PUNJAB INDUSTRIAL ESTATES DEVELOPMENT AND MANAGEMENT COMPANY

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) OF BAHAWALPUR INDUSTRIAL ESTATE, BAHAWALPUR

EIA REPORT

MAY, 2018

National Engineering Services Pakistan (Pvt.) LTD
Environmental and Public Health Engineering Division
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LIST OF ABBREVIATIONS

Abbreviation	***Description***
APHA	American Public Health Association
ASR	Air Sensitive Receivers
ASTM	American Society of Testing Materials
BDL	Below Detection Limit
BIE	Bahawalpur Industrial Estate
BOD	Bio-chemical Oxygen Demand
BWMC	Bahawalpur Waste Management Company
Ca	Calcium
CC	Construction Contractor
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
COI	Corridor of Impact
COP	Conference of Parties
dB (A)	Decibel
DC	Design Consultant
DCR	District Census Report
DO	Dissolved Oxygen
EC	Environmental Committee
EE	Environmental Engineer
EIA	Environmental Impact Assessment
EMMP	Environmental Management and Monitoring Plan
EPA	Environment Protection Agency
EPC	Engineering Procurement Construction
EPD	Environment Protection Department
EPHE	Environmental & Public Health Engineering
ERC	Emergency Resource Center
Fe	Iron
FGDs	Focused Group Discussion
gm	Gram
GoP	Government of Pakistan
IEE	Initial Environmental Examination
JICA	Japan International Cooperation Agency
LGO	Local Government Ordinance
MCCS	Manual Classified Count Survey
mg/l	Milligrams per lite
MSL	Mean Sea Level
NCS	National Conservation Strategy
NDMA	National Disaster Management Authority

NEQS	National Environmental Quality Standards
NESPAK	National Engineering Services Pakistan
NO_2	Nitrogen Dioxide
NSR	Noise Sensitive Receivers
NPZ	Noise perimeter zones
^{O}C	Degree Centigrade
OH & S	Occupational Health and Safety
OH & SAS	Occupational Health and Safety Assessment Series
PAPs	Project Affected Persons
PEPA	Pakistan Environmental Protection Act
PEPC	Pakistan Environmental Protection Council
PHA	Parks Horticulture Authority
PGA	Peak Ground Acceleration
PIEDMC	Punjab Industrial Estates Development and Management Company
PM	Particulate Matter
PPC	Pakistan Penal Code
PPP	Public Private Partnership
RAP	Resettlement Action Plan
RoW	Right of Way
SC	Supervision Consultant
SO_2	Sulfur Dioxide
SO4	Sulphate
SOP	Standard Operating Procedures
SPBUSP	Southern Punjab Basic Urban Services Project
STDs	Sexually-Transmitted Disease
SWM	Solid Waste Management
TA	Technical Assistance
TDS	Total Dissolved Solid
TMA	Tehsil Municipal Administration
TSS	Total Suspended Solids
UC	Union Council
UCP	University of Central Punjab
UfW	Unaccounted For Water
UNDP	United Nation Development Program
UNFCCC	United Nation Framework Convention on Climate Change
USEPA	United States Environmental Protection Agency
VEC	Valued Environmental Components
VSC	Valued Social Components
VPD	Vehicle per Day

WASID	Water and Soil Investigation Division
WAPDA	Water and Power Development Authority
WHO	World Health Organization

Glossary

Aesthetic	Concerned with beauty or appreciation of beauty.
Agency	A business or organization providing a particular service on behalf of another business, person, or group.
Aquifer	An aquifer is an underground layer of water-bearing permeable rock, rock fractures or unconsolidated materials (gravel, sand or silt) from which groundwater can be extracted using a water well.
Climate	The weather conditions prevailing in an area in general or over a long period.
Conservation	Official supervision of rivers, forests, and other natural resources in order to preserve and protect them through prudent management.
Consultant	A person who provides professional advice or services to companies for fee.
Construction Waste	Waste generated from the buildings and construction industry and includes material like bricks, concrete, tiles, debris, ceramics and more.
Convention	An agreement between states covering particular matters, especially one less formal than a treaty.
Cultural Heritage	Valued objects and qualities such as historic buildings and cultural traditions that have passed from previous generations.
Demographic	A single vital or social statistic of a human population, as the number of births or deaths.
Drainage	Natural or artificial removal of surface and sub-surface water from an area.
Ecology	The branch of biology that deals with the relations of organisms to one another and to their physical surroundings.
Endangered species	A species of animal or plant that is seriously at risk of extinction.
Environment	Relationship of natural world (human beings, animals and plants) with physical surroundings (air, land, water).
Environmental Sustainability	Environmental Sustainability is the rates of renewable resource harvest, pollution creation and non-renewable resource depletion that can be continued indefinitely.
Impact	The action of one object coming forcibly into contact with another.
Municipal Waste	Municipal Solid Waste (MSW)—more commonly known as trash or garbage—consists of everyday items we use and then throw away, such as product packaging, grass clippings, furniture, clothing, bottles, food scraps, newspapers, appliances, paint, and batteries. This comes from our homes, schools, hospitals, and businesses

Ordinance	An ordinance is a law enacted by a municipal body, such as a city council or county commission (sometimes called county council or county board of supervisors). Ordinances govern matters not already covered by state or federal laws such as zoning, safety and building regulations.
Preservation	Preservation is the strict setting aside of natural resources to prevent the use or contact by humans or by human intervention. In terms of policy making this often means setting aside areas as nature reserves (otherwise known as wildlife reserves), parks, or other conservation areas.
Proponent	A person who advocates a theory, proposal, or course of action.
Rehabilitation	To restore to a condition of good health, ability to work, or the like.
Resettlement	The settlement of people in a different place.
Resource	A stock or supply of money, materials, staff, and other assets that can be drawn on by a person or organization in order to function effectively.
Sanctuary	
Sanitation	Conditions relating to public health, especially the provision of clean drinking water and adequate sewage disposal.
Seismic Hazards	A seismic hazard is the probability that an earthquake will occur in a given geographic area, within a given window of time, and with ground motion intensity exceeding a given threshold.
Stakeholder	A stakeholder is a party that has an interest in a company, and can either affect or be affected by the business. The primary stakeholders in a typical corporation are its investors, employees and customers.
Stage digging	Stage digging is a process by which portions of the root ball are dug over a period of time in order to allow the tree to acclimate to the stresses gradually.
Valued Environmental	Valued environmental components (VECs) are defined as fundamental elements of the physical, biological or socio-economic environment, including the air, water, soil, terrain, vegetation, wildlife, fish, birds and land use that may be affected by a proposed project.
Valued Social Components (VSCs)	Sociocultural factors are customs, lifestyles and values that characterize a society or group. Cultural aspects include concepts of beauty, education, language, law and politics, religion, social organizations, technology and material culture, values and attitudes. Social factors include reference groups, family, role and status in society, time and available resources. An understanding of sociocultural factors is crucial in developing marketing strategies for businesses or organizations seeking action from particular group.

Executive Summary

Title of the Project

This report presents the findings of "EIA of Construction Bahawalpur Industrial Estate, Bahawalpur.

Location of the Project

The proposed project site is administratively located in Bahawalpur District The proposed site spread over an area of 483 acres for BIE is located at a distance of 12 km south west of Bahawalpur City with geographical coordinates of $29^0$19'19.06"N and $71^0$35'9.97"E. National Highway N5 is passing in the North West of the project site, at a distance of 1.6 km. The project site is bounded by Rama village in the east, Mariwala Khu village in the west, Basti Yar Muhammad village in the south and Airport road in the north. Ahmed Pur East Canal is passing along Airport road at north of the project site. Sutlej River is flowing in the north west of the project site, at a distance of 10 km (approx.).

Name of the Proponent and Organization preparing EIA Report

To comply with IEE/EIA regulations 2000 as per Punjab Environmental Protection (Amendment) Act (PEPA) 2012, Punjab Industrial Estates Development and Management Company (PIEDMC) has entrusted National Engineering Services Pakistan (NESPAK) Pvt. Limited with the assignment of carrying out an Environmental Impact Assessment (EIA) study for "Construction of Bahawalpur Industrial Estate".

Brief Outline of the Project

The Punjab Government has established Punjab Industrial Estates Development and Management Company (PIEDMC) to achieve orderly, planned and rapid industrialization in Punjab by developing new industrial estates and managing the existing industrial estates in a dynamic and innovative manner with a view to provide turnkey solutions to the prospective entrepreneur's thereby generating economic activity and creating mass employment opportunities. The PIEDMC intends to establish "Bahawalpur Industrial Estate" on an area of 483 acres in District Bahawalpur.

The project will be promoting exports of value added manufactured items from different sectors. The project is likely to attract foreign as well as local manufacturers to invest in

industrial sector of Pakistan and increase exports of value added products. It will also help in the economic uplift of the southern Punjab.

The overall objective of the proposed Project

- Structural platform to set up industries with availability of developed plots and infrastructure;
- Provision of support services at one location;
- Availability of skilled manpower;
- To provide secure environment; and
- To facilitate compliance with Environmental Regulation

Scope of EIA Study

The scope of this EIA Study aims at collection and scrutinization of data related to physical, biological and socio-economic environment of the project area and to prepare the baseline environmental profile. It also aims at the identification, prediction and evaluation of the possible environmental impacts of the proposed project on its immediate surroundings on both short and long-term basis. Based on the nature and levels of those impacts, appropriate mitigation measures are proposed in this EIA Report.

The submission of EIA and its approval from Environmental Protection Agency (EPA) is mandatory according to the Punjab Environmental Protection Act (Amended), 2012. Section 12 (1) of the Punjab PEPA (Amended), 2012 states that:

"No proponent of a project shall commence construction or operation unless he has filed with the Provisional 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 Provisional Agency approval in respect thereof."

Approach & Methodology

The study was conducted in accordance with Environmental Protection Agency (EPA), Government of Pakistan (GOP) Guidelines, 2000. The study was based on both primary and secondary data and information. Discussions were held with stakeholders including government officials, community representatives and a wide range of local residents. The

main purpose of this approach is to obtain a fair impression on the people's perceptions of the project and its environmental impacts.

To accomplish the job in time and to produce a quality report, a proper methodology was established as follows:

- Meetings and discussions were held among the members of the EIA Consulting Team. This activity is aimed at achieving a common ground of understanding of various issues of the study.
- The plan included; identification of specific data requirements and their sources; determination of time schedules and responsibilities for their collection; and indication of the logistics and other supporting needs for the execution of the data acquisition plan.
- Primary and secondary data was collected through field observations, environmental monitoring in the field, concerned departments and published materials to establish baseline profile for physical, biological and socio-economic conditions.
- The impacts of the proposed project on the physical, biological and socio-economic environment prevalent in the project area were visualized at the design, construction and operational phases.
- The adequate mitigation measures and implementation mechanisms were proposed so that the proponent could incorporate them beforehand in the design phase.

Legal and Administrative Frameworks for EIA

The Government of Pakistan (GoP) has promulgated laws/acts, regulations and standards for the protection, conservation, rehabilitation and improvement of the environment. In our current studies the applicable environmental policies are National Environment Policy, 2005; National Climate Change Policy, 2012 and National Resettlement Policy, 2002. The relevant laws, regulations and acts to the proposed project are: Pakistan Environmental Protection Act, 1997; IEE/EIA Regulations, 2000; Pakistan Environmental Assessment Procedures, 1997; Punjab Environmental Quality Standard (PEQS) 2016; National Environmental Quality Standard (NEQS) 2010; Punjab Local Government Ordinance, 2001; Pakistan Penal Code, 1860; Guidelines for Solid Waste Management (2005); Canal and Drainage Act, 1873*;* Sectorial Guidelines (1997); The Punjab Wildlife Protection, Preservation, Conservation & Management Act (1974); Protection of Tress and Brushwood Act,1949; Cutting of Tress (Prohibition) Act 1975;

Disaster Management Act, 2010; The Motor Vehicles Rules,2000; National Clean Air Act, 2000; Land Acquisition Act, 1894; Seismic Building Code of Pakistan, 2007; Toxic or Hazardous Waste and Preservation of Cultural Heritage.

The implementing agency of the proposed project is Punjab Industrial Estates Development and Management Company (PIEDMC). The management of PIEDMC will ensure that all the proposed measures are effectively implemented at the design, construction and operational stages of the project.

Project Description

The project is expected to be completed in (24) months. The estimated capital cost of the proposed project is Rs Four (04) Billion.

The Project envisages the development of a State of the Art Industrial Estate at Bahawalpur on a Land Area measuring 483. The proposed Industrial Estate comprises Industrial Plots 1.0 Acre and Amenities (Medical Center/ Emergency 1122 Station, Parks, Sports Facilities, Commercial Area, Vocational Training Center, Truck Stand and Petrol Pump, Jamia Masjid, Grid Station, PIEDMC Office and CETP/ Landfill Site/ Disposal Station etc.).

The materials used in construction of the proposed project would include reinforced cement concrete frame (RCC Frame), brick infill, brick cladding, textured paints and standard paints etc. The materials used in construction of the road for the proposed project would include coarse aggregates (crush), fine aggregates (sand), water, asphalt, reinforcement, cement etc. Estimated average water demand for the proposed project is 4.21 MGD (7.7 cusecs), for which 12 tube wells each of one (01) cusecs are proposed during the operation phase. During the construction phase, estimated average water demand for various project activities is one (01) cusecs. The estimated average wastewater produced during construction and operation phases is 0.8 cusecs and 6.2 cusecs respectively.

The municipal waste generation during construction phase will be 200[1] kg/day and during operation phase it will be estimated as 6000 kg/day. The man power requirement

[1] 0.4 kg/capita/day waste generation of Bahawalpur (Consultation with Manager Operations, Bahawalpur Waste Management Company)

is estimated 500 workers during construction phase and 15000 workers during operation phase of the industrial estate.

Description of the Environment

The existing environment in and around the project area has been studied with respect to the physical, biological and socio-economic conditions.

Physical Environment

The District Bahawalpur can be divided into three parts i.e. the riverain area, the plain area and the desert area. The project area has irregular topography. The sand dunes are deposited all over the project area, which are 1 to 5 meters (3 to 15 feet) high from adjacent agriculture land. The project area has bad land topography. The irregular sand dunes deposited all over the project area which are 1 to 5 meters (3 to 15 feet) high from adjacent agriculture land. The soil is sandy, while the soil of central Bahawalpur mostly consists of the plains of Indus basin,which is at the height of not more than 150 meters above sea level. But the southwestern desert, which is called Rohi or Cholistan, is mostly undulated due to the presence of sand dunes. The height of the sand dunes does not exceed 150 meters (according to Imperial Gazetteer of 1901 height of dunes was not more than 500 feet). Ahmad Pur Canal is the nearest surface water body in the project area.

The District has extremes of climate[2]. because, being adjacent to Rajputana desert, this area overall resembles the dry climate of an arid desert The summer season starts from the month of April and continues till October , while the weather is pleasant and cold from November to February The climate is mainly hot and dry. In the summer the temperature reaches the high 40 (forties Celsius) and 50 during the day and the nights are slightly cooler. Since the city is located in a desert environment there is little rainfall. Weather conditions reach extremes in both summer and winter. Temperature in Bahawalpur ranges from 5.85 to 42.2o C. Average monthly rainfall ranges from 3 to 168 mm. The average temperature in summer is 33°C (91oF) and 18°C (64oF) in winter. During winter it is between 5 and 15 degree centigrade and sometimes it falls below the freezing point, which ruins the crops.

[2]**Source**: *District Census Report, Bahawalpur, 1998*

The environmental parameters like air quality, noise level and ground water were monitored at the proposed project site from January 12, 2018 to January 16, 2018 for analyzing the quality of air, ground water and level of noise at the proposed site, for establishing the baseline profile of the area. The environmental monitoring for ambient air, noise and ground water was conducted at the proposed project site in January, 2018 for establishing the baseline profile of the project area. The results of ambient air monitoring indicate that all parameters are well within the permissible limits of Punjab Environmental Quality Standards (PEQS) while the results of drinking water quality are awaited.

Ecological Environment

The ecological survey of the project site revealed that few trees (45) existing in the median of the existing proposed project and will be affected. Tree cutting will be involved due to construction of the proposed project.

Common mammals found in the area are the hog deer, ravine deer, black buck and blue bull. Fox, jackals, hares, wild boars, porcupines, mongoose, arks, owls and hawks are also found in large numbers. The terrestrial mammals include Cat, Dog, Horse and Donkey Amphibians frequently seen in and around the project area, especially during rainy season include Frogs (Daddos) are found in great number. Bird species known to occur in the area are: Caracal, Chinkra, Houbara Bustard, Great Indian Bustard, Sand, Groud, Desert Costal, Grey Baridrige, Doves, Raptors, Vultures, Diversified song birds, different types of shrikes, Black and Grey partridges (*Francolinus francolinus* and *F. pondicerianus*),Jackal and Jungle cat. Bashin, Tamtari, Crow and Parrot. Snakes such as cobra, kraits etc. were once common in the tract, Kala Mushki, Sangchoor (Yellowish), Dhoi, Lundi Kharpa and Jalebi are also found. Lizards are of numerous and of various species, such as Sanda (the oil of which has restorative power), Spiny tailed lizard (Uromastixhardwickii) and fringed toed lizard (Acanthodactylus cantoris), are also reported in the project area. The Indus contains a variety of fish. In the winter months when the river recedes, fish are caught in greater quantity.

