.
- Safety signage should be adequately displayed
- Clean drinking water availability should be ensured for use by all construction staff.
- In order to prevent spread of infectious diseases, only the workers tested for harmful infectious diseases should be hired. Screening test may be performed at the time of hiring
- Emergency response plan should be made, communicated to all and maintained during all of the construction activities
- First aid facility should be readily available for the workers at the site.
- Good house-keeping should be practiced prevent the events of slips, trips and fall.
- Mandatory personal protective equipment like harness, masks, gloves and helmets should be strictly used by the labor according to their assignments at the work site.
- Smoking should be avoided to prevent any fire incident
- Fire and any other emergency shall be managed with the help of emergency services provided by Government of the Punjab Emergency Services 1122.
- Adequate training and awareness about occupational and safety shall be provided to all of the employees.
- During hot season, outdoor work timing may be changed. Only indoor construction activities may be performed during sunny part of the day. In case of inevitable circumstances, workers should be given adequate breaks.
- Workers should be given mineralized fluids during hot season to balance electrolytes in their body.

4.5.9 Traffic Flow

The project plot is situated within Quaid-E-Azam Business Park, Sheikhupura. The transportation of construction materials through Lahore-Sheikhupura Road shall temporarily cause increased load on the road which already remains congested due to goods transport vehicles.

4.5.9.1 Duration

The congestion shall be of temporary duration only during construction phase of the project.

4.5.9.2 Extent & Location

The impact shall be restricted along Lahore-Sheikhupura Road.

4.5.9.3 Reversibility

Traffic flow shall get smooth after movement of construction materials vehicles. Thus, the impact shall be reversible.

4.5.9.4 Likelihood (Risk)

There is risk of injuries from probable road accidents.

Mitigation Measures

- Transportation of construction materials shall be scheduled during off-peak hours so far as possible.
- Vehicle operators should be instructed to maintain low speed to prevent any accidents.

4.6 Characteristics of Impacts Associated with Operation Phase and their Mitigation Measures

4.6.1 Air Emissions

The operations of this medical devices manufacturing unit shall involve injection moulding. The additives for making recipe of injection moulding shall be in the form of coarse-grained masterbatch. Thus, these shall not cause any air emissions. The movement of vehicles can cause exhaust emissions in the areas of loading and off-loading of raw materials and final products.

4.6.1.1 Duration

The probable impacts (if any) shall be permanent throughout operation phase.

4.6.1.2 Extent & Location

The impact shall be restricted within production hall.

4.6.1.3 Reversibility

The particulate matter (if any) may get settle down naturally due to flocculation. Thus, the impact shall be reversible.

4.6.1.4 Likelihood (Risk)

There are no risks of respiratory problems.

Mitigation Measures

- The additives for making recipe of injection moulding shall be coarse-grained masterbatch. This shall not liberate any air pollution.
- The enclosure of the high speed mixers for recipe of plastic injection moulding input shall be kept tightly closed followed by further sealing to prevent dispersal of material in the surroundings.
- Better air conditioning and ventilation system to prevent any indoor air pollution.
- Restricting the operation of vehicles outside of the covered areas so that the uncontrollable exhaust emissions may be diluted in the open air.
- Vegetation/Tree plantation in the surrounding areas can improve air quality.
- Workers shall be provided with masks to prevent entry of particulates into their breathing system.

4.6.2 Wastewater

The operations of medical devices manufacturing unit shall not directly produce any waste water. It shall only be required for cooling the plastic products from injection moulding machine. This amount of water shall be conserved by circulating with the help of cooling in cooling tower from where this shall be returned to moulding machine again. Thus overall consumption of water shall be saved. Only the water evaporated from cooling water shall be lost. Otherwise the amount of water shall remain conserved.

Water shall also be needed for hygiene purposes in toilets or for irrigation of lawns. The source of water for meeting all needs of water for the unit shall be ground water supplied through borehole pump and also through connection by QABP. The sewerage shall be generated from toilets. Such waste water is not part of regular operations and may not have very hazardous composition. Overall requirement shall be 7500000 liters per month.

Water Balance Equation shall be as follows:

Total units of water consumption= 500 Gallons/day
100 units/day Gallons for Cooling of machinery
90 units/day Recovered from cooling tower
10 units/day lost by evaporation in cooling tower
40 units/day for sanitation purposes in toilets etc.

4.6.2.1 Duration

The cooling water shall be permanently needed for injection moulding machine during life of the project. Water for hygiene purpose shall also be permanently needed throughout operation phase of the project.

4.6.2.2 Extent & Location

The impact shall be on the local ground water resources within radius of about 1 Km from project plot.

4.6.2.3 Reversibility

The cooling tower shall assist in conservation of water. This water shall not contain any pollutants. Therefore, it can be used for irrigation of vegetated area of the plot. Thus, it shall contribute in recharging of the water table.

4.6.2.4 Likelihood (Risk)

There are risks of water depletion if careful steps not taken for water conservation.

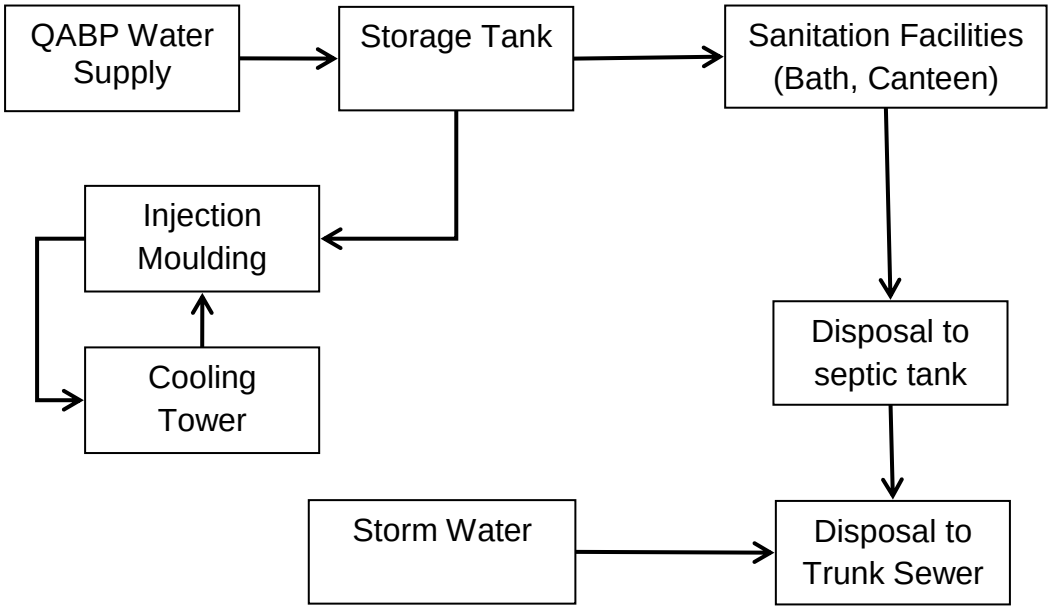

Figure 4.1: Water Flow Diagram

Mitigation Measures

- The cooling water shall be circulated again and again to conserve amount of water.
- Solid contents of water shall be screened at source in order to decrease pollution load of effluent water.
- As part of compliance with PIEDMC bye laws for industrial establishments, the drainage lines for sewerage and storm water shall be kept separate at the unit. Thus there shall be no mixing of both kinds of water.

- As part of compliance with PIEDMC bye laws for industrial establishments, a septic tank shall be established. The wastewater after storage in septic tank shall join drainage system of Quaid-E-Azam Business Park, Sheikhupura and shall be treated through Composite Effluent Treatment plant of Quaid-E-Azam Business Park, Sheikhupura before ultimate disposal to nearby drain.
- Periodic cleaning of lines shall be carried out.
- Better piping design shall be ensured to facilitate draining of the lines.
- The wastewater shall not be containing any kinds of pollutants having values of parameters exceeding PEQS.

4.6.3 Noise

The sources of occupational noise shall be the high speed mixers and injection moulding machines.

4.6.3.1 Duration

The intermittent noise shall be of temporary duration whereas continuous noise shall be existent throughout the project operation phase of the project.

4.6.3.2 Extent & Location

The impact of noise and vibration shall be within production hall thus having potential to impact workers.

4.6.3.3 Reversibility

The potential damage caused to human ear may be either reversible or irreversible depending upon intensity of instantaneous noise.

4.6.3.4 Likelihood (Risk)

This noise shall not be significant and remain well below Punjab Environmental Quality Standards. Following precautions shall further reduce the risk caused by noise and vibration. Otherwise normal efficiency of the workers may be reduced also causing psychological stress.

Mitigation Measures

- Machines shall have built-in containment and isolation to reduce noise.
- Guarding of the moving parts also shall reduce the noise.
- Machinery shall be arranged such that the generated noise shall be absorbed by the surrounding structures instead of reflecting it.
- Regular maintenance of equipment including lubricating moving parts, tightening loose parts and replacing worn out components should be conducted regularly to further reduce the noise generation.
- Equipment will be regularly inspected for good working condition.

- Plantation of trees along perimeter of the building shall reduce impact of noise from outside sources reasonably.
- Due to automation, workers shall be usually away from the sources of noise.
- Workers shall be provided with ear plugs.

4.6.4 Solid Waste

Plastic injection molding is a relatively material efficient process, but it still creates scrap plastic. Some of the raw materials shall be received in drums/containers. Others shall be received in wrappers, sacks or bags. Empty sacks/bags, wrappers and containers of raw material and discarded packing of finished goods shall be source of solid waste. The volume/mass of this solid waste shall vary depending upon the type and quantity of the raw materials to be used. Overall, the generation rate shall be 100-150 Kg/month. Besides this operational waste arising out of manufacturing processes, municipal solid waste shall also be generated.

4.6.4.1 Duration

Municipal waste shall be generated on daily basis. The operational solid waste shall be generated on daily basis yet it shall be segregated at source and managed according to following mitigation measures.

4.6.4.2 Extent & Location

The impact of both municipal and operational solid waste shall be within Quaid-E-Azam Business Park, Sheikhupura.

4.6.4.3 Reversibility

Following measures shall assist in reduction of generation rate of solid waste. Thus reversing the circumstances.