Socioeconomic Environment

The total population of Bahawalpur District was 2,433,091as enumerated in March 1998 with an intercensal percentage increase of 67.4 since March 1981 when it was 1,453,438

souls. The average annual growth rate of population in the district during intercensal period 1998-2017 was 3.07 percent. The total area of the district is 24,830 square kilometers which gives population density of 98 persons per square kilometer as against 59 persons observed in 1981 indicating a fast growth rate of the district.Later on 1998, the massive efforts are made to count the population and census bureau carried out latest census and released the latest statistics of 2017 at the national, provincial and district level. According to the results, the total population of Pakistan is measured as 207,774,520 persons with annual growth rate of 2.40% and the population of Punjab is 110,012,442 persons with annual growth rate of 2.13%. By the annual growth rate of 2.18%, the population of District Bahawalpur is estimated as 3,668,106 persons out of which 1,879,311were male and 1,788,578were female. Sex ratio is measured as 105.07 percent.

The mother tongue refers to the language used for communication between parents and their children in any household. Siraiki is the predominant language being spoken by majority (64.3 percent) of the population of the district followed by Urdu, Pushto and Punjabi being spoken by 5.5, 0.6, and 28.4 percent.

A socio-economic survey was carried out in the project area to get the response about the perceived impacts and preferences towards the project implementation. A sample of 100 respondents was taken on the basis of random sampling technique, which includes shop owners, shop keepers (renters), customers, local residents, pedestrians, road users and students etc.

Impacts and Mitigation Measures

To get one sight overview of the nature of the impacts, their scale and significance; an Environmental Impact Matrix have also been developed for construction and operation phases.

The construction of the proposed project will have both positive and negative impacts during the construction and operational phases, for which proper mitigation measures are prepared. During the field survey, significant efforts were made to identify the main social, cultural and environmental issues related to the construction of the proposed project. Following is the list of main issues and concerns which have been considered in the study report:

Construction Phase

- No land acquisition is involved for the construction of proposed Project;
- Excavation of earth/cutting operations, clearing of vegetation and land levelling activities can destabilize the surrounding land surface;
- Wastewater would be generated from the workforce during the construction phase.
- Air quality will be affected by various construction activities. Emissions may be carried over longer distances depending upon the wind speed, direction, temperature of surrounding air and atmospheric stability. In certain climatic condition such as hot summer, airborne dust can become a major nuisance if control techniques are not properly employed. The air emissions may cause health impacts such as dryness and roughness of the throat; eyes, nose, etc. to the workers and staff of the contractor. These emissions may also affect the bio-physical environment. Major air sensitive receivers identified in the project area are Mosque Muhammadia, Noor Masjid, Govt. Girls Primary School, Mari Sheikh Shujra;
- Main sources of noise will be heavy machinery such as bulldozers, excavators, stabilizers, concrete mixing plant, pneumatic drills and other equipment. Noise generated by construction machinery is likely to affect sensitive receptors located within 500 meters of the project area Major noise sensitive receivers identified in the project area are Masjid Muhammadia, Noor Masjid, Govt. Girls Primary School, Mari Sheikh Shujra and residential area around project site;
- Due to construction activities municipal and construction waste will be generated from construction activities and contractors' camps. Improper dumping of waste may generate odor and attract mosquitoes and other disease vectors. Empty containers containing the toxic, flammable and corrosive materials may pose hazard to the workers. This may result in health risk to work force and public;
- Trees are vital ecosystem, which perform variety of functions for the improvement of environment such as reduction in air pollution, noise abatement, cooling effect on earth and supply of oxygen;
- Nearly 45 trees of different species mostly young trees exist in the project area. These trees are likely to be effected, during construction stage;
- The trees provide nesting and resting places to the fauna. The cutting of these trees will have a negative impact on the fauna as well. During the construction phase, there

will be negative impacts on the mammals and reptiles of the area, due to construction activities involving excavation, access roads, movement of labor, carriage of goods and machinery to various sites along the project corridor. Mammals, such as dogs, cats, jackals etc. will avoid these areas for fear of being persecuted. Same will be the case with reptiles; some reptiles might be killed during the digging and piling operations;

- Due to construction activities, waste will be generated at construction and contractors camp site. The construction waste will include wastewater, oil spillage from machinery, domestic waste and solid waste etc. As the project deals with the construction of the proposed Industrial Estate, so no hazardous waste will be generated during the construction waste. But the handling and storage of oil, asphalt/bitumen may be a source of environmental pollution as a hazardous waste. This will result in unhygienic conditions, health risk to work force and public at the camp site;
- Health risks associated with exposure to continuous noise levels includes increase in blood pressure, hypertension, annoyance and sleep disturbance. temporary threshold shift etc.;
- Construction waste, if left unattended will result in forming leachate that will percolate through the soil strata and will reach underground water table and hence, will end up contaminating groundwater. There is a probability that various materials like fuel, lubricant oil and other oily products, which are used during the construction phase may contaminate groundwater and channels carrying water;
- Large quantities of industrial and hazardous waste along with municipal solid waste will be produced at the different stages of the project. Without a proper solid waste management system and engineered land filling practices, solid waste may result in odor, breeding ground for disease vector, and aesthetic concerns;
- The groundwater quality and quantity may significantly be affected by the project activities. The minimum depth of water table in project area is about 30 to 40 feet below ground surface (9m-12m); therefore it is more likely to be contaminated due to seepage, infiltration and inflows;
- Wastewater of the proposed industrial estate is planned to be disposed of in River Sutlaj which flows in the North West side of the proposed project site at a distance of 10 km. It will significantly affect the nearby settlements due to foul odor and may serve as breeding ground for disease vectors;
- A total number of forty five (45) trees of varying species and sizes will be cut;

- Air Pollution could be a major concern of the nearby settlements from the proposed Industrial Estate. The gaseous emissions and fugitive dust emissions may deteriorate the air quality of project area during pre-construction (site clearing) and construction phase of the proposed project due to construction activities (operation of construction machinery, dust emissions, vehicular movement, etc.) which results in increase in both air and noise pollution along with the associated health risks to the nearby residents. During the operation phase various primary and secondary air pollutants would be emitted. The gaseous emissions in the form of plumes will create an air-shed of pollutants within 15 – 20 Km distance and affect the recipients in the downwind direction of the industries and may cause chronic or acute respiratory diseases like asthma and nausea and will also have effect on the faunal and floral species;
- Disruption of existing public utilities during construction phase;
- Oil spillages from construction machinery, resulting in soil and drinking/spring water contamination;
- Health and safety problems of the workers may also arise during the construction and operational phases of the proposed project; and

- Health risks and work safety problems may result at the workplace/camps if the working conditions provide unsafe and/or unfavourable working environment due to storage, handling and transport of construction materials and malfunctioning in operation of construction machinery and equipments;

Operation Phase

- Wastewater from industrial, commercial and residential zone of the industrial estate will contain high concentrations of Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solids (TSS) and Pathogens etc. Wastewater from other industrial and commercial sectors may contain hazardous metals and compounds. If all this wastewater is not treated properly, it will be a continuous hazard for the aquatic system and downstream uses of canal and rive;
- The operation of industries will result in generation of large quantities of primary and secondary air pollutants including SO_x, NO_x, CO, CO_2, PM_{10}, $PM_{2.5}$, H_2S, and CH_4 etc. The gaseous emissions in form of plumes will create an air-shed of pollutants within 15 – 20 Km distance and affect the recipients in the downwind

direction of the industries and may cause chronic or acute respiratory diseases like asthma and nausea and will also have effect on the faunal and floral species;

- Disposal of hazardous waste of industries, medical facility and commercial areas is one of the major concerns during operation phase of the project. Therefore, its improper handling and disposal will pose serious threat to the physical and biological environment. This will also adversely impact the future use of the land where hazardous waste will be disposed of;
- Movement of traffic in the area shall increase, causing noise and air pollution, which will be a permanent source of disturbance to fauna of the area and especially the birds, which shall avoid this area on account of noise and fear of being harassed or killed. Most of the industries set up in the estate will cause toxic air emissions, resulting in deterioration of ambient air quality and ultimately affecting not only human health, but also it has negative impact on the surrounding flora and fauna. These emissions may be carried over long distances, depending on wind speed and direction, which generally varies with seasons; and
- Large quantities of municipal and hazardous waste will be generated in the operation phase of the project. Without a proper solid waste management system and engineered land filling practices, many environmental risks remain problematic for the workers and visitors.
- Industrial occupational safety of the workers will be of significant concern during operation phase. Industrial processes involve several hazards from minor to major injuries for the workers which need to be addressed during policy making for the operational phase.

Mitigation Measures

- All spoils should be disposed of at designated site and the site should be restored back to its original conditions;
- Protection of groundwater reserves from any source of contamination such as the construction and oily waste;
- Careful planning of the works to avoid soil excavation works during rainy seasons;
- Open burning of solid waste from the contractor's camps should be strictly banned;

- All vehicles, machinery, equipment and generators used during construction activities should be kept in good working condition, properly tuned and maintained in order to minimize the exhaust emissions;
- Provide construction workers with suitable hearing protection like ear cap, or earmuffs and training them in their use;
- Selection of up-to-date and well maintained plant or equipment with reduced noise levels ensured by suitable in-built damping techniques or appropriate muffling devices;
- The waste generated from the camp site will be disposed of at approved sites;
- Burning of waste shall be prohibited;
- Flowering and fruiting shrubs should be planted along the project boundary to beautify the landscape. Plantation would however be done keeping in view the principles of landscape designing;
- Exhaust of noxious gases from movement of heavy machinery will pollute air which will adversely affect health and vigor of plants
- Trees should be properly preserved and no trees should be unnecessarily removed;
- Layout plan for camp site, indicating safety measures taken by the contractor, e.g. fire-fighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents;
- Ensure strict use of wearing these protective clothing during work activities;
- Compensatory plantation of trees shall be undertaken along the boundary of the Industrial Estate, along the main and minor roads and in green areas; and
- HSE protocols should be strictly followed and implemented to avoid any incident/accident.
- Providing basic medical training to specified work staff and basic medical service and supplies to workers;

All the adverse impacts of the proposed project have properly been addressed and appropriate mitigation measures have been proposed and a comprehensive Environmental Management and Mitigation Plan (EMMP) have been formulated. The implementation of EMP will help to reduce the adverse impacts of the proposed project.

Environmental Mitigation and Monitoring Plan

The Environmental Mitigation and Monitoring Plan (EMMP) describe the management and mitigation measures to address the environmental issues during design, construction and operational phases of the proposed project. Results of the EIA Study have shown that overall the project is environmentally feasible.

During design phase, the proposed mitigation measures will be implemented by Design Consultant (DC), Parks and Horticultural Authority (PHA) and Forest Department, whereas Punjab Industrial Estates Development and Management Company (PIEDMC), Construction Constructer (CC), Supervision Consultant (SC), Environmental Committee (EC) and Parks and Horticultural Authority (PHA) will properly mitigated the identified impact of construction phase. The implementing agency for the operation phase of the project will be PIEDMC, Forest Department, BWMC and EPA. The Environmental Mitigation, Monitoring, training and tree plantation cost will be Rs. **28,286,250** or **Rs. 28.286 million.**

Proposed Monitoring

The EC will be responsible for environmental monitoring and reporting throughout the construction and operational phases. During construction phase, one (1) environmental monitoring report will be prepared on monthly basis and one (1) comprehensive report will be prepared at the end of the construction phase and will be submitted to each of the following authorities and institutions: (i) PIEDMC and (ii) EPA-Punjab.

Whereas monthly and quarterly monitoring of ambient air, drinking water and noise level will be carried out by PIEDMC and EPA, During construction phase, one (1) environmental monitoring report will be prepared on quarterly basis and one (1) comprehensive report will be prepared at the end of the construction phase and will be submitted to each of the following authorities and institutions: (i) PIEDMC and (ii) EPA-Punjab. One (1) environmental monitoring report will be prepared bi-annually and one (1) comprehensive report will be prepared annually and submitted to the EPA-Punjab for first year of the project operation. Contents of the final report will include results of environmental monitoring in comparison to the standards for the various parameters, location and sampling time along with recommendations for the future projects.

Conclusion and Recommendations

The implementation of the proposed project will have many beneficial impacts on population residing in the project area and the daily road user/ travellers using this intersection. Major beneficial impacts of the proposed project are:

- Structural platform to set up industries with availability of developed plots and infrastructure;
- Provision of support services at one location;
- Availability of skilled manpower;
- Job opportunities for locals during construction and operation phase; and
- Economic uplift of the District

Apart from the beneficial impacts of the project, the proposed project has potential adverse environmental and social impacts during all phases. Most of the adverse impacts during construction are of a temporary nature. These potential impacts can be avoided or mitigated by adopting suitable mitigation or remedial measures as mentioned in this EIA Report. Following conclusions are based on the findings of detailed EIA study.

Following are the recommendations on the basis of the EIA Study:

- The protected site i.e. Jamia Masjid Al-Sadiq which is declared as Protected Site by the Government of Punjab under Punjab Special Premises Ordinance 1985 is located at an aerial distance of 11.75 km from the proposed site. NOC will be needed from the Archaeology Department prior to execution of the proposed project;
- The proposed forcemain from the disposal station will cross the Ahmadpur East canal and its branches. In this regard, for obtaining NOC from Irrigation department the case must be taken up on priority basis. Also, it is to be mentioned that in case of dry season, the treated effluent may be discharged into the canal for which NOC will be needed for Irrigation Department. NOC for discharge of effluent into river Sutlej may be taken from the concerned department;
- Along the proposed route of outfall sewer (42" i/d), the sewer line will cross one branch and one main railway track for which obtaining NOC and estimate from concerned authorities of Pakistan Railways may be taken up on priority basis;

- The proposed forcemain (800mm outer diameter) will also cross N5 through thrust boring method. In this regard, NOC must be taken from National Highway Authority prior to execution of the work;
- In order to fulfill the requirement of safe disposal of collected wastewater as per Punjab Environmental Protection Act (PEPA) (Amended), 2012 a Combined Effluent Treatment Plant (CETP) is proposed. The CETP shall be designed to provide at least secondary level treatment. The process design of proposed CETP shall be designed for average wastewater flow generated in the Bahawalpur Industrial Estate;
- Individual industries must install their Wastewater Treatment Plant to treat their wastewater as per Punjab Environmental Quality Standards, 2016 for Municipal and Liquid Industrial Effluents;
- In case of any constraints regarding the site location, effective environmental measures should be considered during the design phase of the proposed project. These measures must address the impacts of air, water, noise, waste and social parameters to make the project environmentally sustainable and socially acceptable. These measures may include but not limited to creating buffer zones (green belts) around the perimeter of the industrial estate, waste management plan, treatment of wastewater and installing air pollution control devices;
- The project structures should be designed to cater the requirements of Zone 2A of seismic provisions (2007) of Building Code of Pakistan after giving due consideration to the soil profile at site;
- A proper traffic diversion plan must be formulated prior to construction and conveyed to the road users;
- Health and safety plan for the workers must be followed during construction phase;
- During tree plantation, plants should be selected in accordance to their ability to absorb emissions;
- PIEDMC must formulate such a policy to ensure all the industries that will operate in the proposed Industrial Estate to register with Self-Monitoring And Reporting Tool (SMART) by Pak-EPA; and
- Proper implementation of EMMP should be ensured during all three phases of the proposed project. All personnel staff, employees and contractors/s should undertake appropriate training prior to construction to ensure they are aware of the on-site

responsibilities in respect of all environmental and social issues. In addition, EMMP should be a part of contract document of Contractor/s. Moreover, the cost for environmental mitigation and monitoring has been estimated which should be included in the PC-I or overall Project Cost.

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SECTION - 1
INTRODUCTION

1.1 General

The Government of Punjab has established Punjab Industrial Estates Development and Management Company (PIEDMC) to achieve orderly, planned and rapid industrialization in Punjab by developing new industrial estates and managing the existing industrial estates in a dynamic and innovative manner with a view to provide turnkey solutions to the prospective entrepreneurs thereby generating economic activity and creating mass employment opportunities. Its key objective is to provide quality infrastructure, ensure efficient, cost effective and sustainable management of industrial estates, and to endorse "One Window Operation" by providing utilities and services at industrial estates.

PIEDMC intends to develop an industrial estate in Bahawalpur spread over an area of 483 acres and has engaged NESPAK to carry out the master planning and detailed engineering designing for development of the Industrial Estate. Environmental Impact Assessment (EIA) Study is mandatory requirement of the BIE as a planning stage document. The EIA will ensure that environmental consequences are considered at all stages of the project. In addition, the EIA will assist the proponent to minimize the potential adverse impacts of the project. The EIA methodology promotes a practical and dynamic process of environmental protection that allows significant adverse impacts to be avoided or mitigated throughout the entire planning and design process.

1.2 Background and Need of Project

Bahawalpur is a city located in the Punjab province of Pakistan. Bahawalpur is the 12th largest city in Pakistan with an estimated population of around 0.8 million. It was recognized as the capital of a princely state after the Durrani Empire declined. This princely state was founded by Nawab Muhammad Bahawal Khan-II in the early nineteenth century. Bahawalpur city has been historically the hometown and hub of various different Nawabs and rulers of their times. In the United India, Bahawalpur was called the Rajputana State which is now Rajhistan in India.

Bahawalpur lies at the junction of trade routes from the east, south-east, and south. It is a center for trade for wheat, cotton, millet, and rice grown in the surrounding region. District Bahawalpur spreads over an area of 24,830 square kilometers, comprising the five tehsils of: Bahawalpur, Hasilpur, Khairpur Tamewali, Ahmadpur East and Yazman

Being an expanding industrial city, the government has revolutionized and libertized various markets, allowing the caustic soda, cotton ginning and pressing, flour mills, fruit juices, general engineering, iron and steel re-rolling mills, looms, oil mills, poultry feed, sugar, textile spinning, textile weaving, vegetable ghee and cooking oil industries to flourish. The fragmented industries are difficult to manage environmentally, as their environmental impact is widespread. Hence, the concept of clustered industries i.e. Industrial Estates was evolved to manage the industrial impacts.