4.6.4.4 Likelihood (Risk)

If solid waste not collected timely, there shall be nuisance. Plus, there may be occupation of space by solid waste. Piling of solid waste may cause development of microorganisms and rodents.

Mitigation Measures

- All of the scrap plastic shall be recycled in moulding machine. No plastic waste out of product generated per month shall go out of the unit.
- The packing of raw materials shall form scrap and shall be sold in the market where these are reused.
- Recyclable and non-recyclable waste will be segregated and stored at source. Segregated waste will be sold to outsourced waste managers who shall be responsible to manage all kinds of the solid waste in an

environment friendly manner. Recyclables shall be sold to recycling industry by these waste managers.

- Overall, waste management hierarchy of reduce, reuse and recycle for all of the operations shall be ensured.
- A comprehensive solid waste management plan will be devised and adhered to collect, segregate and dispose solid waste.
- As part of compliance with PIEDMC bye-laws for industrial establishments, QABP shall develop waste management system for daily generated municipal waste by providing color coded waste bins outside every plot. This waste shall be collected and managed by QABP.
- No on-site burning of wastes will be allowed at any time.
- Training of all employees regarding proper waste management
- Collection schedule of waste will be according to the rate of generation.

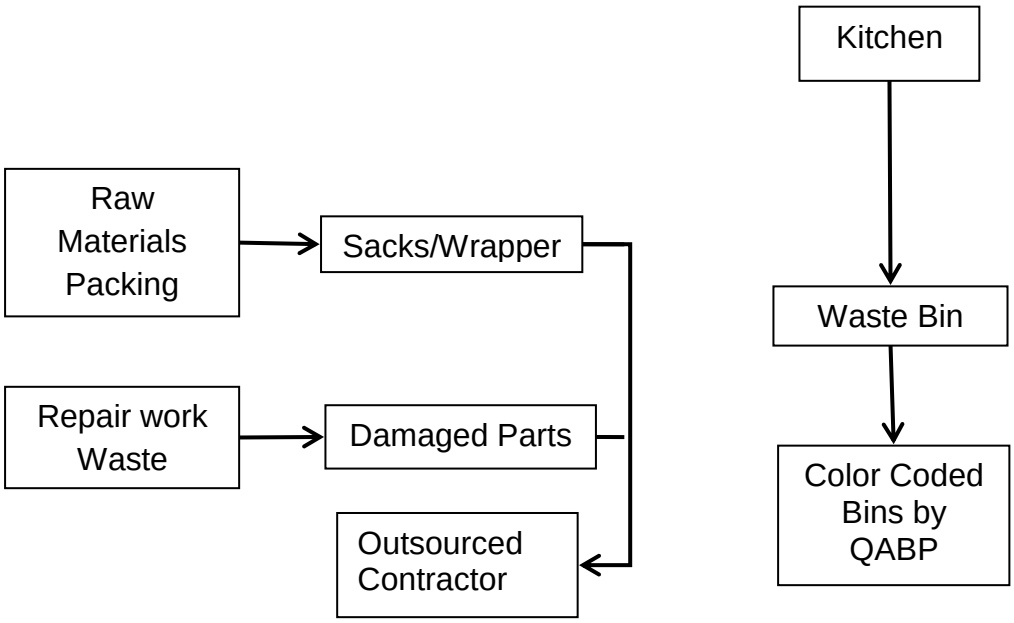

Figure 4.2: Solid Waste Management Plan

4.6.5 Impact on Flora and Fauna

The medical devices manufacturing unit shall be established inside Quaid-E-Azam Business Park, Sheikhupura which does not have significant flora or fauna which may get impacted during operations phase of the project.

4.6.5.1 Duration

Only during instances of noise and vibration, the fauna may get scared and tend to migrate. Otherwise, the operational activities shall not harm flora and fauna.

4.6.5.2 Extent & Location

The operational activities shall not cause much harm to flora and fauna. They may get scared because of noise and vibration. The impact of shall be within Quaid-E-Azam Business Park, Sheikhupura.

4.6.5.3 Reversibility

Following mitigation measures shall assist in reversing the impact caused. If flora replenished sustainably then the caused impact (if any) shall be reversed.

4.6.5.4 Likelihood (Risk)

There may be risk of migration of local fauna to other locations if precautions not taken. Local flora, if not replenished, may become extinguished from locality.

Mitigation Measures

- Ornamental plants and fruit trees have been proposed to be planted on very large sized lawns inside the plot to improve aesthetic beauty, landscape and create a suitable habitat for fauna.
- As part of EPA-Punjab requirement, 2000 trees shall be planted with their distribution according to advice of PIEDMC management.

4.6.6 Occupational Health and Safety

The occupational health and safety aspects of the operational phase of the project shall depend on the nature of activity.

The Plastic injection moulding operations followed by assembly of the components shall have potential of electrical and mechanical hazards including cuts, electric shocks, ergonomics etc. Plastic injection moulding machines shall function automatically. Workers shall only put raw material (plastic resins and master batch) into the blenders/high speed mixers followed by shifting them into hopper of moulding machines and collect products. The manpower shall also have to interact with machine in case of repair and maintenance issues.

Plastic raw materials mixing machines shall produce reasonable noise in the surroundings.

Due to interaction of people from different backgrounds and health conditions, allergies may be caused if precautions not taken. The carriage of heavy cartons may involve ergonomic hazards which may cause musculoskeletal problems if lifted manually.

There may be heat stress during hot season. The operations activity will be performed only 8 hours a day including lunch break. Thus, there shall not be chances of night fatigue.

4.6.6.1 Duration

The occupational health and safety aspects of the operational phase of the project shall remain matter of concern throughout project.

4.6.6.2 Extent & Location

The occupational health and safety aspects of the operational activities of the project shall remain matter of concern within production hall and to the various tiers of hierarchy of operational employees.

4.6.6.3 Reversibility

A sound corrective and preventive action plan may prevent and/or reverse the potential consequences.

4.6.6.4 Likelihood (Risk)

There may be risk from electrical hazards, mechanical hazards, cuts, and musculoskeletal disorders.

Mitigation Measures

- Occupational health and safety management plan shall be established and adhered to during operations.
- Electrical earthing shall be done to prevent electric shock to any of the workers.
- The machines shall have built-in auto-stop mechanism to prevent trapping of human hands into the moving parts of the machine.
- All the raw materials shall be handled according to the required handling instructions provided by their manufacturers in the form of safety data sheets.
- Safety Data Sheets shall be displayed adequately at the unit. The information contained in these safety data sheets shall be made readable, accessible and understandable for all levels of employees. For example, these shall be translated in Urdu language and interpreted in the pictorial form.
- The weights of the inputs as well as outputs of the unit shall be adjusted so as to prevent musculoskeletal problems among staff.
- Safe lifting practices shall be ensured. Staff shall be trained about safe lifting practices in order to prevent musculoskeletal problems.
- Depending upon multi-skilled staff, the assignments of the employees may be changed to prevent musculoskeletal and psychological issues
- During summer season, the facility shall be equipped with bearable temperatures through air conditioning and other such facilities to prevent onsets of heat stress.

- Adequate air exchange with general ventilation shall be carried out to ensure bearable temperatures in the production hall.
- Ergonomic sitting arrangements shall be ensured for all employees.
- Fire extinguishers, sand buckets and fire hydrants shall be installed according to PIEDMC Industrial and Commercial Building Regulations.
- Emergency response plan shall be made, communicated to all and maintained during all of the operations activities.
- Initially Punjab Emergency services 1122 shall address Emergency incidents. Subsequently, emergency services of Industrial Safety Unit of QABP shall be availed.
- First aid facility shall be readily available for the workers.
- Good house-keeping shall be practiced to prevent slips, trips and fall.
- A program shall be established focused on making available the most modern and best quality of PPEs for ensuring occupational health and safety of all levels of employees. Mandatory personal protective equipment like gloves, masks, goggles and ear plugs shall be strictly used by the employees according to their assignments.
- Smoking shall be avoided to prevent any fire incident.
- Clean drinking water availability shall be ensured by installation of domestic type reverse osmosis (RO) based drinking water treatment plant with adequate drinking facility for use by all operational staff.
- During summer, mineralized fluids shall be served to the man power to manage impacts of hot season and prevent chances of heat stress.
- In order to prevent spread of infectious diseases, only the workers tested for harmful infectious diseases shall be hired. Screening test shall be performed at the time of hiring
- Adequate training and awareness about occupational and safety shall be provided to all of the employees.
- Every incident, accident or near miss shall be reported and recorded in order to ensure safe culture and with the objective of attaining zero incidences of mishaps.

4.6.7 Impact on Socio-economic Conditions

A positive impact is anticipated in terms of employment opportunity, as many skilled, semi-skilled and un-skilled personnel will get direct and indirect employment during operational phase of the proposed project.

4.6.7.1 Duration

The operational phase of the project shall have life-long impact on socio-economic conditions of the local population.

4.6.7.2 Extent & Location

The population in immediate surroundings of the project plot can get employment depending upon their skill match with the requirement of the operational phase of the project.

4.6.7.3 Reversibility

There may be some groups of people which may have concerns with the operational phase of the project. Their concerns have been discussed in Chapter-6, Stakeholder Consultation, in order to better manage them.

4.6.7.4 Likelihood (Risk)

There may be risk of negative thoughts about the project if they are not involved/consulted to express their concerns over the project.

Mitigation Measures

In order to enhance the socioeconomic benefits of the project, local people should be preferably hired for all of the operational activities so that they feel ownership of the project.

4.6.8 Traffic Flow

The project plot is situated within Quaid-E-Azam Business Park, Sheikhupura. The transportation of raw materials and finished products through Lahore-Sheikhupura Road shall temporarily cause increased load on the road which already remains congested due to goods transport vehicles.

4.6.8.1 Duration

The transport of raw materials and finished goods during operational phase of the project shall have life-long impact on socio-economic conditions of the local population.

4.6.8.2 Extent & Location

Traffic flow upto 5-7 Km of the project plot may get impacted because of narrow size of Lahore- Sheikhupura Road.

4.6.8.3 Reversibility

Management of transport timing during off-peak hours may prevent contribution to congestion the traffic of the area. Thus the impact may be reversed.