1.3 Scope of EIA Study

The scope of the EIA Study aims at collecting and scrutinizing of data related to physical, biological and socio-economic environment of the project area and to prepare the baseline environmental profile. It also aims at the identification, prediction and evaluation of the possible environmental impacts of the proposed project on its immediate surroundings on both short and long-term basis. Based on the nature and levels of those impacts, appropriate mitigation measures have been incorporated in this EIA Report.

1.4 Study Objectives

The overall objective of EIA is to assess the environmental impacts arising from the project. The specific objectives of the EIA Study for construction of BIE include the following:

- Collection and scrutinization of data related to physical, biological and socio-economic environments of the project area and to prepare baseline environmental profile;
- Identification, prediction and evaluation of environmental impacts of the proposed

Project;

- Implementation plan of mitigation measures to minimize the adverse impacts; and
- Preparation of an Environmental Management Plan (EMP).

1.5 Need for EIA Study of the Proposed Project

EIA is mandatory according to the Punjab Environmental Protection Act (PEPA-2012) amended. Section 12 (1) of the PEPA-2012, which states that:

"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."

1.6 The Proponent and Consultant

The proponent of the project is Punjab Industrial Estates Development and Management Company (PIEDMC) while the Consultant is NESPAK; the details are given as under:

a) Proponent Contact Address

Punjab Industrial Estates Development and Management Company (PIEDMC)
Head Office PIEDMC, Commercial Area (North) Sundar Industrial Estate,
Sundar-Raiwind Road, Lahore
Tel: 042-35297203-6

b) Consultant Contact Address

National Engineering Services Pakistan Private Limited (NESPAK)
EPHE Division, NESPAK House
1-C, Block – N, Model Town Extension, Lahore
Tel: 042-99090000

1.7 Nature, Size and Location of the Project

The proposed site spread over an area of 483 acres for BIE is located at a distance of 12 km south west of Bahawalpur City with geographical coordinates of $29^0$19'19.06"N and $71^0$35'9.97"E. National Highway N5 is passing in the North West of the project site, at a distance of 1.6 km. The project site is bounded by Rama village in the east, Mariwala Khu village in the west, Basti Yar Muhammad village in the south and Airport road in the north. Ahmed Pur East Canal is passing along Airport road at north of the project site. Sutlej River is flowing in the north west of the project site, at a distance of 10 km (approx.).

1.8 Study Team

A multidisciplinary team was formulated to conduct the study. List of names, qualifications and role of team members carrying out EIA is attached as **Annexure-I**. The team comprises the following professionals:

Hammad Qamar	:	Team Leader/ Sr. Environmental Engineer
Saeed Hussain	:	Senior Sociologist
Ahsan Akhlaq	:	Senior Environmentalist
Raheela Hakim	:	Environmentalist
Nida Batool	:	Environmental Engineer
Adeera Nasar	:	Sociologist
Kinza Farrukh	:	Junior Sociologist

1.9 Study Approach & Methodology

1.9.1 Study Approach

The study has been conducted in accordance with Environmental Protection Agency (EPA), Government of Pakistan (GOP) Guidelines, 2000 and the sectoral guidelines for environmental reports (industrial estates) by Pakistan Environmental Protection Agency, 1997. The study is based on both primary and secondary data and information. Discussions were held with stakeholders including government officials, community representatives and

general public. The main purpose of this approach was to obtain a fair impression on the people's perceptions of the project and its environmental impacts.

1.9.2 Methodology

The following methodology was adopted for carrying out the EIA study of the proposed Project:

a) Orientation

Meetings and discussions were held among the members of the EIA Consulting Team. This activity was aimed at achieving a common ground of understanding of various issues of the study.

b) Planning for Data Collection

Subsequent to the concept clarification and understanding obtained in the preceding step, a detailed data acquisition plan was developed for the internal use of the EIA Consulting Team. The plan included identification of specific data requirements and their sources; determined time schedules and responsibilities for their collection; and indicated the logistics and other supporting needs for the execution of the data acquisition plan.

c) Data Collection

In this step, primary and secondary data were collected through field observations, environmental monitoring in the field, concerned departments and published materials to establish baseline profile for physical, biological and socio-economic environmental conditions. This includes:

- Site Reconnaissance
- Analysis of Maps and Plans
- Literature Review
- Desk Research
- Public Consultations
- Field Observations & Studies

- Laboratory Analyses

Physical Environment

Information was gathered on the existing physical environment, particularly as related to geology, topography, soils, hydrology and drainage, water quality, air quality and noise.

Geology, Topography, Soils

A review was conducted of relevant literature on the geology, topography and soils in the Project Area.

Hydrology and Drainage

A literature review was conducted to identify the components of the hydrological cycle that are likely to impact on the project and the possible impacts that the project could have on the hydrologic regime. Field assessments included a determination and verification of all the existing water bodies, assessment of drainage issues, interviews with local community members, and round-table discussions with stakeholders.

Air Quality

Ambient air quality measurements are essential to provide a description of the existing conditions, to provide a baseline against which changes can be measured and to assist in the determination of potential impacts of the proposed construction on air quality conditions. Ambient air quality was continuously monitored for Carbon Monoxide (CO), Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), and Particulate Matter (PM_{10}), for 24 hours by a certified testing laboratory.

Noise

Noise level readings were monitored for 24 hours on continuous basis by a certified environmental lab.

Water Quality

The objective of the water quality monitoring is to determine water quality situation before construction phase. It has been observed that the surface water and ground water

quality are the most important environmental variables to be affected in this project. The extent of groundwater contamination in the project area was assessed based on the test results of chemical and microbiological parameters of groundwater. Sampling and analyses were performed by a certified environmental laboratory.

Biological Environment

The status of the flora and fauna of the study area were determined by an ecological survey, a review of literature relevant to the area, and an assessment of terrestrial environments.

Flora

The vegetative communities were identified and classified into community types. Identification was carried out of dominant tree species, assessment of stage of growth (mature or sapling) and assessment of canopy cover.

Fauna

Information on fauna was gathered from existing literature on reported species as well as observations in the field.

Socio-Cultural Environment

The consultants utilized a combination of desk research, field investigations, census data, structured interviews, maps, reports to generate the data required for description of the existing social environment and assessment of the potential impact of the construction of the proposed project. Data was gathered on the following aspects of the social environment:

- Land use and Municipal Status
- Traffic, Transportation and Access Roads
- Demographics
- Livelihoods
- Poverty

- Education
- Health
- Social Setup
- Community Facilities
- Solid Waste Management
- Proposed Developments
- Recreational Activities
- Archaeological and Cultural Heritage

d) Identification and Evaluation of Environmental Impacts

The impacts of the project on the physical, biological and socio-economic environment prevalent in the Project Area were visualized at the design, construction and operational phases.

e) Mitigation Measures and Implementation Arrangements

The adequate mitigation measures and implementation mechanisms were proposed so that the Proponent could incorporate them beforehand in the design phase.

1.10 Structure of the Report

Section 1 **"Introduction"** briefly presents the project background, objectives, methodology and need of the EIA study.

Section 2 **"Policy, Legal and Administrative Framework"** comprises policy guidelines, statutory obligations and roles of institutions concerning EIA study of the proposed Project.

Section 3 **"Description of the Project"** furnishes information about the location of the proposed Project, cost and size of the project, its major components and alternatives considered for the proposed project to select at the preferred alternative for detailed environmental assessment.

Section 4 **"Environmental Baseline Profile"** establishes baseline conditions for physical, biological and socio-economic conditions prevalent in the project area.

Section 5 **"Public Consultation"** identifies the main stakeholders and their concerns raised through scoping sessions, and deals with the measures to mitigate the social impacts.

Section 6 **"Anticipated Environmental Impacts and Mitigation Measures"** identifies, predicts and evaluates impacts of the project activities during the construction and operation stages and deals with the measures (including mitigation cost) proposed to mitigate potential environmental impacts of the proposed project.

Section 7 **"Environmental Management and Monitoring Plan"** outlines institutional arrangements for the implementation of the proposed mitigation measures, training needs of the staff for implementation of the mitigation measures, monitoring requirements, monitoring cost etc.

Section 8: **Conclusions and Recommendations** provide the outcome of the study and major observations of EIA and suggestions for environmental management and pollution control.

Section 9: **References.**

SECTION – 2
POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.0 General

This section deals with the current environmental policy as well as legal and administrative framework related to carrying out the Environmental Impact Assessment of "Construction of Bahawalpur Industrial Estate". All the relevant Environmental policies and Guidelines of Pak-EPA and legal frameworks have been duly discussed in this section. In addition, the roles and responsibilities of the proponent as well as the Environmental Protection Agency (EPA) Punjab have been covered in this section.

The proposed project, like other development projects, requires an EIA in accordance with the Punjab Environmental Protection (Amendment) Act (PEPA), 2012 and IEE/EIA Regulations, 2000.

2.1 Policy Framework

The ministry of Climate Change is the responsible authority for policy making on environmental protection in Pakistan.

2.1.1 National Environment Policy, 2005

In March 2005, Government of Pakistan (GoP) presented its National Environmental Policy, which compromises a predominant framework for addressing the environmental issues. Section 5 of the policy obligates for amalgamation of environment into development planning as instrument for succeeding the objectives of National Environmental Policy. It further states in clause (b) of subsection 5.1 that EIA related provisions of Punjab Environmental Protection Act, 1997, will be conscientiously enforced for all development projects. It also provides wide-ranging guidelines to the federal government, provincial governments, federally administered territories and local governments to address their environmental concerns and to ensure effective management of their environmental assets.

2.1.2 National Climate Change Policy, 2012

The National Climate Change Policy was approved by the Federal Cabinet on 26 September 2012[1]. With an overall goal, 'to ensure that climate change is mainstreamed in the economically and socially vulnerable sectors of the economy and to steer Pakistan towards climate resilient development', the Policy puts forward comprehensive policy objectives of sustained economic growth, integration of climate change into inter-related national policies, pro-poor gender sensitive adaptation and cost-effective mitigation, water, food and energy security, disaster risk reduction (DRR), effective decision making and coordination, creating awareness, building capacities, and conservation of natural resources and long term sustainability. It also seeks effective use of financial opportunities, and public and private sector investment in adaptation measures.

2.1.3 National Resettlement Policy, 2002

In March, 2002 Pakistan Environmental Protection Agency (Pak-EPA), GOP has issued its National Resettlement Policy, which explains the basis for compensation, rehabilitation and relocation of the affectees. It also explains the requirements and implementation of Resettlement Action Plan (RAP).

2.2 Legal Framework

GOP has promulgated laws/acts, regulations and standards for the protection, conservation, rehabilitation and improvement of the environment. In addition to this, they have also developed environmental assessment procedures governing development projects. Following are the excerpts of these laws and procedures relevant to the proposed project.

2.2.1 Punjab Environmental Protection Act, 2012 (Amended)

The Act was enacted on December 06, 1997 by repealing the Pakistan Environmental Protection Ordinance, 1983. It provides the framework for implementation of the PNCS, 1992, establishment of provincial sustainable development funds, protection and conservation of species, conservation of renewable resources, establishment of Environmental Tribunals, appointment of Environmental Magistrates, Initial

[1] ministry of climate change.org.pk

Environmental Examinations (IEE), and Environmental Impact Assessments (EIA). Section 12 of the Act stresses the need to carry out EIA/IEE study prior to construction or operation of a project. PEPA, 1997 is available at official website of EPD, Punjab.

After the passing of the 18th Amendment to the Constitution of Pakistan, Pakistan's Federal Ministry of Environment was devolved to the provincial level on June 30, 2011. Thus, a recent amendment in Pakistan Environmental Protection Act, 1997 was presented and published in Punjab Gazette on April 18, 2012 as an Act of Provincial Assembly of Punjab.

Twenty three amendments have been made in the Punjab Environmental Protection (Amendment) Act, 2012. The amendments can be categorized as follows:

- Amendments in Short Title and commencement as Punjab Environmental Protection Act and it extends to the whole of Punjab only;
- Amendments in administrative jurisdiction (Transfer of powers and control from Federal to Provincial Government);
- Definitions and reference to the territorial waters, exclusive economic zone and historic waters shall be omitted based on the devolution of powers from Federal to provincial Levels; and
- Amendments in penalties.

2.2.2 Pakistan Environmental Protection Agency (Review of IEE/EIA) Regulations, 2000

These regulations provide lists of the projects requiring IEE and EIA. They also briefly describe the preparation and review of environmental reports. These regulations are also accessible at official website of EPD, Punjab.

2.2.3 Pakistan Environmental Assessment Procedures, 1997

Pakistan Environmental Assessment Procedures (1997) is, in fact, a compendium, which contains the following sets of statistics and information significant to the proposed project.

a) Policy and Procedures for Filing, Review and Approval of Environmental Assessment Reports

It refers to environmental policy and administrative procedures to be followed for filing of environmental examination/assessment reports by the proponents and their review and authorization by the concerned environmental protection agencies.

b) Guidelines for the Preparation and Review of Environmental Reports

These guidelines are developed to facilitate both the proponents and decision makers to prepare reports (inclusive of all the information contained therein) and carry out their review so as to take cognizant decisions.

2.2.4 National Environmental Quality Standards (NEQS), 2010

Pakistan Environmental Protection Council (PEPC) first approved these standards in 1993. They were later revised in 1995, 2000 and 2010. They endow information on the permissible limits for discharges of municipal and industrial effluent parameters and industrial gaseous emissions in order to regulate environmental pollution. Results of environmental monitoring (ambient air, water and noise) conceded out at different locations in study area are compared with NEQS values and are conversed in later chapter of the report. The NEQS, 2010 are openly available at official website of EPD, Punjab.

2.2.5 Punjab Environmental Quality Standards (PEQS), 2016

In exercise of the powers conferred under clause (c) of sub-section (1) of section 4 of the Punjab Environmental Protection Act, 1997 (XXXIV of 1997), the Environmental Protection Council has approved the Punjab Environmental Quality Standards (PEQS), 2016. They endow information on the permissible limits for discharges of municipal and industrial effluent parameters and industrial gaseous emissions in order to regulate environmental pollution. Results of environmental monitoring (ambient air, water and noise) conceded out at different locations in study area are compared with PEQS values and are conversed in later chapter of the report. The Punjab Environmental Quality Standards (NEQS), 2016 are available at official website of EPD, Punjab.

2.2.6 Other Relevant Laws

a) Punjab Local Government Ordinance, 2001

Environmental protection is federalized subject under Punjab Local Government Ordinance (LGO), 2001. Despite any specific provisions, every local government may execute functions conferred by or under the Punjab LGO, 2001 and in performance of such functions may implement such powers, which are necessary and appropriate. Until different provisions, rules, regulations or byelaws are made, the local governments may exercise such powers as are specified in the Sixth Schedule of Punjab LGO, 2001. Environmental protection is sequential at 48 of the Sixth Schedule.

b) Guidelines for Solid Waste Management (2005)

Guidelines for Solid Waste Management have been issued as a draft by the Pakistan Environmental Protection Agency in coordination with JICA and UNDP. These guidelines explain the waste generation, discharge and composition.

c) Canal and Drainage Act, 1873

This Act entails provisions for the prevention of pollution of natural or man-made water bodies.

d) Sectoral Guidelines (1997)

Pakistan Environmental Assessment procedure deals with general guidelines as well as the sectoral guideline for the Environmental Assessment Studies. The sectoral guidelines have been given for different categories of the projects and deals with the procedure requirements of Environmental Assessment.

e) Pakistan Penal Code, 1860

This states the penalties for violations concerning pollution of air, water bodies and land.

f) The Punjab Wildlife (Protection, Preservation, Conservation & Management) Act, 1974

This Act provides for the protection, preservation, conservation and management of wildlife in the Province of Punjab. This act defines the wildlife sanctuary, game

reserves, protected areas and national parks. It also defines the rules and responsibilities of the relevant authorities and the relevant personnel to protect the ecological resources. It also describes the penalties and punishments on offenses against the sections given in the act.

g) Protection of Trees and Brushwood Act, 1949

This Act prohibits cutting or chopping of trees and brushwood without permission of the Forest Department.

h) Cutting of Trees (Prohibition) Act, 1975

This act forbids cutting of trees without acquiescence of the Forest Department.

i) Disaster Management Act, 2010

The Disaster Management Act, 2010 to offer an effective National Disaster Management System and for matters associated therewith or incidental thereto and to overawed unforeseen situations. The act is administered by federal government which provides guidelines for the provision of disaster management plans, offer necessary technical assistance to the Provincial Governments and Provincial Authorities as well for preparing their disaster management plans in case of any mishap. This Act is valid to the subject project in case of any unseen situation.

j) The Motor Vehicles Rules, 2000

Subject to the provisions of this Act, and the rules and regulations, no person shall operate a motor vehicle from which air pollutants or noise are being emitted in an amount, concentration or level which is in excess of the National Environmental Quality Standards, or where applicable the standards customary under clause (g) of sub-section (I) of section 6.

k) Land Acquisition Act, 1894

This act deals with the procurement of private land for public purposes. There are 55 sections in this act mainly dealing with area notifications, surveys, acquisition, compensation, appointment awards, dispute resolution, penalties and exemptions.

l) Seismic Building Code of Pakistan 2007

This code stipulates the minimum requirements for seismic safety of building and structures and the provisions of the Building Code of Pakistan (Seismic Provisions-2007) shall apply for engineering design of buildings, like structures and related components.