4.6.8.4 Likelihood (Risk)

There may be risk of accidents in case of over speeding. In case of undisciplined traffic flow, traffic congestion may occur.

Mitigation Measures

- Transportation of raw materials and finished products shall be scheduled during off-peak hours so far as possible.

- Vehicle operators should be instructed to maintain low speed to prevent any accidents.

4.7 Potential Environmental Enhancement Measures

Following steps shall be taken for environmental enhancement:

- Daily sweeping and dusting/cleaning shall be ensured.
- Vacuum cleaning shall be done daily where required.
- The perimeter and lawns of the plot shall be vegetated with flowering plants and fruit trees for environmental enhancement.
- Additionally the proponent shall also plant 2000 trees inside and outside of Quaid-E-Azam Business Park, Sheikhupura as part of environmental responsibility.
- There shall be separate drainage for sewerage and rain water.
- Adequate fire fighting system will be established and maintained at all times according to PIEDMC bye-laws.
- Visual impact of the unit and its surroundings shall be given due consideration.

CHAPTER-5

ENVIRONMENTAL MANAGEMENT PLAN AND MONITORING PROGRAM

5.1 General

This chapter describes the Environmental Management Plan (EMP) for the environmental and social mitigation measures identified during the Environmental Impact Assessment and reported in Chapter 4 of this document. The Environmental Management Plan (EMP) is a site specific plan developed to ensure that the project is implemented in an environmental sustainable manner where all interested parties including suppliers, contractors and subcontractors and consultants, understand the potential environmental risks arising from the proposed project and take appropriate actions to properly manage that risk. EMP also ensures the project implementation is carried out in accordance with the design by taking appropriate mitigative actions to reduce adverse environmental impacts during its life cycle. Existing environmental regulations are complied with and potential adverse environmental impacts resulting from the project activities are minimized as practicably as possible. This EMP provides the delivery mechanism to address the adverse environmental impacts of the proposed project during its execution, to enhance project benefits and to introduce standards of good practices to be adopted for all project works.

The plan outlines existing and potential problems that may adversely impact the environment and recommends preventive and corrective measures where required. Also, the plan outlines roles and responsibility of the key personnel and contractors who are charged with the responsibility to manage the project site.

Environmental monitoring and management have been proposed to be carried out in all stages of the project namely; pre-construction, construction and operational phases. EMP will be operational to ensure legal environmental compliance. Environmental Monitoring by a third party will further ensure operation in environmentally sustainable fashion. The proponent will ensure that the implementation of all phases of the project is in line with the EIA report and Environmental Management Plan.

5.2 Objectives of EMP

For the effective implementation and management of the mitigation measures Environmental Management Plan (EMP) has been prepared to ensure compliance with the basic provisions of the Punjab Environmental Protection Act (Amendment) 2012. A structure of EMP is being given for the assistance of the management of this medical devices manufacturing unit. It is recommended that project management must implement this EMP and where

required, changes must be made accordingly. The key objectives of the EMP are summarized below:

- Define roles and responsibilities for all of the interested parties including the project proponent, contractors and construction supervision consultants for implementation of the plan.
- Mention standards which need to be achieved. All relevant legislation is complied with prescribed procedures/standards.
- All environmental safeguards are carried out correctly.
- Provide mechanism for unanticipated environmental situation.
- Identify training requirements at various levels.
- The EMP provides a delivery mechanism to address potential impacts of project activities.
- Minimization of adverse impacts on environment.
- Monitoring of the project for environmental impacts.

5.3 Components of EMP

The EMP of the identified environmental impacts associated with this project consists of the following components:

- Description of the activities that are to be carried during all phases of project.
- Description of aspects which are likely to be impacted due to proposed project.
- Mitigation plan to reduce the severity of associated impacts
- Institutional arrangement and framework for monitoring, reporting and supervision of EMP
- Specific requirements for communication, documentation, training, management and implementation of the mitigation measures
- Monitoring the implementation of the EMP
- Monitoring plan to monitor the impacts and their severity
- Actions required for assessing the effectiveness of the mitigation measures employed such as guide through the monitoring mechanism and identifying related parameters required for confirming the effective implementation of the mitigation measures
- Environmental and social trainings to raise awareness
- Allocation of resources required to implement the EMP and outline relevant expenses arrangements.

5.4 Institutional Capacity/Roles & Responsibilities of Environmental Management Team

Environmental management will be the integral part of the project policy. Therefore, committing to reduce the environmental impacts will reflect the management approach and believe that good performance in this area is identical with running a well managed efficient project operations.

Environmental management is basically the institutional arrangement which delegates some specific assigned responsibilities and those responsibilities are to be monitored properly. During operation phase, main responsibility for environmental performance will be supervised by top management of this medical devices manufacturing unit, while the daily management will be performed under the direction of Manager Operations and Administrator. Under their supervision, environmental management during operations will be performed as per the mitigation and monitoring plans outlined in this EIA. A brief structure of role and responsibilities is given below:

5.4.1 Top Management

Project proponent will be responsible for monitoring and evaluation. He shall be able to do so with consultation of his Environment Consultant who will be responsible to monitor EMP implementation and reporting to the proponent. The Environment Specialist of consultant will carry out a final evaluation at the end of the project construction. Management will undertake overall responsibility for compliance with the EMP. It will ensure that all activities, management executes with contractors, comply with positive environmental sensitivities as well as it will cooperate with the concerned regulatory agencies such as the Environmental Protection Agency-Punjab.

For effective environmental management, responsibilities shall be set internally as follows:

5.4.1.1 Chief Executive Officer

- To cooperate and consult with relevant environmental agency in order to perform in better way.
- Over all in-charge of all the Environmental Management Plan (EMP) and EMtP.
- He will be responsible to ensure smooth functioning of the EMP and EMtP system.
- To evaluate the progress of development and implementation of this management plan.
- Daily progress on the state of the environmental performance will be reported to him by General Manager.
- All Environmental Management and Monitoring matters, issues and problems will be reported to him.
- To approve any change in decision making with the consultation of respective managers, if appropriate.

5.4.1.2 General Manager

- He will be responsible to look into smooth functioning of the processes in environmentally sustainable fashion.
- He will directly report and will be answerable to the higher management in all matters relating to EMP.

- He will be responsible to rectify any problem regarding environmental matters.
- He will be responsible to get all environmental monitoring carried out according to the monitoring schedule and will keep records

5.4.1.3 Contractor

The contractor will carry out field activities as part of the proposed project that includes relevant and subsidiary construction work. The contractor will be subjected to certain liabilities under the environmental laws of the country which will be mentioned in the contract with the project site engineer. On behalf of contractor, top management will be responsible for all issues pertaining to environment related with the assigned contractor. The delegated roles and responsibilities of the contractor will consist of the following basic points:

- To carry out construction activities in environmentally sound manner.
- To coordinate with the HSE Officer to resolve issues arise during construction phase.
- To manage and implement environmental management practices as per the impact assessment report as well as HSE polices belong to both contractor and project site engineer.
- To manage construction crew and reduce the environmental impacts.

5.4.1.4 Manager Operations

The role of these managers will be crucial during the operation phase as all of the key environmental aspects listed fall into their respective domains. Followings are some of the common roles and responsibilities given to these positions:

- To ensure that the points of views of staff, are considered and placed in the EMP accordingly
- To regularly meet and resolve the upcoming and on-going environmental issues.
- To identify issues and where possible propose solutions for inclusion in the management plan review process.
- To make sure that relevant staff is adequately trained to carry out their respective duties in order to improve environmental performance of the medical devices manufacturing operations.
- To contribute towards the actions to deliver the management plan and ensure its continued improvement.

5.4.2 Construction Manager

The role of Construction Manager is very important. The success of an EMP will mainly depend upon effective management by this person. During the construction phase, main responsibility of environmental performance will reside with proponent’s construction manager, who will be assisted in daily

activities monitoring by site HSE Officer. Followings are some of the roles and responsibilities given to the Construction Manager:

- To ensure that the staff, contractors and HSE Officer's point of views are considered and placed in the EMP accordingly.
- To identify issues and where possible, propose solutions for inclusion in the management plan review process.
- To improve coordination and exchange of information between management, employees, contractors, etc.
- To contribute towards the actions to deliver the management plan and ensure its continued development.
- To monitor the progress of development and implementation of this management plan.

5.4.3 Role of EPA-Punjab

District Office of the EPA-Punjab will monitor the overall environmental performance of all phases of the project.

5.5 Monitoring Program to Assess Performance of EMP

Environmental monitoring of this medical devices manufacturing unit will be carried out according to schedule as given in Table 5.3 and be reported to the EPA-Punjab. Monitoring of all the activities will be required to analyze the impacts of construction and operation phases on the environment. After start-up, a comprehensive monitoring for all PEQS parameters for normal operations will be carried out. Thereafter, subsequent regular monitoring will be restricted to priority parameters. This is to establish that this project of medical devices manufacturing unit does meet the environmental commitments made in this EIA Report.

For external monitoring, proponent shall engage an independent agency to conduct third party validation of EMP implementation. All monitoring data shall be reviewed and analyzed regularly in comparison with the PEQS limiting values. In case of any deviation, immediate necessary corrective actions shall be taken.

5.5.1 Responsibilities for Monitoring

HSE officer will coordinate with construction manager and contractor site representative to monitor environmental parameters during the construction phase.

During operations, the Manager Operations will follow the monitoring plan as mentioned in Table 5.3. They will keep record of all environmental non-compliances and report them along with the corrective actions in regular quarterly meetings with the top management.

5.6 Reporting and Reviewing Procedures

Monitoring schedule will be adhered to and all the data to be monitored will be scrutinized at the level of General Manager and on regular basis at the Chief Executive Officer level. For presentation of the data to the Government Agencies, approved data recording format will be followed. Some of the approaches to be followed during the environmental management practices are given below:

- Complying with the relevant legislation and regulations
- Developing appropriate indicators in order to monitor core impacts.
- Regularly reviewing of the impacts on the environment.
- Setting appropriate annual objective, targets and public reporting on progress.
- Communicating openly with internal and external stakeholders on environmental issues.

5.7 Training Needs and Schedule

Training is another major step for the implementation of EMP. All the employees will require training appropriately to work on EMP effectively. There are lots of advantages of training including help in minimizing the waste generation and conserving resources. General Manager shall be responsible to determine the training requirements in consultation with project workers.

To enhance the capacity of the proponent as well as the contractor, training will be imparted related to the environmental and social issues of the project, implementation of mitigation measures, the monitoring protocols and reporting mechanism. The training during construction will be conducted by PMU of the project. PMU will ensure in-house training for the project staff i.e., labor, masons etc., contractor, and the supervisory staff covering environmental and social aspects of the project with emphasis on the roles and responsibilities of the proponent and the contractor's staff. This shall be done just after recruitment of staff and also just before commencement of the construction activities. Subsequently, during operations, the proponent shall ensure that all the recruited staff receives basic training as well as recurrent training for his operational role as well as his role and responsibility regarding environmental management at the unit. Basic training shall be imparted just after recruitment of every staff and subsequently recurrent training shall be imparted annually.

5.7.1 Training Syllabus Contents

The training will include the following aspects:

- Identification of all environmental aspects of construction and operation.
- Likely impacts on these aspects of the environment.
- Measures to be adopted for avoiding or minimizing impacts on these aspects of the environment.

- Measures to be adopted for avoiding or minimizing water pollution, air pollution and safe waste disposal practices.
- Defining roles, responsibilities and authorities of every one for environmental management plan during construction and operations.
- Permissible limits for all environmental aspects according to Punjab Environmental Quality standards.
- Safety measures against hazards for workforce and the local communities arising from the construction and operation activities.
- Occupational health and safety aspects, use of personal protective equipment by the workforce during construction and operations.
- Emergency preparedness and response.
- Fire safety and management.
- Fire drill shall be performed every year during operations to aware the employees about their roles, responsibilities and authorities. This shall also help maintenance of the equipment installed for fire management.
- Safe work practices to ensure safe culture.

5.8 Environmental Management Plan

The preparation of this plan has involved an extensive and detailed program of investigation to the processes and issues involved and with consultation of project's management and all others concerned. Therefore, this network will provide a structure to assist in the implementation of the management plan accordingly.

The success of the management plan will lie with its implementation. An EMP requires to be executed in three stages. Those are, planning & design stage, construction stage and operation stage.

5.8.1 Pre-Construction Phase EMP

Implementation of EMP at this stage may tackle the environmental issues before they arise i.e., prior to the construction phase. Following three main components to be considered in EMP are given below:

5.8.1.1 Design Stage

It describes the location of proposed project, its adjoining conditions in the area, facilities to be installed in particular locations as well as their mechanics and other related operations. If any design parameter changes at time of approval, management will assess the environmental impacts that may arise from such changes. If the impacts are found to be different and in excess of those mentioned in the report, project management will develop further mitigation measures with respect to the changes to minimize these impacts and seek approval for the required change from Environmental Protection Agency-Punjab as well as other regulatory authorities.

5.8.1.2 Approvals

The proponent is bound to get all relevant clearances and necessary approvals required by the government prior to commencing the project activities regarding medical devices manufacturing unit. Hence No Objection Certificate from the Environmental Protection Agency-Punjab will not relieve the project management and they have to fulfil the other requirements as well for starting their project. Approval from PIEDMC shall take place in two steps i.e., Submission Stage and Completion stage. Submission stage approval by PIEDMC is mandatory before commencement of construction of the project at Quaid-E-Azam Business Park, Sheikhupura. After construction, machinery shall be installed and application shall be filed for completion stage. This shall be the time when application for Environmental Approval for Operation phase of the project shall be filed before EPA-Punjab. Thus, Submission approval by PIEDMC and Environmental approval for construction phase by EPA-Punjab shall be part of pre-construction phase.

5.8.1.3 Contractual Provisions

The requirements of environmental impact assessment in terms of environmental mitigation shall be incorporated into the operations plans and procedures of the contract. Therefore, signing of contract will strictly bind contractor to follow those procedures and must comply the environmental regulations.

5.8.2 Construction Phase

During the construction phase, the management will assign an HSE Officer, whose role will be to implement all environmental related issues as per the mitigation matrix in the EIA.

5.8.3 Operations Phase

During normal operations of the project, the proponent will assign all specific environmental related actions to respective departments who will be fulfilling their responsibilities as per the mitigation and monitoring matrices.

5.8.4 Mitigation Plan

The Environmental Management Plan is meant for mitigation, management, avoidance of the adverse impacts. It defines all the impacts and their remedies with highlighting the responsible personals to work on those mitigations. The identified impacts and suggested mitigation measures with institutional responsibilities are tabulated in Table 5.1 and Table 5.2. All these impacts and mitigations have already been given in previous chapter of this report. Project management and construction contractor will be required to adhere these mitigation measures throughout the project. For each mitigation measure to be taken, its location, timeframe, implementation and supervising responsibilities are listed in the EMP.

Table 5.1: Environmental Management Plan of Construction Stage

Anticipated Environmental Aspects and Impacts	Proposed Mitigation Measures	Institutional Responsibility		
		Implementation	Supervision	Monitoring
Solid Waste Solid waste shall be generated in the form of excavation waste, excess fill materials, small concrete spills, broken bricks, wasted concrete material, wasted steel trimmings, scrap wood and metals, etc.	The construction site shall be equipped with temporary bins for waste collection and segregation. All kinds of solid waste shall be kept segregated. Development of proper solid waste management system (Collection, storage, segregation, transportation and disposal). The waste collection and disposal schedule should be made so as to prevent any kind of nuisance at the site. The construction staff shall be trained regarding housekeeping practices. At the end of all processes, whatever left behind shall be disposed of through construction waste contractor. Municipal waste shall be stored in specific color coded bins.	Construction Staff	PMU	Proponent

Water Quality There shall be additional load on ground water resources supplied by Quaid-E-Azam Business Park, Sheikhupura through overhead water tanks. Construction activities may cause the generation of sanitary wastewater discharges in varying quantities depending on the number of workers involved.	Spills and wastage should be prevented which may cause contamination of ground water. Solid waste should be prevented to enter into water. Water consumption shall be kept at minimum and even the amount used also will mostly percolate to ground water table thus recharging it. Storm water shall be managed such that it can be used beneficially. The runoff shall be diverted to open areas such that it can facilitate recharge of ground water. Sanitary wastewater shall be discharged to sewerage system of QABP from where this is disposed after treatment.	Construction Staff	PMU	Proponent
Air Quality Particulate matter may arise due to localized excavation in soil for foundation purpose, ground leveling activities, deposits of construction materials and also due to movement of off-road or on-	Trucks carrying, soil, sand, aggregate and other materials will be kept covered with tarpaulin to contain the construction materials being transported within the body of each carrier. Regular tuning and maintenance of engines ensures good efficiency.	Construction Staff	PMU	Proponent

road automobiles. Off-road or on-road automobiles shall also cause exhaust pollution.	Waste burning will not be allowed. Sprinkling of water on regular basis especially during dry seasonal conditions should be carried out to limit dispersion and suspension of particulate matter Regular sweeping of roads and parking areas to avoid deposition of dirt. The workers shall be provided with appropriate masks for use against air pollution.			
Noise During the construction phase of the project, noise sources may include heavy construction machinery, shuttering and scaffolding, cutting of metal parts, on-road and off-road vehicles.	All construction equipment should be maintained in good working order. The noise sources shall be enclosed with acoustic proof material to decrease the noise levels. Noise from construction equipment shall meet the applicable standard in PEQS. Avoid use of pressure horns. Provision and use of PPEs shall be ensured. Lubricate all moving parts of the	Construction Staff	PMU	Proponent

	machinery. Noise barriers shall be installed as practicable. Work shall only be done during day time thus sleep of the surrounding community shall not be disturbed.			
Spillage of oil and other lubricants	Maintenance of the contracted and outsourced logistics shall be the responsibility of outsourced contractors.	Construction Staff	PMU	Proponent
Soil Soil may erode by exposure of soil surface to rain and wind during site clearing, earth moving, and excavation activities.	Providing adequate surface material compaction and maintenance. Only localized excavation shall be done with drilling equipment.	Construction Staff	PMU	Proponent
Traffic Flow A slight increase in traffic is apprehended due to the transportation of construction materials for proposed project at Quaid-E-Azam Business Park, Sheikhupura.	The transportation of construction materials may be scheduled during off-peak hours. This is a small scale project and shall need transport of materials only few times.	Construction Staff	PMU	Proponent
Occupational Health and Safety	First aid facilities should be readily available	Construction Staff	PMU	Proponent

There may be risks associated with work at height. Due to interaction of workers from various backgrounds, there is possibility of contagious diseases. Construction activity pose particulate pollution hazard to workers. Fire safety measures.	Construction workers shall be provided with adequate awareness and training about HSE aspects of the project. Provision and use of suitable Personal Protective Equipment. Work at height should be performed under supervision of HSE Officer who shall issue work at height permit after taking all appropriate measures. Emergency response plan should be made and relevant facilities established and maintained Safety signs should be displayed. Smoking should be prevented to prevent fire hazard. Electric earthing shall be done to prevent electric shock to workers. Safety shoes shall be worn by the workers while performing jobs related with electric equipment. Punjab Emergency Service 1122 may assist in fire and other kinds of			

	emergency management. Reporting and documentation of all incidents, accidents and near misses shall be ensured.			
Construction materials such as sand, gravel etc.	Stockpiles should be covered to prevent dispersion of materials These should be surrounded by low brick wall to prevent their spreading on the ground.	Construction Staff	PMU	Proponent
Socioeconomic Impacts	Aesthetic of the area should be protected so far as possible Unnecessary use of horns should be prevented Hire local people to the maximum possible extent if competent people found from the area	Construction Staff	PMU	Proponent

Table 5.2: Environmental Management Plan of Operational Stage

Anticipated Environmental Aspects and Impacts	Proposed Mitigation Measures	Institutional Responsibility		
		Implementation	**Supervision**	**Monitoring**
Air Pollution Due to movement of vehicles,	Workers shall be provided with specific masks to protect their breathing system.	General Manager	Environment Consultant.	Proponent

ambient air may get polluted.	The transport vehicles will be kept in good working condition and properly tuned, in order to minimize the exhaust emissions. Limited entry to vehicles under the indoor areas. Better ventilation in production halls. Offices and control rooms shall be kept air conditioned. All the open soil shall be grassed or tuff tiled to prevent dispersion of disintegrated soil and fugitive dust.			
Water Quality The production processes shall not consume water. Water shall only be used for cooling of the products from plastic injection moulding. Sanitary waste from toilets.	Cooling water shall be circulated back again and again with the help of cooling tower to conserve amount of water. Screening of solid contents of water at source in order to decrease pollution load of effluent water. Drainage lines shall be periodically cleaned.	General Manager	Environment Consultant	Proponent

	There shall be separate lines for drainage of storm water and waste water. According to PIEDMC bye-laws, septic tanks shall be constructed for wastewater management. All wastewater shall flow to septic tank from where it shall reach composite effluent treatment plant of Quaid-E-Azam Business Park, Sheikhupura for treatment before ultimate disposal. Special care shall be taken to conserve, and preserve water resources. The leakage of sewage shall be strictly prevented and if such a chance happens, immediate action must be taken so that mixing of the sewage with ground water or soil will be absolutely avoided. All drainage works shall be designed and constructed in accordance with the requirements of the EPA-Punjab.			