Construction of buildings in defilement of the Building Code shall be considered as violation of professional engineering work specified under clause (XXV) of section 2 of the Act. This Code is applicable to the subject project as it includes the formation of structures.

2.3 Occupational Health & Safety

Construction and operational activities can distress the occupational health of the workers. Quantitative national standards with respect to the above aspect are yet to be developed in Pakistan. However, guidance in qualitative terms can be obtained from the Labor Laws (Amended) Ordinance, 1972 and Pakistan Factories Act (1934).

2.4 ISO 18001 Occupation Health and Safety Assessment Series (OHSAS)

OHSAS 18001 is an Occupation Health and Safety Assessment Series for health and safety management systems to help organizations to control occupational health and safety risks. The OHSAS specifications are applicable to any institute that desires to establish an OH&S management system to eradicate or reduce risk to employees and other interested parties who may be exposed to the risks allied with the project activities. As the subject project is a construction of Industrial Estate at Bahawalpur and involves various health and safety issues to construction labor, therefore these ISO 18001 guidelines will be applicable and pertinent.

2.5 Labor and Health and Safety Legislation

The Constitution of Pakistan contains a range of provisions with regards to labor rights, in particular:

- Article 11 of the Constitution prohibits all forms of slavery, forced labor and child labor;

- Article 17 provides for a fundamental right to exercise the freedom of association and the right to form unions;
- Article 25 lays down the right to equality before the law and prohibition of discrimination on the grounds of sex alone; and
- Article 37(e) makes provision for securing just and humane conditions of work, ensuring that children and women are not employed in vocations unsuited to their age or sex, and for maternity benefits for women in employment.

Labor law is controlled at both provincial and national levels with compulsory employment agreements containing the terms set out by the labor laws. There are various laws containing health and safety requirements including: Mines Act 1923; Factories Act 1934; Factories Rules; Hazardous Occupations Rules 1963; Provincial Employees Social Security Ordinance 1965; and Workmen's Compensation Act 1923. No single comprehensive piece of legislation deals with occupational or community safety and health.

2.6 Toxic or Hazardous Waste

Protection of the environment with regards to toxic and hazardous waste is covered by the Pakistan Penal Code (PPC), 1860. Environment Protection Department (EPD), Punjab, is mandated to monitor the transportation of hazardous materials within the Provincial limits.

2.7 Preservation of Cultural Heritage

The Antiquities Act, 1975, administered by the Provincial Government, is aimed at safeguarding the preservation of cultural heritage, destruction, damage or defacement of antiquities is an offence under the act.

2.8 Administrative Framework

2.8.1 Punjab Industrial Estates Development & Management Company (PIEDMC)

The implementing agency of the proposed project is PIEDMC who will execute the proposed project at Bahawalpur. The management of PIEDMC will ensure that all the proposed measures are effectively implemented at the operational stages.

2.8.2 Environmental Protection Agency, Punjab

Pakistan Environmental Protection Council is the apex inter-ministerial and multi-stakeholders decision-making body, which is headed by Prime Minister. While Pakistan Environmental Protection Agency is meant for the enforcement of environmental laws in Pakistan. They have delegated powers to provincial environmental protection agencies for review, approval and monitoring of environmental examination/assessment of projects. As regards the proposed Project, EPA Punjab will be responsible for issuing environmental approval and overall/broad based monitoring of the proposed Project activities.

2.8.3 Rules of Business for District Environment Office under Punjab LGO, 2001

National Reconstruction Bureau has formulated the following rules of business for District environment offices:

- To regulate motor vehicles subject to the provisions of the Pakistan Environmental Protection Act, 1997 and the rules and regulations made there-under;
- To ensure, guide and assist the proponents of new projects in submission of Initial Environmental Examination (IEE)/ Environmental Impact Assessment (EIA) to Director General, EPA for approval;
- To ensure implementation of environmental protection and preservation measures in all development projects at the District level and to sensitize government agencies on environmental issues;
- To identify the needs for legislation in various sectors of the environmental matters;
- To provide information and guidance to the public on environment;
- To encourage the formation and working of non-governmental organizations, to prevent and combat pollution and promote sustainable development; and
- To undertake regular monitoring of projects and to submit progress reports to Director General, EPA for publication in the annual report.

SECTION 3
PROJECT DESCRIPTION

3.1 Rationale of the Project

The Punjab Government has established Punjab Industrial Estates Development and Management Company (PIEDMC) to achieve orderly, planned and rapid industrialization in Punjab by developing new industrial estates and managing the existing industrial estates in a dynamic and innovative manner with a view to provide turnkey solutions to the prospective entrepreneur's thereby generating economic activity and creating mass employment opportunities. The PIEDMC intends to establish "Bahawalpur Industrial Estate" on an area of 483 acres in District Bahawalpur.

The project will be promoting exports of value added manufactured items from different sectors. The project is likely to attract foreign as well as local manufacturers to invest in industrial sector of Pakistan and increase exports of value added products. It will also help in the economic uplift of the southern Punjab.

3.2 Type and Category of the Project

According to the Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations 2000 (see **Annexure-II**), the proposed project falls under category B (Manufacturing & Processing) of Schedule II, which requires an EIA before commencement of construction.

3.3 Project Objectives

The main objectives of this project are:

- Structural platform to set up industries with availability of developed plots and infrastructure;
- Provision of support services at one location;
- Availability of skilled manpower;
- To provide secure environment; and
- To facilitate compliance with Environmental Regulation

3.4 Project Alternatives

Based on the conceptual Master Plan for Bahawalpur Industrial Estate, four (04) alternatives have been prepared keeping in view the planning principles, sustainability concepts and on ideology of best utilization of available land.

3.4.1 Alternative-I

a) Landuse Distribution

Total land of the project area has been divided into different zones/land uses. **Table 3.1(a)** presents the land distribution for different zones in the project area.

Table 3.1(a): Landuse Distribution

Sr. No.	Land use	Area (Acres)	Percentage
1	Industrial	288.38	65.88
2	Commercial	22.90	05.23
3	Amenities	34.80	0 7.94
4	Roads (198, 180, 80’ & 60’ ROW)	91.72	20.95
	Total	**437.80**	**100**

b) Industrial Plots Composition

Two plot sizes have been planned i.e. 1 acre and 0.5 acres. **Table 3.1(b)** presents the dimensions and numbers of different sizes of plots.

Table 3.1(b): Industrial Plots Composition

Sr. No.	Size of Plots	Dimensions	Nos.
1	1.0 Acre	145.2’ x 300’	238
2	0.5 Acre	109’ x 200’	61
		Total	**299**

c) Detail of Amenities and their Plot Areas

Provision has been made for the commercial and social amenities in the proposed industrial estate. **Table 3.1(c)** shows the detail of social amenities.

Table 3.1(c): Amenity Plots

Sr. No.	Amenity	Area (Acres)
1	Medical Center/ 1122 Center	1.50
2	Jamia Masjid	2.00
3	Site Office	0.50
4	Vocational Training Center	2.30
5	Grid Station	5.30
6	CETP/ Disposal Station/ Landfill Site	4.20
7	Truck Stand	4.80
8	Parks and Sports Facilities	14.20
	Total	**34.80**

Figure 3.1(a) shows the conceptual master plan of Alternate-I.

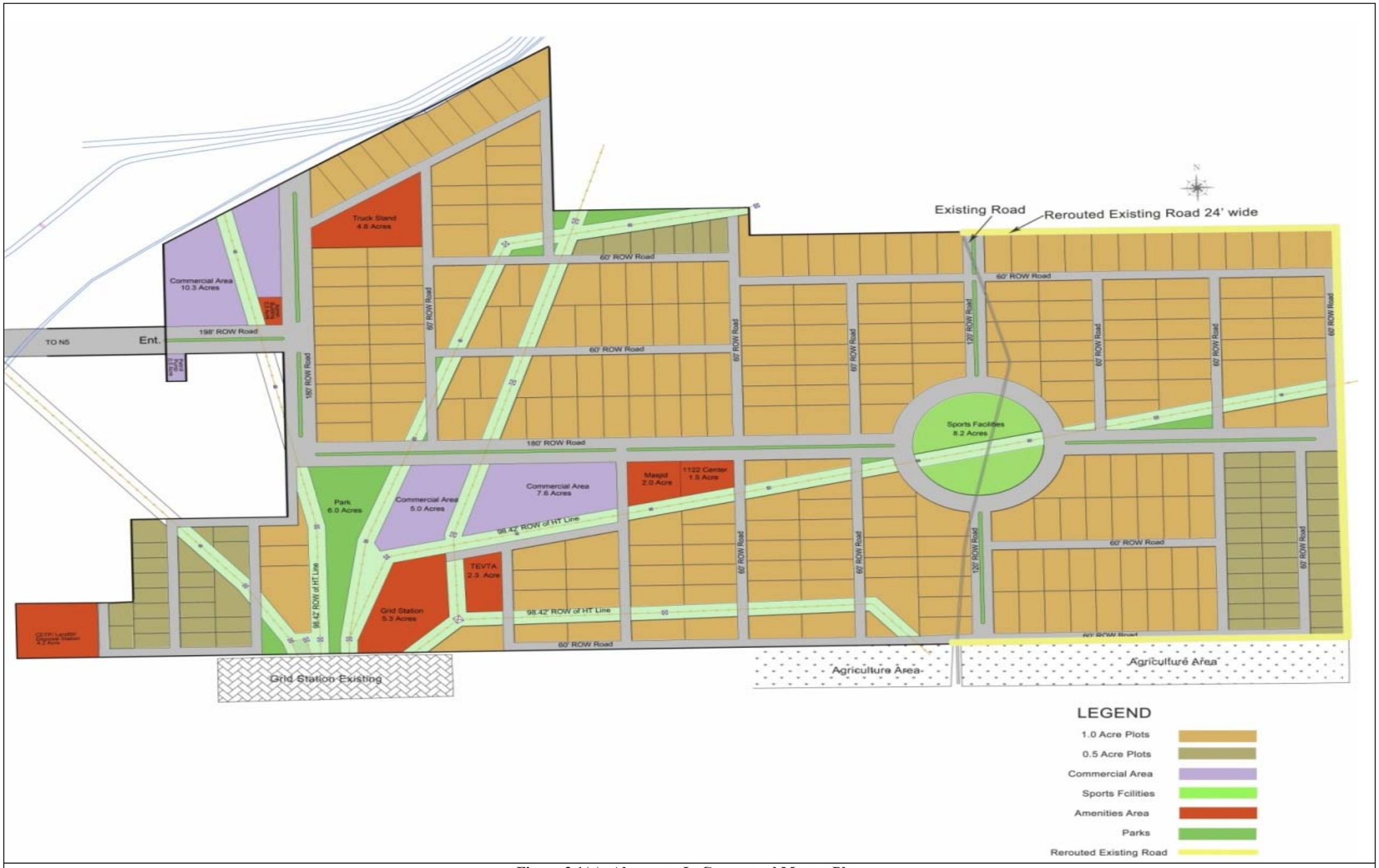


Figure 3.1(a): Alternate -I , Conceptual Master Plan

3.4.2 Alternate-II

a) Landuse Distribution

Total land of the project area has been divided into different zones/land uses. **Table 3.2 (a)** presents the land distribution for different zones in the project area.

Table 3.2 (a): Landuse Distribution

Sr. No.	Land use	Area (Acres)	Percentage
1	Industrial	297.62	67.98
2	Commercial	15.50	3.54
3	Amenities	38.10	8.70
4	Roads (198', 180', 80' & 60' ROW)	86.58	19.78
	Total	**437.80**	**100.00**

b) Industrial Plots Composition

Two plot sizes have been planned i.e. 1 acre and 0.5 acres. **Table 3.2 (b)** presents the dimensions and numbers of different sizes of plots.

Table 3.2 (b): Industrial Plots Composition

Sr. No.	Size of Plots	Dimensions	Nos.
1	1.0 Acre	145.2' x 300'	260
2	0.5 Acre	109' x 200'	48
		Total	**308**

c) Detail of Amenities and their Plot Areas

Provision has been made for the commercial and social amenities in the proposed industrial estate. **Table 3.2 (c)** shows the detail of social amenities.

Table 3.2 (c): Amenity Plots

Sr. No.	Amenity	Area (Acres)
1	Medical Center/ 1122 Center	2.00
2	Jamia Masjid	3.00

3	Site Office	0.50
4	Vocational Training Center	2.40
5	Grid Station	5.30
6	CETP/ Disposal Station	4.20
7	Truck Stand	5.20
8	Parks& Sports Facilities	15.50
	Total	**38.10**

Figure 3.1 (b) shows the conceptual master plan of Alternate-II.

3.4.3 Alternate-III

a) Landuse Distribution

Total land of the project area has been divided into different zones/land uses. **Table 3.3(a)** presents the land distribution for different zones in the project area.

Table 3.3(a): Landuse Distribution

Sr. No.	Land use	Area (Acres)	Percentage
1	Industrial	282.47	64.52
2	Commercial	21.50	4.91
3	Amenities	37.03	8.46
4	Roads (198, 120', 80' & 60' ROW)	96.80	22.11
	Total	**437.80**	**100.00**

b) Industrial Plots Composition

Two plot sizes have been planned i.e. 1 acre and 0.5 acres. **Table 3.3 (b)** presents the dimensions and numbers of different sizes of plots.

Figure 3.1 (b): Alternate -II , Conceptual Master Plan

Table 3.3(b): Industrial Plots Composition

Sr. No.	Size of Plots	Dimensions	Nos.
1	1.0 Acre	145.2’ x 300’	237
2	0.5 Acre	109’ x 200’	50
		Total	287

c) Detail of Amenities and their Plot Areas

Provision has been made for the commercial and social amenities in the proposed industrial estate. **Table 3.3(c)** shows the detail of social amenities.

Table 3.3(c): Amenity Plots

Sr. No.	Amenity	Area (Acres)
1	Medical Center/ 1122 Center	1.00
2	Jamia Masjid	3.00
3	Site Office	0.50
4	Vocational Training Center	2.63
5	Grid Station	5.30
6	CETP/ Disposal Station	4.20
7	Truck Stand	5.00
8	Parks	15.40
	Total	**37.03**

Figure 3.1(c) shows the conceptual master plan of Alternate-III.

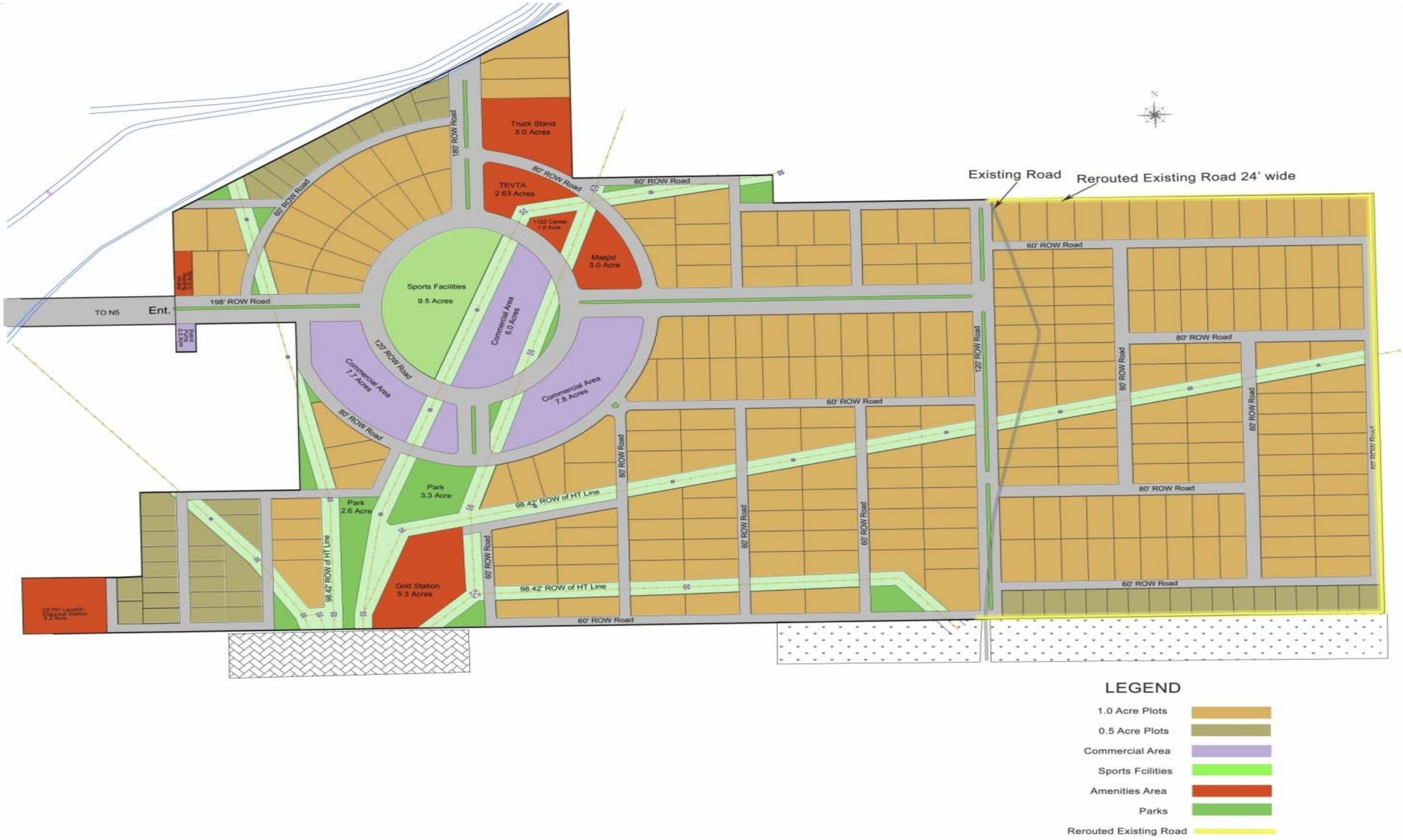


Figure 3.1(c): Alternate -III , Conceptual Master Plan

3.4.4 Alternate-IV

a) Landuse Distribution

Total land of the project area has been divided into different zones/land uses. **Table 3.4(a)** presents the land distribution for different zones in the project area.

Table 3.4(a): Landuse Distribution

Sr. No.	Land use	Area (Acres)	Percentage
1	Industrial	294.20	67.21
2	Commercial	20.00	4.57
3	Amenities	32.20	7.35
4	Roads (198, 120'& 60' ROW)	91.40	20.87
	Total	**437.80**	**100.00**

b) Industrial Plots Composition

Two plot sizes have been planned i.e. 1 acre and 0.5 acres. **Table 3.4(b)** presents the dimensions and numbers of different sizes of plots.

Table 3.4(b): Industrial Plots Composition

Sr. No.	Size of Plots	Dimensions	Nos.
1	1.0 Acre	145.2' x 300'	255
2	0.5 Acre	109'x 200'	46
		Total	301

c) Detail of Amenities and their Plot Areas

Provision has been made for the commercial and social amenities in the proposed industrial estate. **Table 3.4(c)** shows the detail of social amenities.

Table 3.4(c): Amenity Plots

Sr. No.	Amenity	Area (Acres)
1	Medical Center/ 1122 Center	1.20
2	Jamia Masjid	2.80
3	Site Office	0.50
4	Vocational Training Center	2.80

Sr. No.	Amenity	Area (Acres)
5	Grid Station	5.00
6	CETP/ Disposal Station	4.20
7	Truck Stand	4.00
8	Parks	11.70
	Total	**32.20**

Figure 3.1(d) shows the conceptual master plan of Alternate-IV.

3.4.5 Comparison of Master Plan Alternates 1, 2, 3 & 4

Table 3.5 shows the comparison of different master plan alternates.

Table 3.5: Comparison of Different Master Plan Alternates

Sr. No.	Alternate-1	Alternate-2	Alternate-3	Alternate-4
Landuse				
1	Industrial Area is **65.88%**	Industrial Area is **67.98%**	Industrial Area is **64.52%**	Industrial Area is **67.21%**
2	Commercial area is **5.23%**	Commercial area is **3.54%**	Commercial area is **4.91%**	Commercial area is **4.57%**
3	Area reserved for amenities is **7.94%**	Area reserved for amenities is **8.70%**	Area reserved for amenities is **8.46%**	Area reserved for amenities is **7.35%**
4	Area under roads is **20.95%**	Area under roads is **19.78%**	Area under roads is **22.11%**	Area under roads is **20.87%**
Number of Industrial Plots				
5	Number of Plots measuring 1.0 Acre are **238**	Number of Plots measuring 1.0 Acre are **260**	Number of Plots measuring 1.0 Acre are **237**	Number of Plots measuring 1.0 Acre are **255**
6	Number of Plots measuring 0.5 Acre are **61**	Number of Plots measuring 0.5 Acre are **48**	Number of Plots measuring 0.5 Acre are **50**	Number of Plots measuring 0.5 Acre are **46**
Roads Pattern				
7	Grid iron pattern with circular Sports Facilities in the center of industrial estate	Grid iron pattern with circular Park in the front of Main Entrance	Mix of Grid iron and Circular Roads with semicircular public buildings, sports facilities and commercial areas	Grid iron pattern with circular Park

Figure 3.1(d): Alternate -IV , Conceptual Master Plan

PIEDMC in a meeting of BOD PIEDMC held in its city Office Lahore dated December 07, 2017 accorded approval for Alternate-4 of Conceptual Master Plan of Bahawalpur Industrial Estate and advised that some 60' ROW roads may be replaced with 80' ROW roads. The same is duly incorporated in the Approved Master Plan of the Bahawalpur Industrial Estate as shown in **Figure 3.2.**

3.5 Selected Option (Approved Master Plan)

a) Landuse Distribution

Total land of the project area has been divided into different zones/land uses. **Table 3.6(a)** presents the land distribution for different zones in the project area.

Table 3.6 (a): Landuse Distribution (Selected Option)

Sr. No.	Land use	Area (Acres)	Percentage
1	Industrial	294.49	67.26
2	Commercial	19.43	4.44
3	Amenities	27.58	6.30
4	Roads (198, 120', 80' & 60' ROW)	96.30	22.00
	Total	**437.80**	**100.00**

b) Industrial Plots Composition

Two plot sizes have been planned i.e. 1 acre and 0.5 acres. **Table 3.6(b)** presents the dimensions and numbers of different sizes of plots.

Table 3.6 (b): Industrial Plots Composition (Selected Option)

Sr. No.	Size of Plots	Dimensions	Nos.
1	1.0 Acre	145.2' x 300'	262
2	0.5 Acre	109'x 200'	47
		Total	**309**

c) Detail of Amenities and their Plot Areas

Provision has been made for the commercial and social amenities in the proposed industrial estate. **Table 3.6(c)** shows the detail of social amenities.

Table 3.6 (c): Amenity Plots (Selected Option)

Sr. No.	Amenity	Area (Acres)
1	Medical Center/ 1122 Center	1.03
2	Jamia Masjid	1.16
3	Site Office	0.82
4	Vocational Training Center	1.18
5	Grid Station	4.07
6	CETP/ Disposal Station	4.22
7	Truck Stand	3.62
8	Overhead Water Tank	0.64
9	Parks	10.84
	Total	**27.58**

Figure 3.2 shows the conceptual master plan of the selected option.

Figure 3.2: Selected Option, Approved Master Plan

3.6 Type of Industries- Zoning Plan

Different types of industries are planned in different plots of the proposed industrial estate. **Table 3.7** summarizes the types of industries for proposed industrial estate. Zoning plan for type of industries is given as **Figure 3.3.**

Table 3.7: Type of Industries

Block No.	Type of Industry	Size of Plots	Nos.	Area (Acres)	%age
A	Food	1.0 Acre	24	25.96	10.04
		0.5 Acre	7	3.62	
		Total (A)	**31**	**29.58**	
B	Oil	1.0 Acre	72	73.51	24.96
C	Ice Factory	1.0 Acre	20	20.47	6.95
D	Cotton	1.0 Acre	31	31.33	10.64
E	Flour & Rice	1.0 Acre	61	61.59	20.90
F	Pesticides, Agri & Chemical	1.0 Acre	29	30.27	12.73
		0.5 Acre	14	7.20	
		Total (F)	**43**	**37.47**	
G	Miscellaneous Industries	1.0 Acre	25	26.12	13.78
		0.5 Acre	26	14.42	
		Total (G)	**51**	**40.54**	
Total			**309**	**294.49**	**100**

Figure 3.3: Zoning Plan for Type of Industries

3.7 Project Description

3.7.1 Project Location

The proposed site spread over an area of 483 acres for BIE is located at a distance of 12 km south west of Bahawalpur City with geographical coordinates of 29019'19.06"N and 71035'9.97"E. National Highway N5 is passing in the North West of the project site, at a distance of 1.6 km. Project location is shown below in **Figure 3.4**.

3.7.2 Access Road

The proposed project site can be accessed through National Highway (N-5) from Bahawalpur to Ahmadpur East Section at a distance of 12 km after crossing Bahawalpur City. The site is located on eastern side of National Highway (N5) at a distance of 1.6 km and can be approached from Dera Masti stop on Ahmad Pur East Canal on the main Highway.

3.7.3 Land use Pattern

Land use of the proposed project site is barren with sand dunes and some residential structures located in Agha Pur (near existing Grid Station). The surrounding land use consists of agricultural land and settlements. There is a Grid Station along the south-west boundary of proposed Project site terminating six (06) 132 kV & 220 kV Transmission Line which are passing through the Project site. **Plate 3.1 is** showing the current land use pattern of the project area.

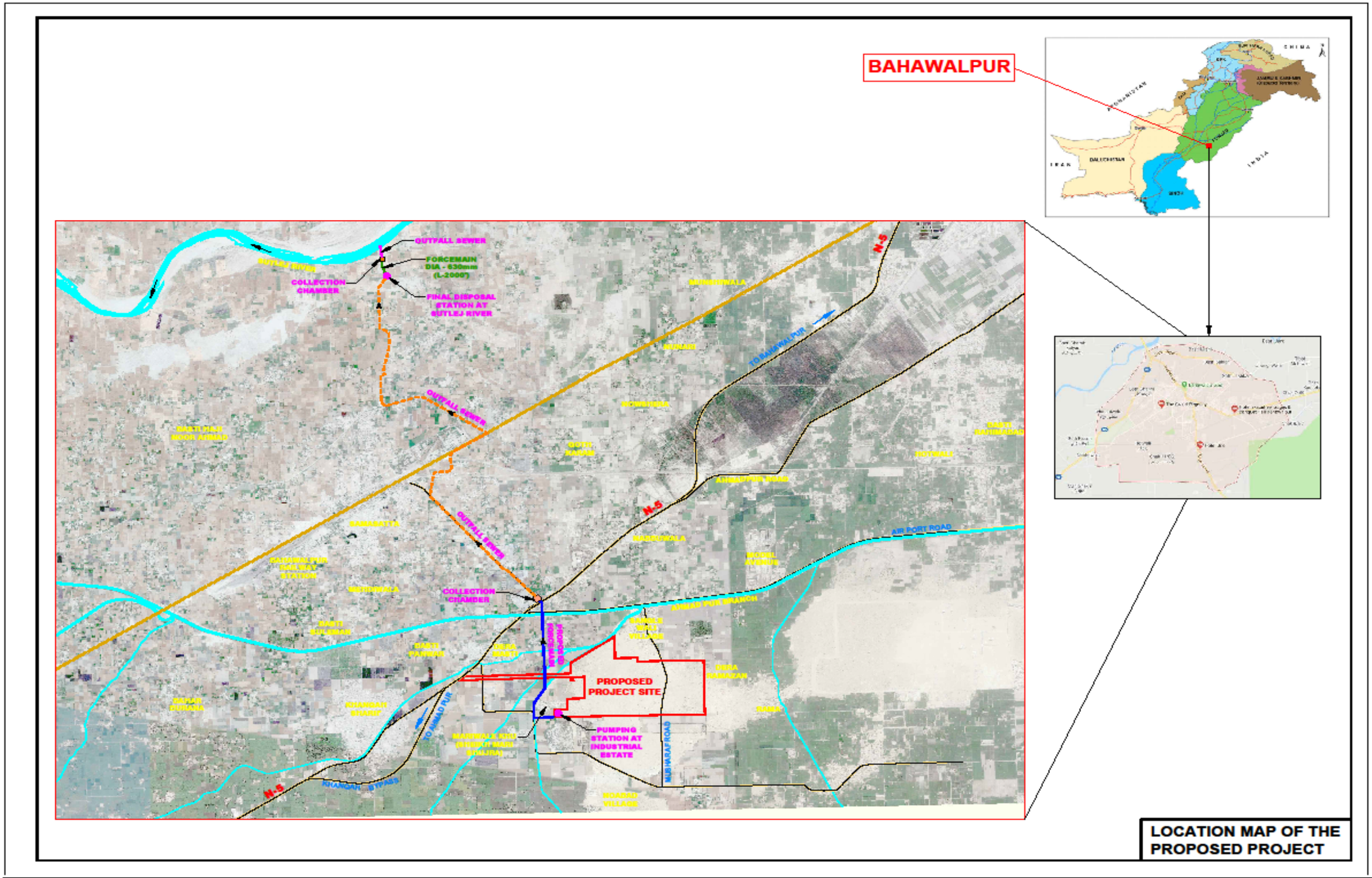


Figure 3.4: Location Map of the Project Area

Plate 3.1: Current Land Use of the Project Area

3.7.4 Vegetation Features of the Project Site

The project is surrounded by agricultural land and trees. Amongst trees the most important are Kikar (Acacia Nilotica), Frash (Tamasix Aphylla), Pillu (Salvadora Oleoides), Jand (Prosopis Spicigera), Bhos (Calliginus Polygonic Des), Khar, Grasses, Shrubs, Herbs etc. are present in the area.

3.7.5 Components of the Project

The Project envisages the development of a State of the Art Industrial Estate at Bahawalpur on a Land Area measuring 483 Acres.

Features of the proposed Industrial Estate are:

- Industrial Plots 1.0 Acre
- Amenities include:

- Medical Center/ Emergency 1122 Station
- Parks, Sports Facilities
- Commercial Area
- Vocational Training Center
- Truck Stand
- Petrol Pump
- Jamia Masjid
- Grid Station
- PIEDMC Office
- CETP/ Landfill Site/ Disposal Station
- Pumping station include
  - Wet Well (01) 30" Dia
  - No. of Pumps (04), 03 working for which one is 10 cusecs and two are 0.5 cusecs capacity.
- Force main (7400ft or 2300m length with Dia 8") on 0.82 Acer
- Pumping Station at N5
- Gravity Sewer (27300ft length with Dia 42" RCC)
- Collection chamber at Sutlej river

3.7.6 Sewerage and Disposal System

Safe collection and disposal of industrial and commercial wastewater are vital infrastructure components of the Bahawalpur Industrial Estate (BIE). The primary purpose of providing wastewater collection system is to efficiently and safely collects contaminated water, thereby preventing disease transmission and nuisance, and transmits it to treatment works and final disposal point without loss or contamination of the surrounding environment.

Wastewater Flows

Based on the estimated water demand of BIE, average wastewater flows are calculated and given in the **Table 3.8**.

Table 3.8: Estimated Average Wastewater Flows to be Generated from the Bahawalpur Industrial Estate

Sr. No.	Description	Area	Water demand	Average Wastewater Generation (80% of Water Demand)	
		(Acre)	(Cusec)	(Cusec)	(m^3/s)
1	Industrial Area	294.5	7.26	5.80	0.164
2	Commercial Area	19.43	0.11	0.088	0.0025
3	Amenities	16.6	0.07	0.056	0.0016
4	Parks	11.48	0.38	0.304	0.0086
5	**Total**	**342**	**7.82**	**6.248**	**0.1767**

Topographic survey of the project area reveals that level difference is in the range of 364 ft to 415 ft with natural slope from North-East to South West. Highway engineers of NESPAK designed the slopes of the road network from North-East to South West so that wastewater and storm water can be collected under gravity through sub-mains and laterals which will add-up to trunk sewers.

Wastewater Collection Systems

After considering merits and de-merits of different types of wastewater collection systems, a separate system has been proposed for the collection of wastewater and storm water.

Keeping in view the economy and limited budget available with the client, it is proposed that storm water collection system will be designed as a part of this project, however its construction may be taken up in next phase upon colonization of the industrial area. Till that period, a part of storm water on roads will be catered through wastewater pipes (partially combined system) and infiltration in empty industrial plots. Therefore, the wastewater collection system will work as partially combined system till construction of storm water drains.

Components of Wastewater Collection Systems

Following are the main components of a proposed wastewater collection system:

- Interception Works
- Conveyance Network
- Inspection Chambers/Manholes
- Disposal Station
- Outfall Sewer and Receiving Water Body

Separate wastewater collection system is proposed for the industrial estate spreading over net area of 437.8 acres. Wastewater will be collected by lateral sewers proposed on both sides of roads covering every single plot of project area as shown in the **Figure 3.5**. These lateral sewers will join trunk sewer and convey the wastewater to pumping station proposed at Industrial Estate (**Figure 3.6**).

Options for Disposal of Wastewater

Three (03) options have been considered for the disposal of wastewater generated within the industrial estate.

1. Option - I: Disposal of wastewater from the entire Industrial Estate directly into River Sutlej through force mains.
2. Option - II: Pumping of wastewater from Bahawalpur Industrial Estate and its disposal into Outfall Sewer for ultimate disposal into River Sutlej through final effluent disposal station near the river.
3. Option-III: No pumping station within the industrial estate and deep gravity sewer up to river and final disposal station near river.

Considering technical & financial evaluation, **option-II** i.e. Pumping of wastewater from Bahawalpur Industrial Estate and its disposal into Outfall Sewer for ultimate disposal into River Sutlej through final effluent disposal station near the river has been recommended for disposal system of BIE.