Noise Noise may be generated by operation of the blenders/high speed mixers and plastic injection moulding machines.	Better maintenance and lubrication of all the machinery may keep the noise under control. Regular monitoring of noise may be carried out every year to check the efficacy of control measures. The whole machinery shall be enclosed and isolated hence decreasing the impact of noise levels. Employees shall be provided with ear plugs to prevent entry of sound waves into ear canal.	General Manager	Environment Consultant	Proponent
Solid Waste Packing of raw materials such as resin sacks/bags. Discarded packing of the finished products. Municipal waste shall also be generated.	All of the plastic waste shall be shredded and recycled by the unit. So nil of this goes waste. Empty sacks/bags of resin shall be sold to contractor for reuse in the market. Packing shall be either reused or it shall be sold to open market for reuse or recycling. All solid waste shall be carefully	General Manager	Environment Consultant	Proponent

	segregated according to the type and sold in the market for reuse and recycling as may be appropriate. Municipal Solid Waste shall be carefully segregated according to the type and transported to TMA approved site, as presently QABP does not have mechanism in place. Thus the industrial solid waste shall be managed in an environment friendly manner. No on-site burning of wastes will be allowed at any time. Training of personnel in proper waste management practices. Provision of sufficient waste collection points and regular collection of waste.			
Occupational Health & Safety Electrical hazards Safeguards.	All the blenders/high speed mixers shall be kept tightly closed during their operation to prevent dispersal of any fine particulate in the surroundings.	General Manager	Environment Consultant	Proponent

Fire Safety measures. Ergonomic issues	All additives shall be handled according to their safety data sheets. These shall be coarse grained masterbatches. Better ventilation can relieve the workers of production area from heat stress. All machinery shall be by default safe-guarded. Provision of ergonomically designed seats for machine control panel operators. All employees should undergo occupational health and safety training including training about safe lifting practices. Finished product cartons shall be lifted and transported with the help of levers to prevent musculoskeletal problems for loading staff. First Aid kit shall be provided. Fire extinguishers and fire buckets shall be installed for fire safety			

	according to PIEDMC Industrial and Commercial Building Regulations. Workers shall be provided with appropriate kind and number of Personnel Protective Equipment (PPE). Emergency response plan should be made and relevant facilities established and maintained Safety signs should be displayed. Smoking should be prevented to prevent fire hazard. Electric earthing shall be done to prevent electric shock to workers. Safety shoes shall be worn by the workers while performing jobs related with electric equipment. Till establishment of QABP Industrial Safety Unit, Punjab Emergency Services 1122 shall assist in fire and other kinds of emergency management.			

	All safety incidents shall be recorded and monitored with the objective of attaining zero incidences of mishaps.			
Ecology	Plantation of trees shall be carried out in and around the project site as advised by PIEDMC in compliance with the conditions imposed by EPA-Punja. A large portion of the plot has been proposed to be planted with fruit trees, flowering plants and grass.	General Manager	Environment Consultant	Proponent
Socioeconomic Impacts Local norms and values Standard of Living	Local norms and values should be respected. Unnecessary use of horns should be prevented. Local people shall be hired to the maximum possible extent if competent people found from the area.	General Manager	Environment Consultant.	Proponent
Traffic Flow A slight increase in congestion is apprehended at Lahore-Sheikhupura road due to proposed project.	The transportation may be scheduled during off-peak hours.	General Manager	Environment Consultant.	Proponent

5.9 Environmental Monitoring Program

The purpose of monitoring is to get acquainted with actual quantitative assessment of environmental aspects to verify that their values are within permissible limits as defined by Punjab Environmental Quality Standards. Therefore, in order to remain rational with the help of quantitative assessments instead of merely making assumptions about status of environmental aspects, following environmental monitoring plan has been proposed:

Table 5.3: Environmental Monitoring Plan

Environmental Aspect	Parameters	Concerned Location	Frequency
Construction Phase			
Ambient Air	CO, SO_x, NO_x, O_3, PM	Project Site	06 Months
Ground Water	All parameters as described in PEQS	Water Connection at site	06 Months
Noise	Industrial Noise	Project Site	06 Months
Solid Waste	Generation Rate according to type of waste	Project Site	Fortnightly
Occupational Health & Safety	Fire, ERP, PPE's	Project Site	Daily
Operational Phase			
Ambient Air	CO, SO_x, NO_x, O_3, PM	Production rooms	Annually
Noise	Industrial Noise	Production rooms	Annually
Solid Waste	Generation Rate according to type of waste	Solid Waste Bin	Fortnightly
Occupational Health & Safety	Fire, ERP, PPE's	Whole unit	Daily

5.10 Equipment Maintenance Schedule

The project involves use of high speed mixers/blenders, plastic injection moulding machines during operations. Maintenance & Repair plan shall be carried out as per procedures advised by the manufacturer of these machines and on need basis. Fire safety equipment shall be kept maintained and monitored monthly. The condition of the first aid box and PPEs shall be maintained regularly. The schedule of maintenance shall be daily, weekly and monthly basis for overall cleaning and maintenance check of all of the equipment.

5.11 Communication and Documentation

Progress evaluation, documentation and communication will play a vital role in good management practices. Steps given below will assist in effective communication and documentation.

A kick-off meeting may be arranged at the start of construction phase, which will communicate the importance of meeting. EMP will be provided to the construction contractor and discuss the implementation steps.

Operation/HSE manager will arrange departmental meeting regularly on weekly basis throughout the project. The purpose of this meeting shall be to discuss day-to-day problems arise during work, steps to be taken to resolve problem, overview on the progress of HSE department and contractor with respect to the EMP. An overview on monitoring plan and progress with respect to changes made in operations/documentation/EMP will also be discussed. All the HSE matters will be discussed in detail and if any problem sought, another meeting will be called-on to discuss solutions within time.

Weekly meeting will be attended by Manager Operations/Administrator, HSE officer and contractor representative. Such meetings will help out in the effective monitoring, management and documentation of the environmental performance during construction and operations. Any issues that require attention of higher authorities will be communicated to Top Manager (Operations) for necessary action. Quarterly meetings will also be arranged which will be headed by Top Manager (Operations).

In the end of weekly and quarterly meetings, minutes will be issued that may be incorporated in the record register. Meeting minutes will also be sent to contractor and higher authorities for their own record. On the basis of decisions taken in meetings if any change in documentation required will be incorporated in the respective document.

5.12 Environmental Management Budget

The environmental management cost aside from other costs is as follows:

Table 5.4: Environmental Management Budget

Aspect	Quantity	Estimated Cost (PKR)
Tree Plantation	2000	2,00,000
Occupational Health and Safety Management		2,00,000
Fire Safety		1,00,000
Training & Awareness		200,000
Scheduled Monitoring		200,000 per year
Total Environmental Budget		**9,00,000**

5.13 Schedule of Implementation of EMP

The implementation of environmental management plan shall start from pre-construction stage and shall remain effective throughout all phases of the project namely pre-construction, construction and operation phase. Even when life cycle of the project shall be ending, it shall be carried out under environmental controls.

CHAPTER-6

STAKEHOLDERS CONSULTATION

6.1 General

This chapter includes the output of consultations carried out with the people of the project area. This elaborates the findings from the field and data collected from public. These include local residents who also carry out different businesses such as shop keepers, labour, farmers and entrepreneurs. These also include representatives of the management of Quaid-E-Azam Business Park, Sheikhupura. Their feedback regarding the project has been recorded through a questionnaire and interviewing them to fill the questions of questionnaire. Other stakeholders were also consulted.

6.2 Importance of Public Consultation

Public participation is an integral part of EIA. Public participation means that public should be consulted, informed, or involved in the decision making process and public should know about the project in detail. The “Policy and Procedures for the filing, review and approval of environmental assessments” requires proponents to consult with the affected community and NGOs during preparation of an environmental report. The “Guidelines for the preparation and review of environmental reports” by Pakistan Environmental Protection Agency contain a number of references to the need for public involvement. Public participation is compulsory under the Punjab Environmental Protection Act. Section-9 of Punjab Environmental Protection (Review of IEE and EIA) Regulations-2022 requires that public notice should be published in English or Urdu in local newspaper in the affected area 7 days before the public hearing. The public notice contains information on project type, location, name, address of the proponent and the place from where EIA report can be accessed.

The adequacy of the public consultation and information disclosure is one of the basic criteria used to determine the project compliance with the national/international safeguard policies.

6.3 Objectives

The objectives of this process were to:

- Inform the public about what is proposed project.
- Identify and involve all stakeholders, especially local residents, in the consultative and participation process;
- Share information with stakeholders on the design and construction of the proposed project and anticipated impacts on the physical, biological and socioeconomic environment of the project area;

- Understand stakeholders' concerns regarding various aspects of the project, including the existing available facilities and problems, construction of the project and the likely impacts of construction and operation related activities;
- Provide an opportunity for those otherwise unrepresented to present their views and values therefore allowing more sensitive consideration of mitigation measures and trade offs
- Understand the perceptions, assessment of social impacts and concerns of the communities in the vicinity of the proposed project;
- Provide an opportunity to the public in the public consultation session to provide valuable suggestions for the project design in a positive manner;
- Reduce the chances of conflict through the early identification of controversial issues, and consult them to find acceptable solutions.
- Increase public confidence in proponent, reviewers and decision makers.
- Provide better transparency and accountability in decision making
- Develop truly sustainable proposal.