Figure 3.5: Layout Plan of Wastewater System at Bahawalpur Industrial Estate

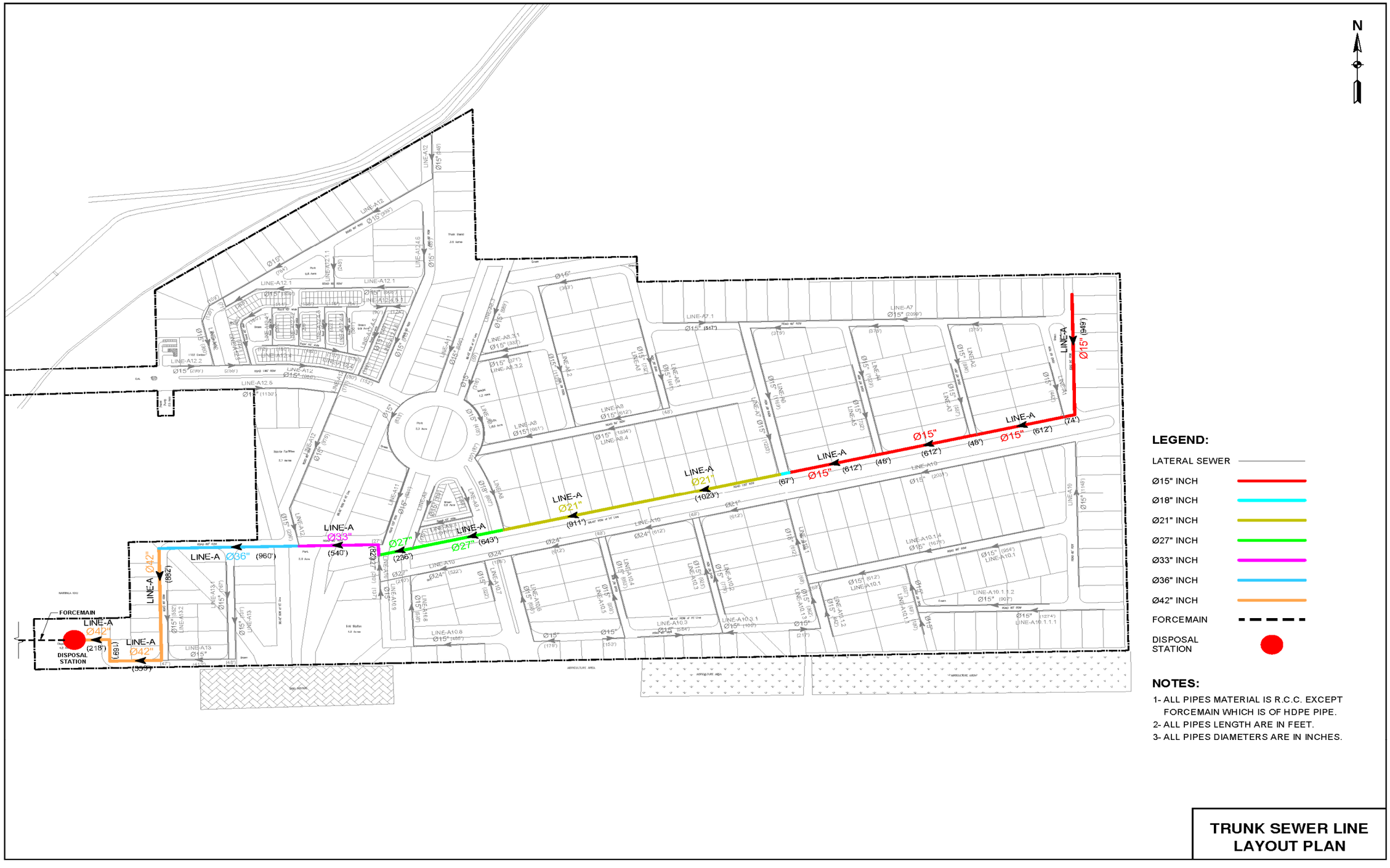


Figure 3.6: Trunk Sewer Layout Plan

All the wastewater from the pumping station within the industrial estate will be pumped through forcemain of 32''diameter and 7,400 ft in length to outfall sewer starting from N-5. Outfall sewer of 42'' diameter and 27,300 ft in length will convey the treated effluent to final disposal station proposed near bank of River Sutlej. Wastewater from this disposal station will be pumped through forcemain of 24'' diameter and 2,000 ft in length to Sutlej River. Layout plan and cross section of these disposal stations are shown in **Figure 3.7** & **Figure 3.8** below.

Figure 3.9 depicts the conceptual plan of proposed collection and disposal system of Bahawalpur Industrial Estate.

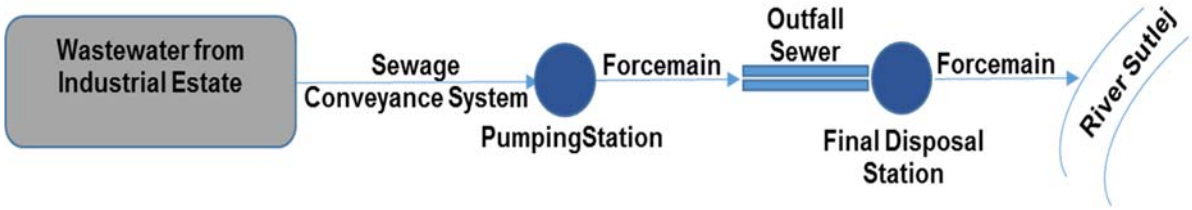


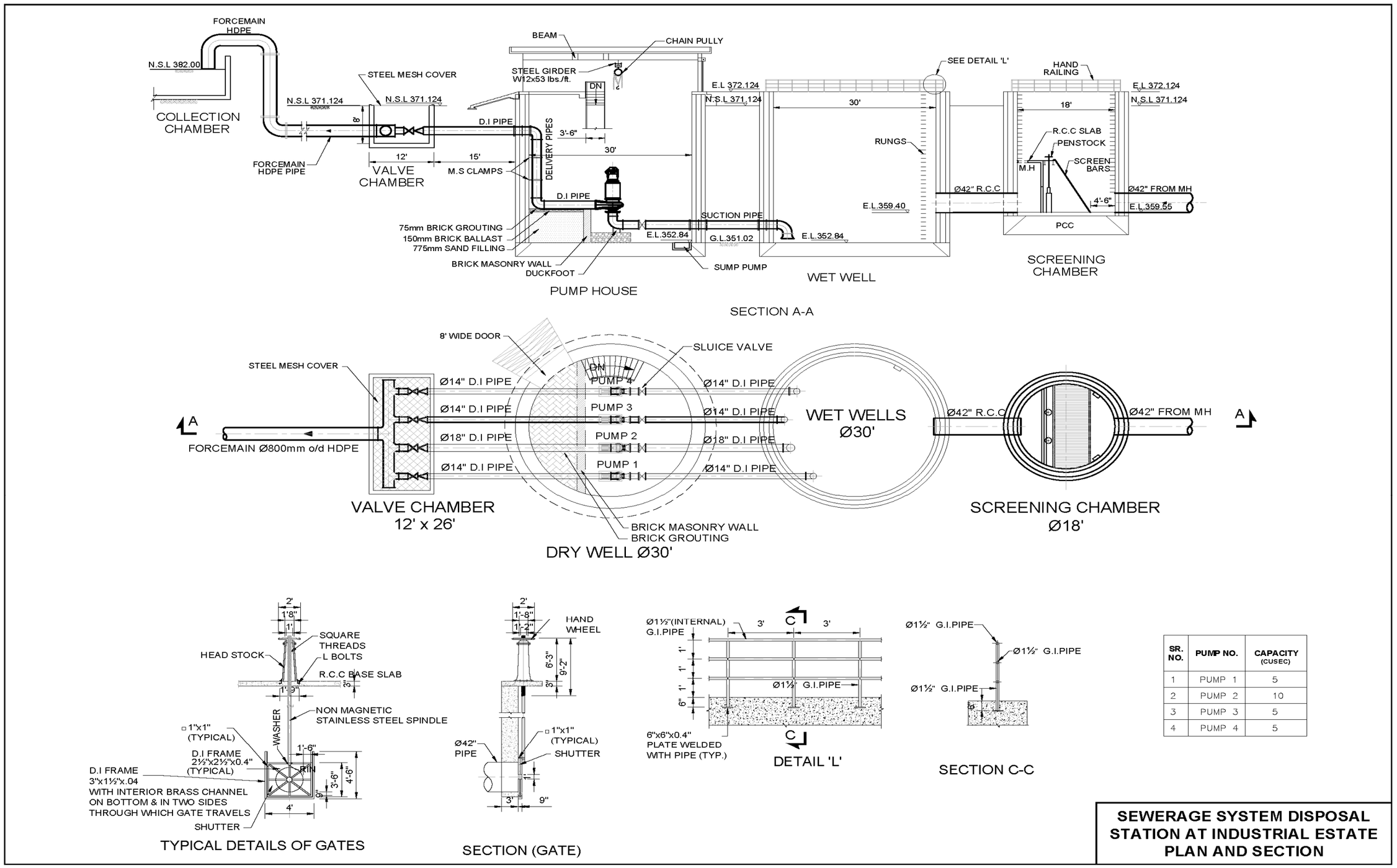
Figure 3.9: Conceptual Plan of Proposed Collection and Disposal System

3.7.7 Storm Water Drainage System

The topography of the project area is uneven therefore, whole area is liable to ponding of rain water at several areas. In order to avoid this situation, a separate storm water drainage system has been proposed. Storm water allowance has also been taken in sewerage system according to the PDSSP criteria. Hence in the design of storm water collection system the flow is calculated by excluding the storm water allowance already taken in wastewater collection system.

Components of Storm Water Drainage System

- Interception works comprises
  - Inlets to collect runoff and discharge it to storm water drainage system;
  - Gratings of required length at the inlets to avoid entry of sediment load in rain water;



SR. NO.	PUMP NO.	CAPACITY (CUSEC)
1	PUMP 1	5
2	PUMP 2	10
3	PUMP 3	5
4	PUMP 4	5

SEWERAGE SYSTEM DISPOSAL STATION AT INDUSTRIAL ESTATE PLAN AND SECTION

Figure 3.7: Layout Plan and Cross of Disposal Station (DS-I)

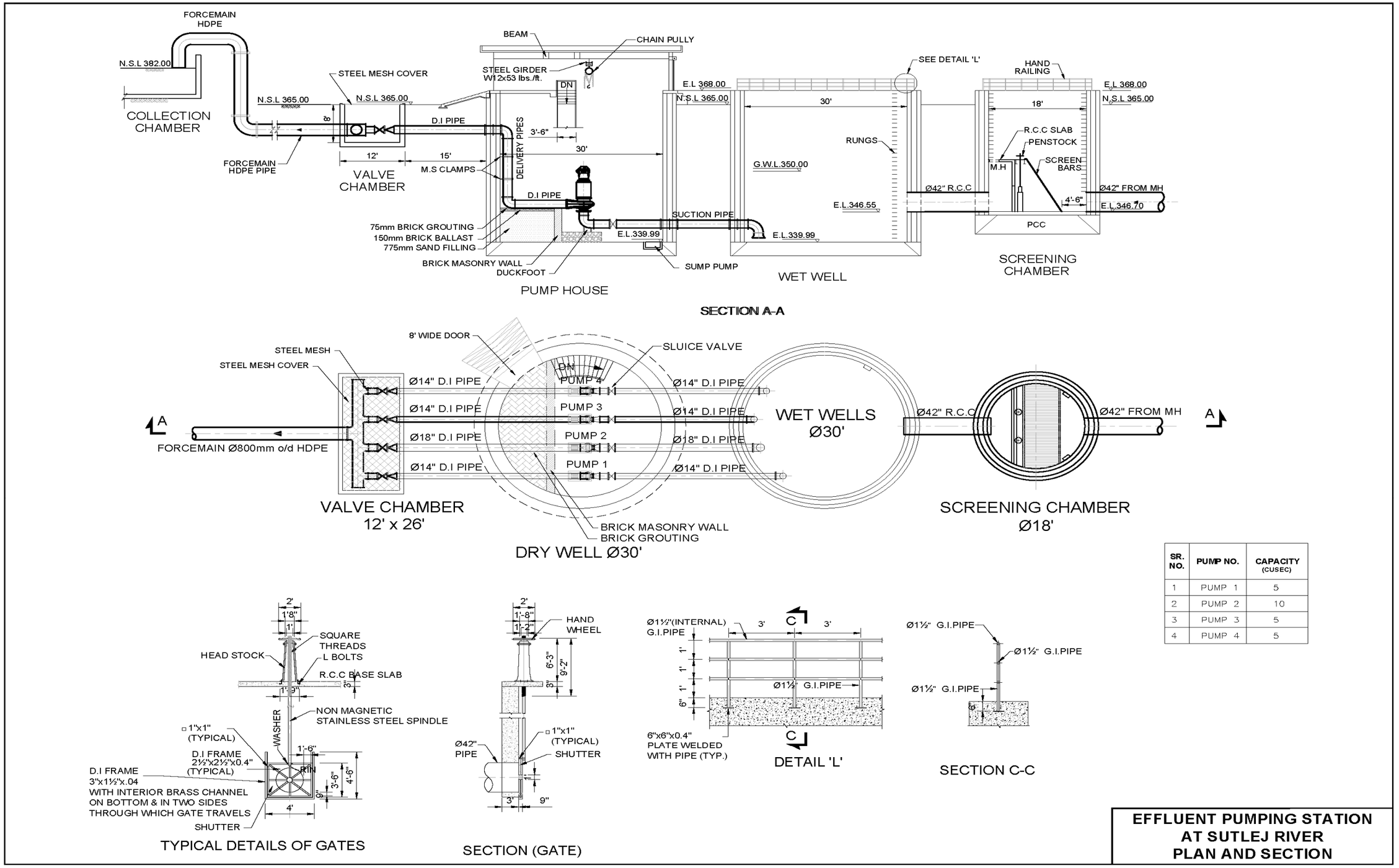


Figure 3.8: Layout Plan and Cross Section of Final Disposal Station

- Conveyance Network includes lateral drains/sewers, sub-main, main/trunk lines and conduits. The drains/sewers are sloped towards disposal station;
- Culverts;
- Disposal Station contains screening chamber, collection wells, dry wells and pumps with suction and delivery pipe lines; and
- Force main.

Selection of Appropriate Option for Storm Water Collection and Disposal

After technical and financial comparison of different types of storm water collection systems, pipe drainage system has been recommended as the most feasible option.

Drains/pipes have been provided on both sides of the roads. Main/trunk line is passing along the central road ROW 120' of the Industrial Estate. The lateral pipe/drains will discharge their flow into trunk line. This trunk will carry the collected storm water into the disposal station. In disposal station, pumps will dispose of the water into final disposal point through force main. Different options for the route of force main have also been evaluated and most feasible option has been recommended.

The flow direction of drainage for project area is shown in **Figure 3.9** while the catchment areas are shown in **Figure 3.10**.