6.4 Methodology

Guidelines for Public Consultation issued by Pakistan Environmental Protection Agency issued dated October, 1997 have been used for carrying out this process. For public consultation and participation, main stakeholders were interviewed and asked about their concerns. Subject specialists and field experts have also been consulted in order to get their technical verdict.

For ascertaining the perceptions of different stakeholders about the project (during construction/operation) consultation meetings were held with them. These meetings were carried out in the vicinity areas of Sahu ki Malliyan, Chichoo ki Malliyan, Joeyianwala Morr, Sheesh Mahal Chowk, Sheikhupura Sports Complex, Khokhar ki Mallian, Near Hiran Minar, Sheikhupura City.

Firstly, the project has been described briefly before the stakeholders in local language without going into its technical details. Their response has been recorded in the form of a questionnaire (attached herewith under Annexure-III). In this questionnaire, brief introduction of the stakeholder is followed by their response in the form of their answers to asked questions pertaining to the project.

6.5 Identification of Stakeholders

Stakeholders are those who have a direct or indirect interest in project development, and who will be involved in the consultation process. During the field survey, significant efforts were made to identify the possible categories of stakeholders and their stakes. These included local people, other affected communities, proponent, government agencies and interested public.

6.5.1 Proponent's Environmental Management Team

The environmental management team of the proponent shall have to be involved to give their input to better manage all the environmental aspects of across all phases of the project. They shall define all kinds of resources required for the implementation of the EMP. Therefore, they have to be taken onboard for all decision making.

They will present the project to all stakeholders and record their stakes on the project. In the light of the feedback of stakeholders, better planning shall be possible.

6.5.2 The Responsible Authority

Various personnel of EPA-Punjab, Lahore have been consulted to format this report in accordance with stipulated statutory requirements contained in Punjab Environmental Protection (Amendment) Act-2012 and Punjab Environmental Protection (Review of IEE and EIA) Regulations-2022.

6.5.3 Other Departments & Agencies

The management of QABP, PIEDMC has also been consulted to know their specific requirements in the light of PIEDMC Industrial & Commercial Buildings Regulations. PIEDMC is the sole authority to approve the project submission case followed by completion case.

6.5.4 Environmental Practitioners & Experts

Teachers from College of Earth & Environmental Sciences, University of the Punjab, Lahore have also been consulted. These included subject specialists of Occupational health and safety, Waste Water Treatment, Hydrology, Geology and Toxicology. Views of other environmental consultants have also been included.

6.5.5 Affected & Wider Community

The stakeholders identified during field survey also included the local residents, politicians, private land & shop owners, shop keepers (renters), customers, pedestrians. Some of the local people were found hesitant to respond. They were engaged and taken into confidence that their response shall be beneficial to them and shall never harm them. Informal group discussions were also held as an additional tool for the assessment of the perceptions of the stakeholders.

Table 6.1 List of Stakeholders consulted

S#	Stakeholder Name	Designation	Area
1	Mr. Shahzad Azam	Ex. President SIE	Sundar Industrial Estate, Lahore
2	Mr. Abdul Shakoor	Construction	Bhamb Ki Mallian

		Labour	
3	Mr. Fayaz Jutt	Farmer	Sahu Ki Mallian
4	Mr. Matloob Hussain	Shopkeeper, General Store	Khokhar Ki Mallian
5	Mr. Ayyub Siddique	Barber	Chicho Ki Mallian
6	Mr. Ahmed Gujjar	Land Owner	Bhamb Ki Mallian
7	Mr. Muhammad Tariq	Brick Kiln Worker	Chicho Ki Mallian
8	Mr. Rana Mujahid	Qinqi Driver	Sheesh Mahal Chowk, Sheikhupura City
9	Mr. Shahid Ali	Helper in a factory	Joyeanwala Morr
10	Mr. Waseem Anjum	Livestock Farmer	Khokhar Ki Mallian
11	Mr. Allah Ditta	Livestock Farmer	Bhamb Ki Mallian
12	Mr. Rana Shaukat Ali	Farmer	Mandiala
13	Mr. Zaheer Ahmed	Plumber	Shahbaz Pura
14	Mr. Umer Hayat	Mason	Sahu Ki Mallian
15	Dr. Azhar Ali	Assistant Professor	College of Earth & Environmental Sciences, University of the Punjab, Lahore
16	Yousuf Jamal	CEO, Well-On Techniques	41-B, ZamZam Tower, Johar Town, Lahore

6.6 Concerns of the Stakeholders

The project site exists in Quaid-E-Azam Business Park, Sheikhupura. At the time of establishment of Quaid-E-Azam Business Park, Sheikhupura, public consultations were held with the people from the project area as part of its EIA. The public consultation for Establishment of Medical Devices Manufacturing unit by Cardiac Care (Private) Limited has been carried out with specific scope of the construction and operations of this unit inside the Business Park. The individual feedback has been annexed in Annexure-III. Their feedback has been summarized as follows:

- Most of the people of the study area perceive overall positive impacts as a result of establishment of this Medical Devices Manufacturing unit. Their attitude towards the project is quite positive.

- They are of the view that the project will open up new direct or indirect job and business opportunities for the people of the project area. This will result in poverty alleviation though to small extent.

- People especially comment that this area had been uninhabited since long. There was no use of this land. With the industrial development,

the overall standard of living of the people has improved. The establishment of this unit shall also contribute to this phenomenon.

- Local residents of the area should be preferred for filling job vacancies of the unit.

- Some people are of the perception that the unit shall not emit hazardous air emissions and shall have relatively clean workplace.

- People responded that local people should be given jobs in this manufacturing and retail unit.

- If local people be hired, they shall go back to their homes every day. Whereas currently all almost all of the employed persons of the area work in far furlong areas from where they have inconvenience returning their homes on daily basis. If they be employed here in this manufacturing unit by Cardiac Care (Private) Limited, they shall work with more dedication as they shall be enjoying proximity with their residences.

- Due to acquisition of land by Government of Punjab, we have lost our grazing areas and also agricultural fields where we used to seed food for our cattles.

- The people also perceive accelerated economic activity due to the small business opportunities likely to emerge in the area, e.g. shop keepers, traders, suppliers, contractors, transporters, labor etc.

Public also have shown their apprehensions as follows:

- After the establishment of the business park, people have been displaced. Although displaced people have been paid compensation, yet this is better to get them in the circle and provide them jobs in the units, which are going to be established here.

- During construction phase, a plenty of people can be employed depending upon their respective competence.

- Due to external evasion, local demography of the area shall be changed. We (the locals) do not have knowledge about the background of the incoming people.

- If our land, ground water and air are not polluted then we do not have objections over the establishment of the unit.

- Some people have shown that they will neither be benefited nor be harmed by the project.

- The unit should manage their wastes wisely without harming local natural resources.

- People have scarcity of basic needs of life such as electricity, transport, sewerage system and clean water supply

- Something should be done about the development of the locality.

6.7 Mitigation Measures proposed for addressing the Stakeholder's Concerns

- Local residents should be given priority while hiring during construction and operation phase of the proposed project.

- The waste water shall be managed in an environment friendly manner. It shall not be pumped underground at all. This shall be channelized to dedicated drain. Treatment shall also be done if needed.

- There shall no air emissions due to operations of the unit which can harm the surrounding community.

- The solid waste shall be managed by the management of Quaid-E-Azam Business Park, Sheikhupura and also by outsourced contractor who shall manage the solid waste according to the environmental guidelines.

- There shall not be any displacement of the surrounding community due to this medical devices manufacturing unit by Cardiac Care (Private) Limited.

Figure 6.1: Highlights of Public Consultation Survey-A

Figure 6.2: Highlights of Public Consultation Survey-B

Figure 6.3: Meeting with Assistant Professor, Punjab University, (Waste Water Expert)

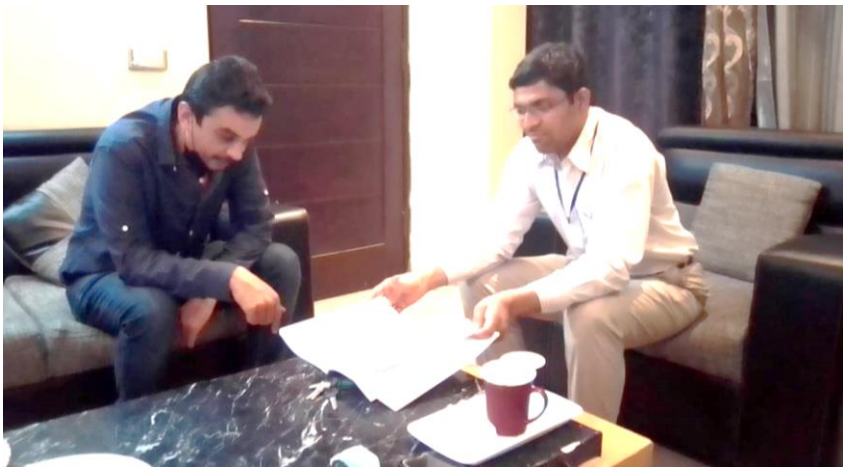

Figure 6.4: Meeting with CEO, Well On Techniques, a Water Treatment Company

CHAPTER-7

CONCLUSION & RECOMMENDATIONS

7.1 Conclusion

The project aims at Establishment of Medical Devices Manufacturing unit by Cardiac Care (Private) Limited at Plot No. 11-B, Quaid-E-Azam Business Park, Sheikhupura. According to the "Punjab Environmental Protection (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations-2022" the project falls in Schedule-II. Accordingly, this Environmental Impact Assessment report has been prepared for issuance of NOC/EA by EPA-Punjab, Government of the Punjab, Lahore before initiation of the project on ground. The study has been conducted according to Guidelines issued by Environmental Protection Agency-Government of Pakistan in 1997.

On the basis of this Environmental Impact Assessment (EIA) Report of the project, it is concluded that:

i. There are no sensitive elements/segments of environment around the project site.
ii. No gaseous emissions will be generated due to the operations. Although construction phase shall cause some particulate pollution yet this shall be kept under PEQS with the help of applicable controls. Thus air emissions during both construction and operations phase of the project shall be within Punjab Environmental Quality Standards.
iii. During operations, cooling water shall be circulated again and again in the system thereby decreasing pollution load.
iv. Noise level, waste water and solid waste will remain well within the prescribed limits of the PEQS.
v. EMP as recommended in this EIA Report is to be put in place during construction as well as operations of the project.
vi. EMP shall guide about specific actions deemed necessary to assist in mitigating the environmental impact of the project.
vii. If steps described in EMP are fully practiced, the project shall not have significant harmful impacts.
viii. Monitoring of all environmental parameters by a third party shall endorse that the project will run in accordance with legal requirements.
ix. The positive impacts of the project outweigh negative impacts.
x. Endangered species have not been found in the area which is expected to be impacted by the project.
xi. The project does not involve displacement of the local population.

7.2 Recommendations

Being aware of the environmentally responsibility, the proponent has proceeded for this Environmental Impact Assessment study and making its report. The proponent aims to and commits to comply with all legal

requirements pertaining to environmental protection applicable for the time being.

On the basis of the potential impacts, the project can be categorized as favorable and having only low adverse impacts. The project potential impacts will be mitigated by adopting all suggested technical/engineering best practices and measures. The EMP developed needs to be fully implemented during the both construction and operation stage of the project.

Following are the major recommendations:

1. The project should be established according to the specifications as defined in documents. If any changes needed on the ground, these should also be documented. i.e. there should not be conflict between reality and documentation.
2. Environmental monitoring should be regularly carried out according to schedule defined in this EIA report.
3. All the legal and regulatory provisions should be complied with including PIEDMC bye-laws, Punjab Environmental Quality Standards etc. during all phases of the project.

Detailed and points wise recommendations have already been described in Chapter 4 and 5 and have been summarized in executive summary of this EIA Report.

The facts summarized as above, and the whole discussion made in the foregoing chapters of this report support that the project merits for issuing Environmental Approval by the Environmental Protection Agency-Punjab, Lahore for construction and operation of the project.

ANNEXURES

ANNEXURE-I

GLOSSARY

Air Pollutant:

Any substance that causes pollution of air and includes soot, smoke, dust particles, odor, light, electromagnetic radiation, heat, fumes, combustion exhaust, exhaust gases, noxious gases, hazardous substance and radioactive substances.

Biodiversity:

The variability among living organisms from all sources including inter alia terrestrial, marine and other aquatic ecosystem and the ecological complexes of which they are part; including diversity within species, between species and of ecosystems.

Climate:

The weather conditions prevailing in an area in general or over a long period typically averaged over a period of 30 years.

Ecosystem:

A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

Effluent:

Any material in solid, liquid or gaseous form or combination thereof being discharged from industrial activity or any other source and includes a slurry, suspension or vapor.

Environment:

Air, water, land; all layers of the atmosphere; all organic and inorganic matter and living organisms; the ecosystem and ecological relationships; buildings, structures, roads, facilities and works; all social and economic conditions affecting community life; and the inter-relationships between any of the aforesaid factors.

Environmental Impact Assessment:

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.

Ergonomics:

Derived from the Greek *ergon* (work) and *nomos* (laws) Which means the science of work. It is a scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design workplace in order to optimize human well-being and overall system performance.

Initial Environmental Examination:

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.

Meteorology:
The scientific study of the atmosphere that focuses on weather processes and forecasting.

Noise:
The intensity, duration and character of sounds from all sources, and includes vibration.

Occupational Health and Safety Aspects:
Health and Safety Aspects pertaining to workplace.

Proponent:
The person who proposes or intends to undertake a project.

Standards:

Qualitative and quantitative standards for discharge of effluents and wastes and for emission of air pollutants and noise either for general applicability or for a particular area, or from a particular production process, or for a particular product, and includes the Punjab Environmental Quality Standards, emission standards and other standards established under this act and the rules and regulations made there under.

Waste:

Any substance or object which has been, is being or is intended to be, discarded or disposed of, and includes liquid waste, solid waste, waste gases, suspended waste, industrial waste, agricultural waste, nuclear waste, municipal waste, hospital waste, used polyethylene bags and residues from the incineration of all types of waste.

Weather:
The state of the atmosphere at a particular place and time as regards heat, cloudiness, dryness, sunshine, wind, rain, etc.

ANNEXURE-II

LIST OF ABBREVIATIONS AND SYMBOLS

CETP	Composite Effluent Treatment Plant
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
dB(A) Leq	Decibel (A) L Equivalent
EIA	Environmental Impact Assessment
EA	Environmental Approval
EMP	Environmental Management Plan
EMtP	Environmental Monitoring Plan
EPA	Environmental Protection Agency
EPD	Environmental Protection Department
ERP	Emergency Response Preparedness
IEE	Initial Environmental Examination
HSE	Health, Safety and Environment
KW	Kilo Watt
LESCO	Lahore Electric Supply Company
MSDS	Material Safety Data Sheets
MSL	Mean Sea Level
NEQS	National Environmental Quality Standards
NOC	No Objection Certificate
NO_X	Nitrogen Oxides
O_3	Ozone
OHS	Occupational Health and Safety
PEPA	Pakistan Environmental Protection Act
PEQS	Punjab Environmental Quality Standards
PGA	Peak Ground Acceleration
PIEDMC	Punjab Industrial Estate Development and Management Company
PKR	Pakistani Rupees
PM	Particulate Matter
PMU	Project Management Unit
PPE	Personal Protective Equipment
QABP	Quaid-E-Azam Business Park, Sheikhupura
RCC	Reinforced Cement Concrete
SDS	Safety Data Sheets
SIA	Social Impact Assessment
SIR	Site Investigation Report
SO_X	Sulfur Oxides
Sq. ft.	Square Feet
TEVTA	Technical Educational and Vocational Training Authority
TMA	Tehsil Municipal Administration
TOR	Terms of References
TDS	Total Dissolved Solids
VOCs	Volatile Organic Compounds
WAPDA	Water & Power Development Authority

ANNEXURE-III

List of individuals and organizations consulted along with their written feedback

List of Individuals Consulted

S#	Stakeholder Name	Designation	Area
1	Mr. Shahzad Azam	Ex. President SIE	Sundar Industrial Estate, Lahore
2	Mr. Abdul Shakoor	Construction Labour	Bhamb Ki Mallian
3	Mr. Fayaz Jutt	Farmer	Sahu Ki Mallian
4	Mr. Matloob Hussain	Shopkeeper, General Store	Khokhar Ki Mallian
5	Mr. Ayyub Siddique	Barber	Chicho Ki Mallian
6	Mr. Ahmed Gujjar	Land Owner	Bhamb Ki Mallian
7	Mr. Muhammad Tariq	Brick Kiln Worker	Chicho Ki Mallian
8	Mr. Rana Mujahid	Qinqi Driver	Sheesh Mahal Chowk, Sheikhupura City
9	Mr. Shahid Ali	Helper in a factory	Joyeanwala Morr
10	Mr. Waseem Anjum	Livestock Farmer	Khokhar Ki Mallian
11	Mr. Allah Ditta	Livestock Farmer	Bhamb Ki Mallian
12	Mr. Rana Shaukat Ali	Farmer	Mandiala
13	Mr. Zaheer Ahmed	Plumber	Shahbaz Pura
14	Mr. Umer Hayat	Mason	Sahu Ki Mallian
15	Dr. Azhar Ali	Assistant Professor	College of Earth & Environmental Sciences, University of the Punjab, Lahore
16	Yousuf Jamal	CEO, Well-On Techniques	41-B, ZamZam Tower, Johar Town, Lahore

ANNEXURE-IV

Team Members of EIA Study Project

NAME	QUALIFICATIONS	STATUS IN PROJECT
Mr. Engr. Luqman Khan	ME Structural Engineering BE (Hons.) Civil Engineering;	Team Leader
Mr. Zaghum Abbas	MS Environmental Sciences; PGD Environmental Law	Environmentalist
Mr. Yousuf Jamal	MS Environmental Sciences	Environmentalist
Mr. Rana Muhammad Zahid	DAE Civil	Site Engineer; Project Coordinator
Mr. Arslan Ali	BE Civil Engineering	Civil Engineer
Mr. Muhammad Arshad	M. Sc. Chemistry	Lab Manager
Mr. Muhammad Irfan	BS Chemistry	Assistant Lab Manager
Mr. Umer Kazim Ali	BS Analytical Chemistry	Lab Analyst
Mr. Ameer Hamza	BS Environmental Sciences	Field Officer
Mr. Muhammad Tahir	B.A.	Field Executive
Mr. Ahmed Nabeel	B. Civil Technology	Draftsman

ANNEXURE-V

Terms of Reference

Title:
Establishment of Medical Devices Manufacturing unit by Cardiac Care (Private) Limited at Plot No. 11-B, Quaid-E-Azam Business Park, Sheikhupura.

Environmental Consultant Organization "M/s Altec Engineers" to carry out the Environmental Impact Assessment of the project in accordance with the guidelines of EPA-Punjab. The consultant scope includes following activities:

I. Collect all the information relevant/required for the project & are required to compile EIA Report and subsequently obtain approval of same from EPA-Punjab.
II. Description of the Proposed Project Activities
III. Review of Alternatives
IV. Field Survey
V. Collection and Review of primary and secondary data as per requirement.
VI. Review of existing environmental legislation, guidelines and standards applicable to the operation and assessing their applicability.
VII. Stakeholders' Consultation (if required)
VIII. Identification and evaluation of environmental impacts
IX. Recommendations for mitigation measures
X. Development of Environmental Management Plan
XI. Any other item deemed necessary to complete the report in-line with guidelines/requirements of Punjab Environmental Protection Act-1997 (Amended) 2012.
XI. Preparation of a Final Report to meet the requirements of Pakistan EPA.

The Environmental consultant shall prepare Environmental Impact Assessment Report and subsequently submit to relevant authority after obtaining approval from the proponent.

Consultant shall be solely responsible for obtaining the final approval after fulfillment of all pre-requisites as per Punjab Environmental Protection Act-1997 (Amended) 2012.

Overall correspondence and or other financial requirement(s) in this regard are to be taken care by the consultant.