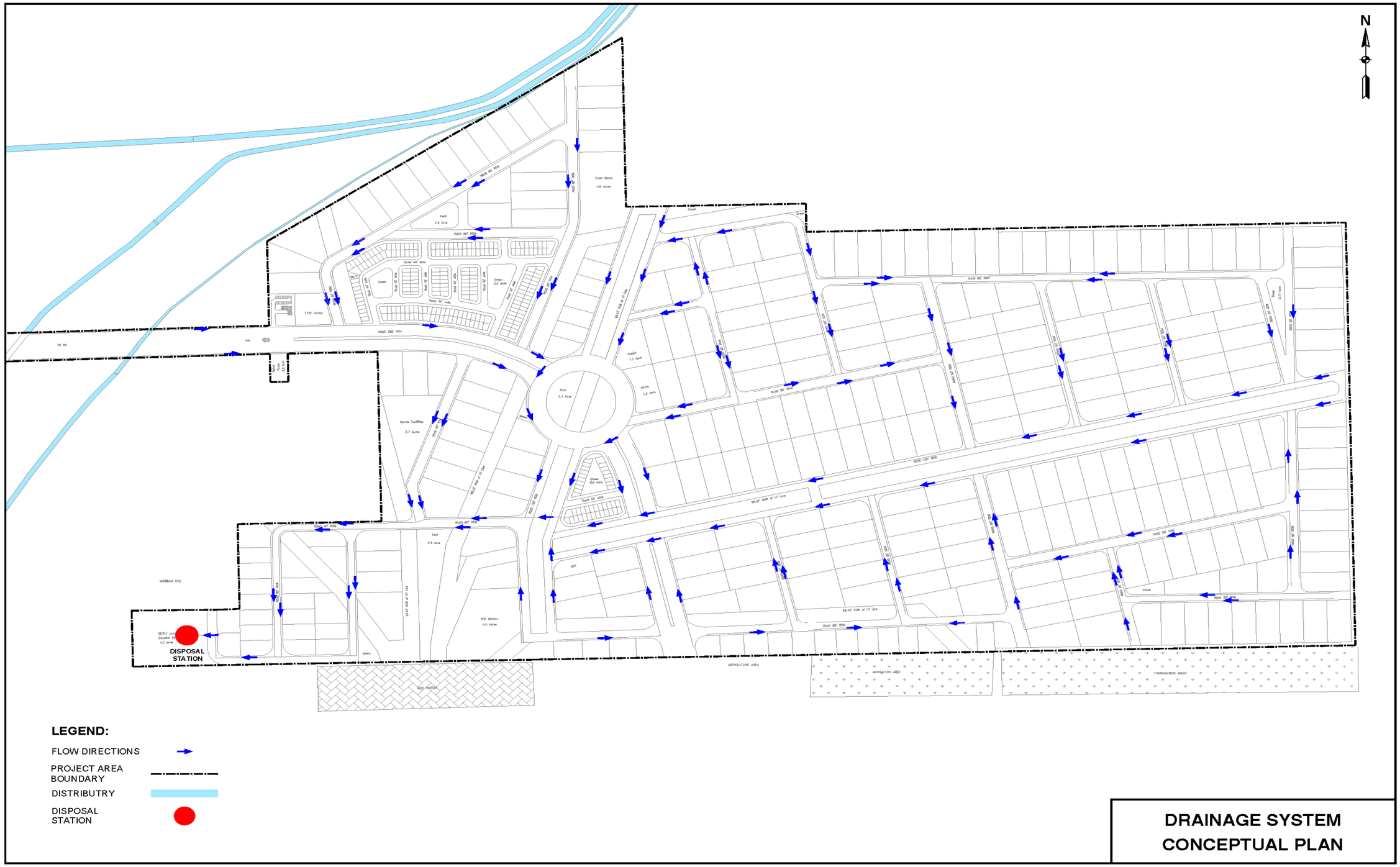


Figure 3.9: Flow Direction of Drainage System

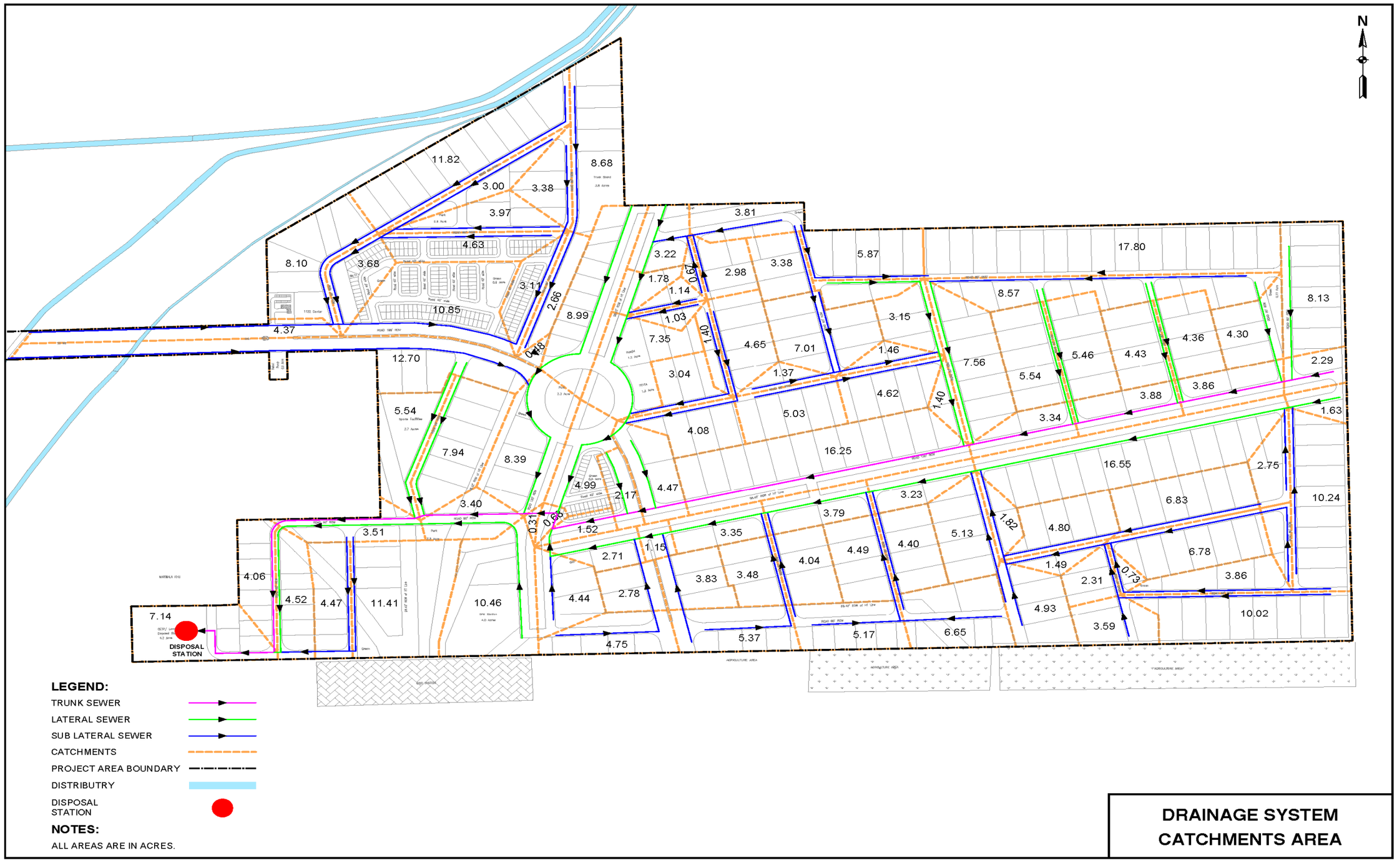


Figure 3.10: Catchment Areas of Bahawalpur Industrial Estate

3.8 Project Administrative Jurisdiction

The proposed project lies in the city of Bahawalpur in District Bahawalpur. The district is under the general charge of Deputy Commissioner (DC).

3.9 Project Implementation Schedule

The project is expected to be completed in 24 months.

3.10 Land Acquisition

The project will be constructed on the land already being owned by the PIEDMC.

3.11 Cost of the Project

The total project investment costs are estimated to be Rs. Four (04) Billion.

3.12 Workforce Requirements during Construction Phase

The man power requirement is estimated 500 workers during construction phase and 15000 workers during operation phase of the industrial estate.

3.13 Water Requirement during Construction and Operation Phase

During the construction phase, estimated average water demand for various project activities is one (01) cusecs. During the operation phase, the water in BIE will be supplied by installing twelve (12) number of tube wells / pumps each of 1.0 cusec capacity and four (4) Overhead Reservoirs (OHRs) each of 100,000 gallons capacity. The estimated water demand for BIE during the operation phase is given in the **Table 3.9**.

Table 3.9: Summary of Estimated Water Demand for Bahawalpur Industrial Estate

Sr. No.	Description	Area (acre)	Water demand	Unit
1	Industrial Area	294.49	3,463,051	Gallons/day
2	Worker/ Employees	-do-	441,735	Gallons/day
3	Amenities and Commercial Area	132.47	93,790	Gallons/day
4	Horticulture Area	10.84	206,695	Gallons/day
5	**Total Water Demand for BIE**	**437.80**	**4,205,271**	**Gallons/day**
			4.21	**Million Gallons/day**

3.14 Fire Demands

The optimum water demand for firefighting is 1.44 MGD calculated by National Guidance Document on the Provision of Water for Fire Fighting (U.K). The locations of Fire Hydrants are given in the **Figure 3.11**.

3.15 Power Requirements

The electrical load has been estimated to be 77.10 MW. To meet these requirements an independent (132/11.5 kV) Grid Station will be established and will be connected to national grid.

3.16 Wastewater / Surface Water

The wastewater/ storm water of the proposed industrial estate is planned to be disposed of in River Sutlej through Pumping station without treatment, however it is planned that waste water treatment plant will be installed later on for the industrial estate. The estimated average wastewater produced during construction and operation phases is 0.8 cusecs and 6.2 cusecs respectively.

3.17 Solid Waste

Estimated municipal waste generation during construction phase will be 200[1] kg/day and during operation phase it will be estimated as 6000 kg/day.

3.18 Construction Materials

The materials used in construction of the proposed project would include reinforced cement concrete frame (RCC Frame), brick infill, brick cladding, textured paints and standard paints etc. The materials used in construction of the road for the proposed project would include coarse aggregates (crush), fine aggregates (sand), water, asphalt, reinforcement, cement etc.

Coarse and fine aggregate for concrete can be obtained from Sakhi Sarwar quarries and Lawerencepur quarries respectively.

[1] 0.4 kg/capita/day waste generation of Bahawalpur (Consultation with Manager Operations, Bahawalpur Waste Management Company)

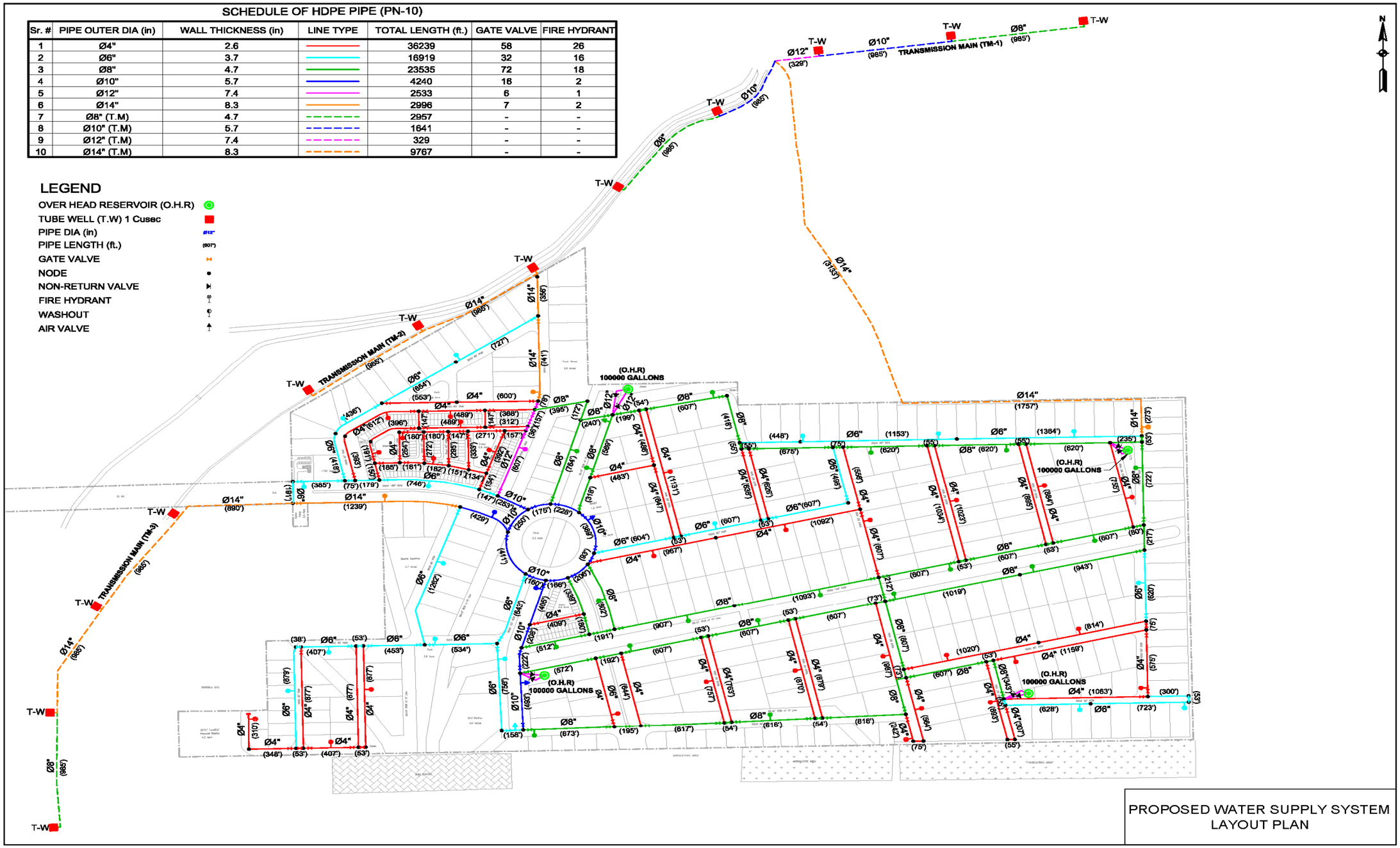


Figure 3.11: Proposed Water Supply System Layout and locations of Fire Hydrants

3.19 Construction Camps

Camp sites will be selected keeping in view the availability of adequate area for establishing camp sites, including parking areas for machinery, stores and workshops, access to communication and local markets, and an appropriate distance from sensitive areas in the vicinity. Final locations will be selected by the contractor in consent with Supervision Consultant after approval from PIEDMC.

3.20 Expected Equipment for Construction

The list of the machinery and the equipment required for the proposed project is provided in **Table 3.10**.

Table 3.10: Machinery and Equipment Requirement for the Proposed Project

Machinery and Equipment Requirement for the Proposed Project	
Concrete batching plant	Transformers for construction
Transit mixer	Excavators
Formwork	Cranes
Pneumatic rollers	Dumper trucks
Concrete pump (mobile and stationary)	Compactor
Loaders and drilling rigs	Graders
Cutting/bending machine	Tractor trolleys
Generator set	Carriage vehicles
Total station with level machine	Water boozers
Concrete vibrators (external and internal)	Steel bending machines

3.21 Restoration and Rehabilitation Plan

There may be areas that could be affected by construction activities which may require rehabilitation such as stockpile sites, campsites and side tracks. The sites for stockpile area, construction camps and side tracks have not been identified at the planning stage of the proposed project. Hence, a restoration and rehabilitation plan has been proposed and presented as **Annexure-III**.

SECTION-4
ENVIRONMENTAL BASELINE PROFILE

4.1 General

For any development project, the prevailing environmental conditions need to be assessed prior to the preliminary stages of planning, designing and execution of the project. Identification of physical, ecological and social aspects of environment and collection of relevant data is essentially important for the evaluation of impacts as well as for the suggestion of adequate mitigation measures which forms the basis of the Environmental Impact Assessment (EIA).

The existing environmental conditions of the proposed project have been considered with respect to physical, biological and socio-economic aspects. Information has been collected from variety of sources, including published literature, field observations and surveys conducted specifically for this project have been analyzed for this study.

4.2 Methodology

For baseline data collection, following sequences of various techniques has been adopted. These techniques were chosen because of their pragmatic application in very short span of time.

1. Reconnaissance survey;
2. Field investigations/ Surveys;
3. Meteorological analysis;
4. Environmental analysis (air, noise and water quality surveys);
5. Collection and review of secondary environmental and social data; and
6. Basic parameters collection from published sources.

4.3 Reconnaissance Survey

Reconnaissance survey of the proposed project site was conducted from January 12, 2018 to January 12, 2018 for the collection of preliminary information about the flora, fauna and existing human intervention along with ecological characteristics. Reconnaissance survey helped us to delineate the ecological habitats and to explore the diversified ecological rich environment.

This information has become the baseline information for the detailed survey that specifically targets those areas which are going to be affected by the implementation of

the proposed project. As a result of this survey, basic plants and animals families were identified that actually prevailing in the associated habitats.

4.4 Field Investigations/ Surveys

Various field surveys were conducted details of which are presented in **Section 4.12.2.**

4.5 Meteorological Analysis

4.5.1 Climate and Temperature

Seasonal climatic conditions must be considered for the design and execution of the project. The climate including air, temperature and precipitation is an influencing factor, affecting the construction and other engineering structures. However, to determine the overall effect of the climatic stresses, daily and seasonal temperature changes and precipitation must be considered.

The District has extremes of climate[1]. because, being adjacent to Rajputana desert, this area overall resembles the dry climate of an arid desert The summer season starts from the month of April and continues till October , while the weather is pleasant and cold from November to February. **Table 4.1** presents month-wise mean temperature and precipitation. **Figure 4.1 & 4.2** shows the graphical presentation of Temperatue and rainfall of the project area.

The climate is mainly hot and dry. In the summer the temperature reaches the high 40 (forties Celsius) and 50 during the day and the nights are slightly cooler. Since the city is located in a desert environment there is little rainfall. Weather conditions reach extremes in both summer and winter. Temperature in Bahawalpur ranges from 5.85 to 42.2o C. Average monthly rainfall ranges from 3 to 168 mm. The average temperature in summer is 33°C (91oF) and 18°C (64oF) in winter. During winter it is between 5 and 15 degree centigrade and sometimes it falls below the freezing point, which ruins the crops. Before the launching of canal system, when the Bahawalpur region mostly comprised of sand dunes, the temperature of Fort Abbas and Khanpur sometimes used to match that of Jacobabad and became the cause of sand storms. (Rehman, 1899).

These days Bahawalpur receives more rainfall all over the year even in summer, which shows that even Bahawalpur is also not immune to the effects of global

[1]**Source**: *District Census Report, Bahawalpur, 1998*

warming. The months of July and August constitute the months of rainy season (commonly known as Sawan). The remaining monsoon winds of Northern Punjab occasionally cause heavy rainfall in this area which makes the weather pleasant. Cholistan consists of 10,399 square miles. There are some places, which do not receive rain years at a time. During winter sometimes the western winds coming from Persian Gulf would move towards this desert, creating conditions of thunderstorms, which last for over a week or so. Rainfall is comparatively very low due to the fact that most of the area comprises of desolate and barren desert. Cholistan,The average rainfall is 200 to 250 mm annually.