Consultant Signatures **Client Signatures**

ANNEXURE-VI

GOOGLE MAP AND DRAWINGS OF PROPOSED PROJECT

MASTER PLAN
QUAID-E-AZAM BUSINESS PARK
SHEIKHUPURA

LEGEND		
Sr. No.	DESCRIPTION	NO. OF PLOTS
1	0 - 0.99 (0.5 ACRE TYPICAL= 30m X 55.74m)	154
2	1 - 1.99 (1 ACRE TYPICAL= 37.16m X 90m)	190
3	2 - 2.99 (2 ACRE TYPICAL= 50m X 135m)	177
4	3 - 3.99 (3 ACRE TYPICAL= 77m X 135m)	16
5	4 & Above (4 ACRE TYPICAL= 70.5m X 190m)	143
	TOTAL NO. OF PLOTS	**680**
	TOTAL SALEABLE AREA	1316.95 Acres

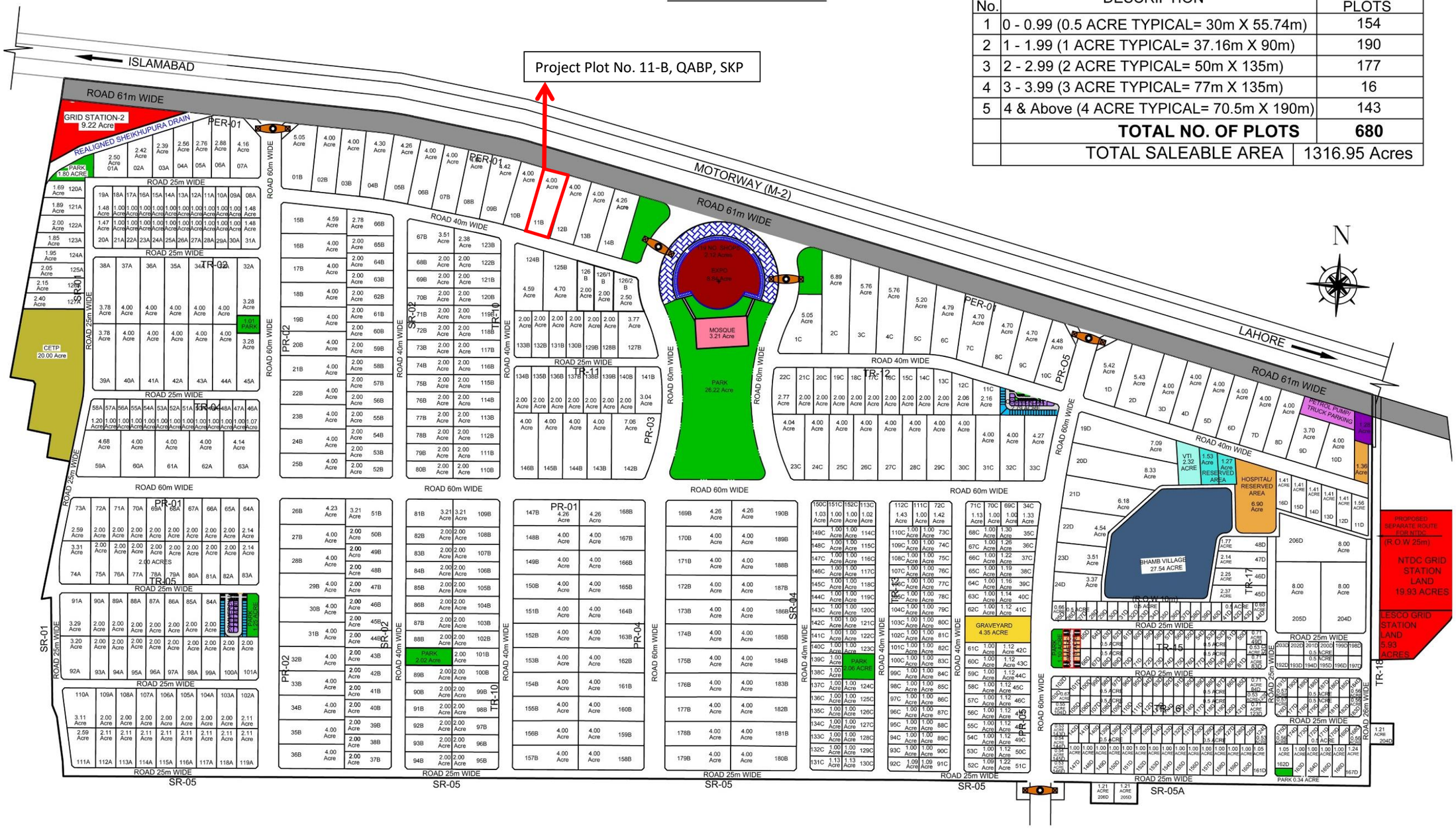

Figure A-VI-I: Location of Plot 11-B at Quaid-E-Azam Business Pak, Sheikhupura

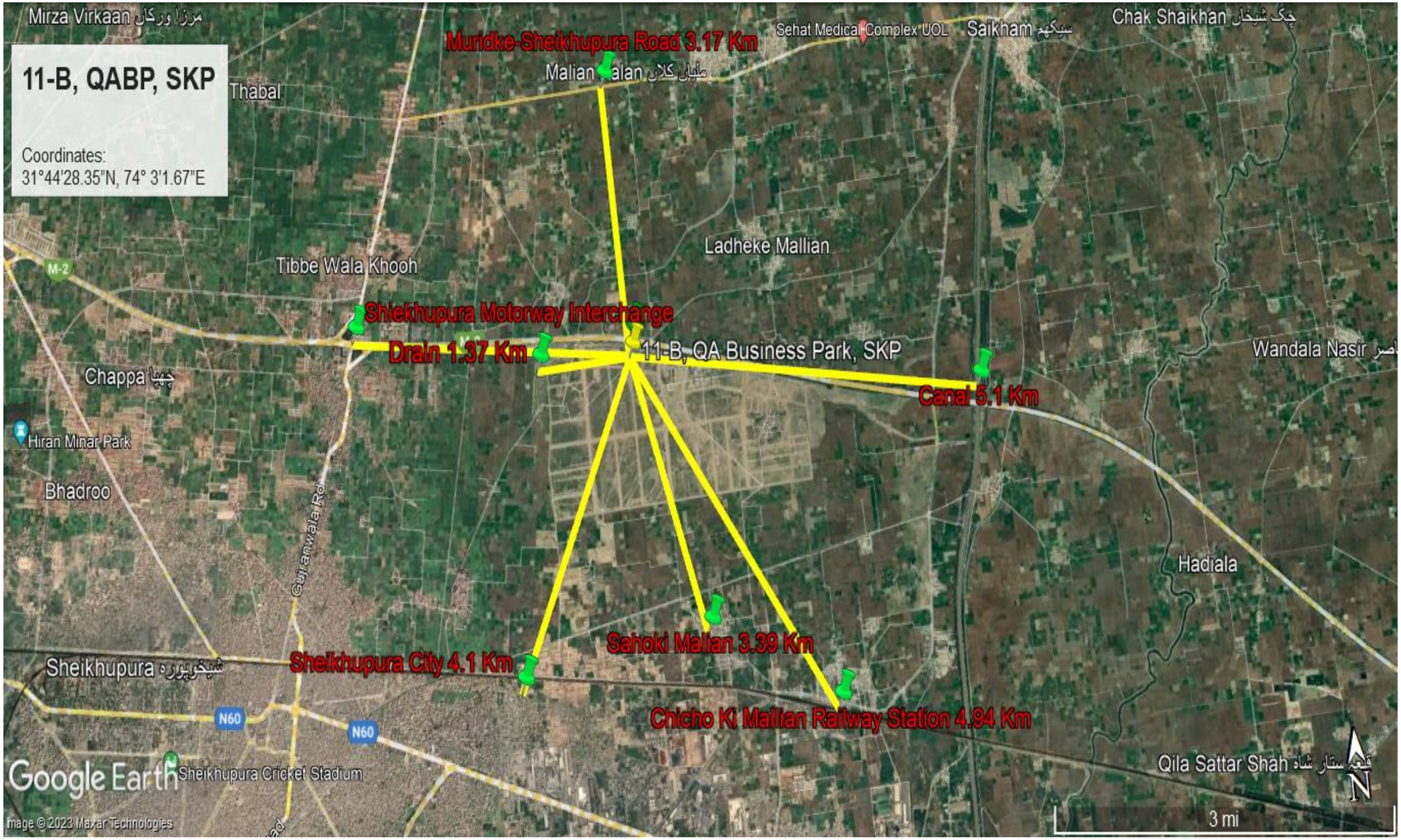

Figure A-VI-II: Google Earth Map of Plot 11-B at Quaid-E-Azam Business Pak, Sheikhupura

ANNEXURE-VII

Baseline Parameters Monitoring Test Reports
(Ambient Air, Ground Water, Noise)

ANNEXURE-VIII

Property Ownership Documents

ANNEXURE-IX

Land Use, Solid Waste Management, Sanitation and Drainage related Documents

ANNEXURE-X

CHECKLIST (EIA) PAK-EPA GUIDELINES FOR PREPARATION AND REVIEW OF ENVIRONMENTAL REPORTS-1997

ANNEXURE-XI

REFERENCES

- Information and data provided by the proponent
- Project feasibility report
- Technical design data related to the project
- Interviews with project related persons of project proponent
- Technical documents of various machinery/equipment
- Meteorological Data from Pakistan Meteorological Department
- Punjab Environmental Protection Act (Amendment) 2012
- Punjab Environmental Quality Standards for Ambient Air & Noise 2010
- Punjab Environmental Quality Standards for Water 2010
- Guidelines for the preparation and review of Environmental Reports
- Punjab Environmental Protection (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations-2022
- Punjab Occupational Health and Safety Act-2019
- Higher Education Department, Punjab
- School Education Department, Punjab
- Population Data from Ministry of Population
- Small and Medium Enterprises Development Authority
- An article on Hiran Minar of Sheikhupura published by Wonders of Pakistan-First Blog on Heritage, Culture and Tourism in Pakistan
- Hiran Minar on Wikipedia
- Sheikhupura City Profile-Punjab Cities Improvement Investment Program by Urban Unit