Table 4.1: Average Monthly Temperature and Precipitation (1998)

Month	Mean Temperature		Precipitation (millimeters mm)
	Maximum	Minimum	
January	21.6	05.6	06.0
February	24.1	08.6	11.5
March	29.5	13.8	09.4
April	36.1	19.6	7.2
May	40.8	24.5	6.1
June	42.2	28.4	16.9
July	39.5	28.5	52.6
August	38.3	27.9	43.2
September	37.1	24.8	12.1
October	34.8	18.3	0.6
November	29.3	11.7	4.0
December	23.5	06.6	3.0
Annual	**33**	**18.2**	**169.8**

Source: *District Census Report, Bahawalpur, 1998*

The above table depicts that May, June and July are the hottest months with mean temperature usually ranging from 40.8 to 42.2 degree centigrade. The winter season begins from the month of November and continues till March. January is the coldest month with a mean minimum temperature of 05.6 degree centigrade. Most of the rain falls in July and August during summer months and in January and sometimes in February during the winter months

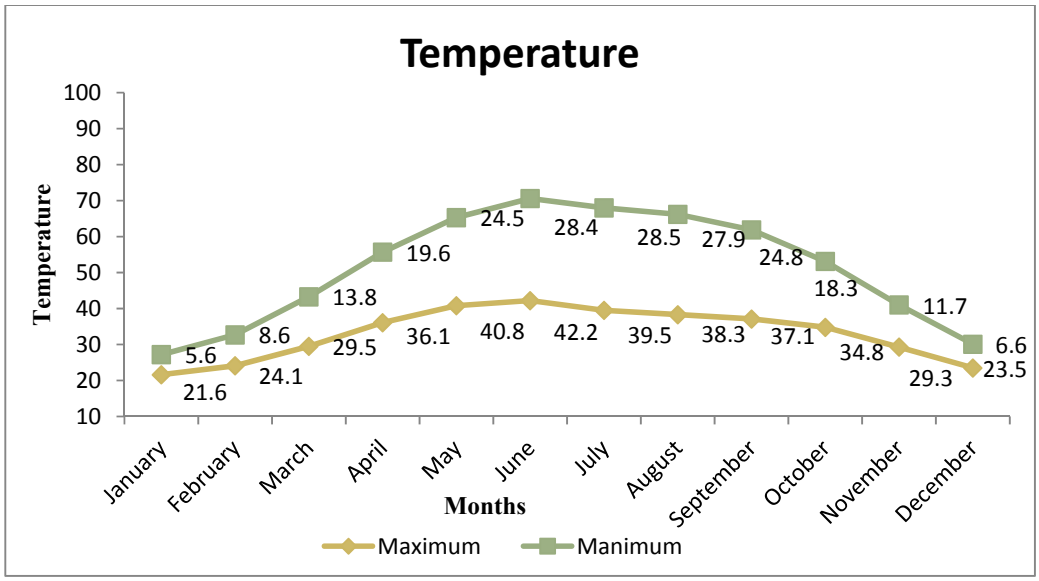


Figure 4.1: Maximum and Minimum Temperature in the project area (1998)

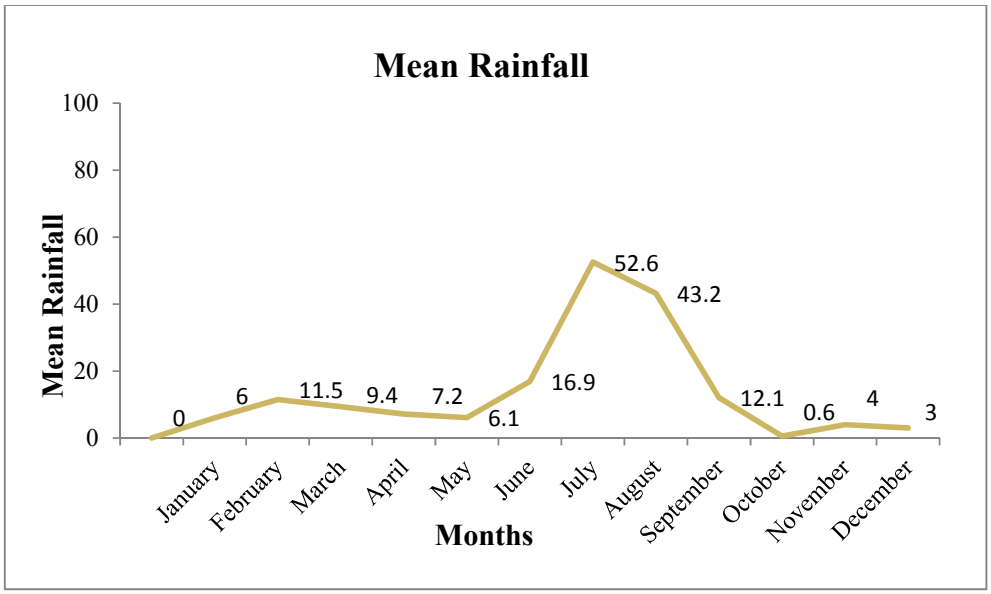


Figure 4.2: Mean Rainfall in the project area (1998).

4.5.2 Wind Speed and Wind Direction

Figures 4.3 (a) and **(b)** show that dominant wind direction of Bahawalpur is from North to South with an average speed of 6 km/hr.

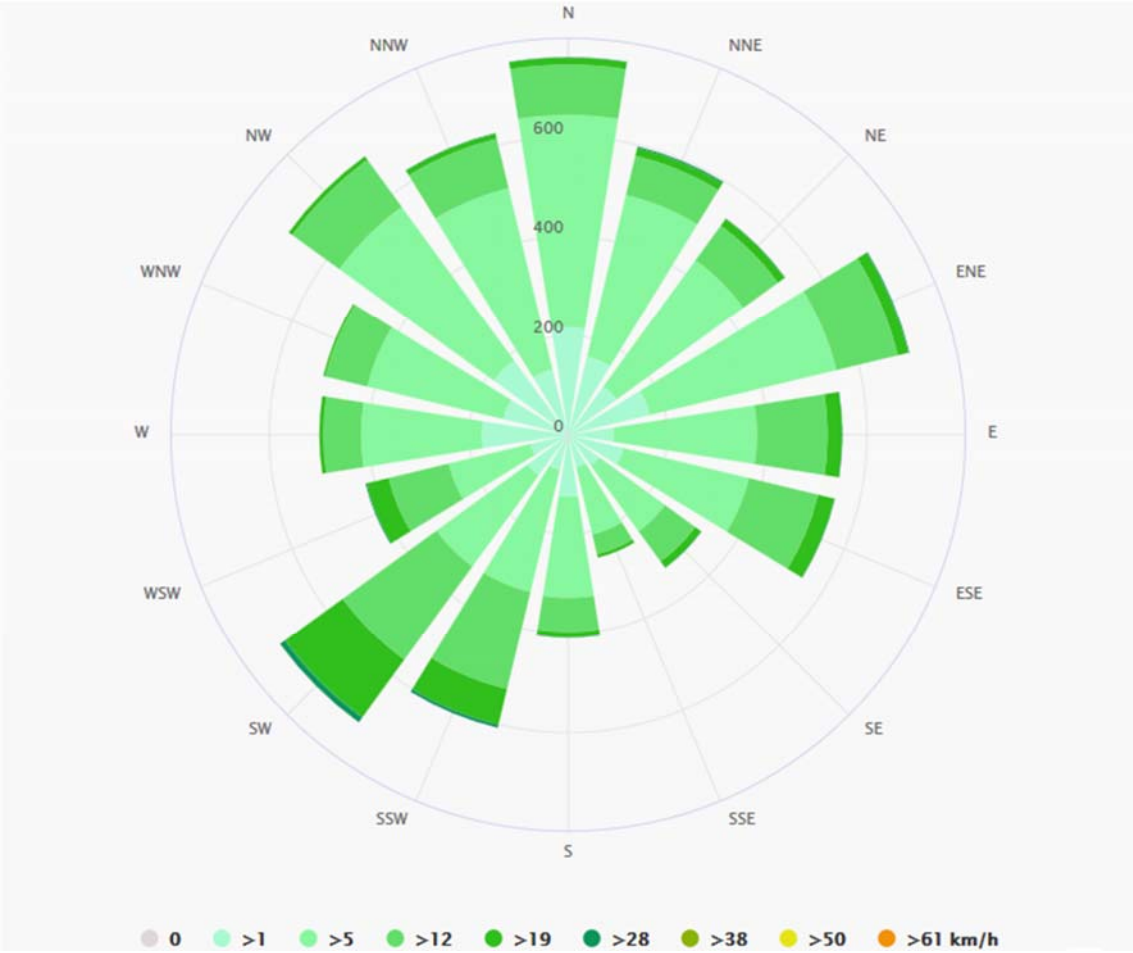


Figure 4.3 (a): Wind Rose for the Bahawalpur[2]

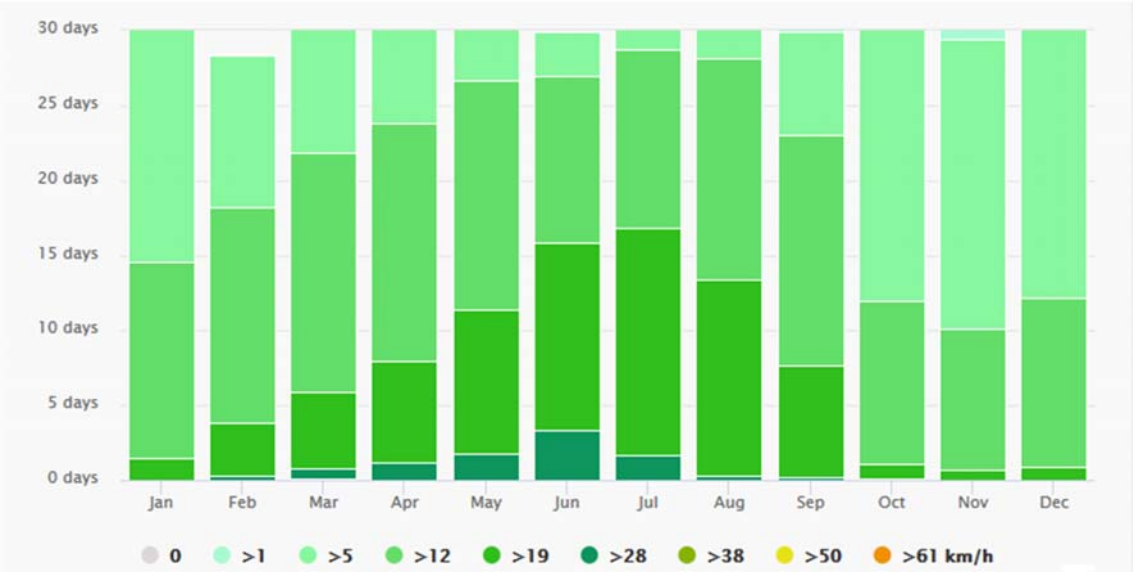


Figure 4.3 (b): Wind Direction for the Bahawalpur[2]

[2] ***Source:*** *https://www.meteoblue.com/en/weather/forecast/modelclimate/bahawalpur_pakistan_1183883*

4.6 Field Investigation/ Survey

Bahawalpur City

The city, lying just south of the Adamwahan Empress Bridge on Sutlej River, is situated 17 km from Lodhran, 90 km from Multan, 420 km from Lahore, 122 km from Burewala, 90 km from Vehari, 270 km from Faisalabad and about 700 km from the national capital, Islamabad[3]. It is a fertile alluvial tract in the Sutlej River valley. East of Bahawalpur is the Pat, or Bar, a tract of land considerably higher than the adjoining valley. It is chiefly desert. Farther east, the Cholistan, is a barren desert tract, bounded on the north and west by the Hakra depression with mound ruins of old settlements along its high banks; it is still inhabited by nomads.

Figure 4.4: Location of Bahawalpur Industrial Area on Pakistan Map

4.6.1 Topography

The District Bahawalpur can be divided into three parts i.e. the riverain area, the plain area and the desert area. The riverain area lies close to the River Sutlej, which flows in the north along its boundary with Lodhran and Vehari Districts. The area is inundated during floods. The irrigated track is higher than the riverain area. Most of the land has been brought under cultivation. The desert area is known as the Cholistan. It runs along

[3] **Source:***Master Planning and Detailed Designing for Development of Bahawalpur Industrial Estate*

the entire eastern boundary of Bahawalpur District in the north and Rahimyar Khan District in the south. The surface of the desert consists of a succession of sand dunes rising in some places to a height of 150 meters. Ahmad Pur Canal is the nearest surface water body in the project area. **Figure 4.5** represents the topography of the project area.

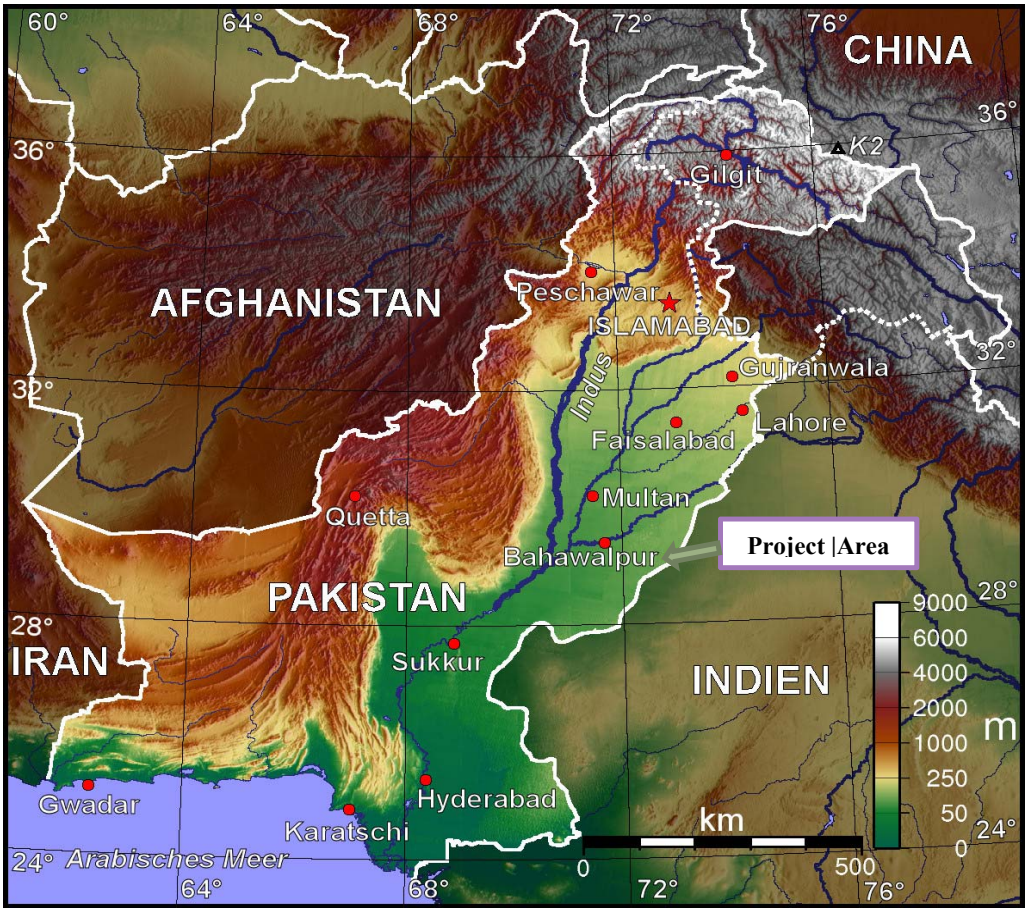


Figure 4.5: Topography of the Study Area

The project area has irregular topography. The sand dunes are deposited all over the project area, which are 1 to 5 meters (3 to 15 feet) high from adjacent agriculture land. The project area has bad land topography. The irregular sand dunes deposited all over the project area which are 1 to 5 meters (3 to 15 feet) high from adjacent agriculture land. The surface is irregular throughout the project area as shown in **Plate 4.1.**

Plate 4.1: Topography of The Project Area

The project area comprises of small sand dunes amidst of Bahawalpur Agricultural areas located at airport road near villages Mari Sheikh Shujra and Mariwala Khu. In the North, the project area is bounded by a metal road connecting Grand Trunk road to Bahawalpur airport. In the South, the project area is bounded by Grid station. Total area of the project is 483 acres and its coordinates are 29º19'11'' N, 71o34'49'' to 29º 19'09'' N, 71o 35'51'' E[4].

4.6.2 Geology

In the Punjab Plains, Quaternary alluvium has been deposited on semi-consolidated Tertiary rocks or on a basement of metamorphic and igneous rocks of Precambrian age. The distribution of Tertiary rocks in the project area is unknown, except in the Pabbi Hills area, in northeastern Chaj Doab, where rocks of the Siwalik system are exposed. In the area of -the buried bedrock ridge, in Chaj, Rechna, and Bari Doabs, exploratory drilling has revealed that the Precambrian basement rocks are overlain directly by Quaternary alluvium. The northeast and southwest of the bedrock ridge, test holes drilled to a maximum depth of about 1,500 feet bottomed in alluvium. Hence, no information is available concerning the total thickness of the alluvial deposits, the southward extension of Tertiary or older sedimentary rocks from the Salt Range and the Pabbi Hills, and the depth to the basement complex in most of the area.

[4] **Source:***Master Planning and Detailed Designing for Development of Bahawalpur Industrial Estate*

Ground-water reservoir of the area is contained almost exclusively in the alluvial deposits. The alluvium of the Punjab Plains, derived from the mountain ranges to the north, has been deposited by the present and ancestral tributaries of the Indus River. The alluvial complex of Pleistocene and Recent age represents the latest phase of sedimentation in an environment that had its beginnings in mid-Tertiary time: the deposition of predominantly fluviatile sediments in a subsiding trough a fore-deep adjacent to the rising Himalayan ranges.

The alluvial complex consists principally of fine to medium sand, silt, and clay. Beds of gravel or very coarse sand are uncommon. Pebbles of siltstone or mudstone may be found embedded in silty or clayey sand in many places. Also associated with fine-grained strata are concretionary zones or nodules of kankar, a calcium carbonate deposit of secondary origin. The study of drill cuttings and electric logs has shown the absence of thick horizons of pure clay within the alluvium. Except for local clay lenses, a few feet thick, the finer parts of the alluvium consist generally of sandy, gravelly, or silty clay. Although there are local concentrations of fine-grained sediments of considerable thickness, individual strata are generally lenticular and have little horizontal or vertical continuity. The random distribution of coarse and fine-grained sediment within the alluvial complex is entirely consonant with its mode of deposition by large constantly shifting streams.

Regional Geology

The project area is positioned in the southern part of the Punjab Plain which is a vast plain of the alluvial material deposited by the five main rivers of the Indus River System crossing the Punjab Plain. The alluvial deposits at the site are deposited by the old course of one of these rivers, the river Sutlej. The alluvial deposits around the site comprise stream bed, meander-belt deposits and flood plain deposits, deposited by the shifting of river course. The alluvial plain at the site mainly consists of silty clay/clayey silt, sandy silt and sand layers of varying thickness.

Site Specific Investigation

In order to evaluate the subsurface conditions at site field investigations was entrusted to M/s HA Engineers, Lahore. These investigations were carried out under the full-time supervision of experienced geotechnical engineers of NESPAK from November 11 to

23, 2017, while selected soil and water samples collected during the field investigations were tested at SOILCON Geotechnical Testing Laboratory, Lahore.

Objectives of Geotechnical Investigations

The following geotechnical investigation plan was developed to fulfill the above mentioned objectives:

- Execution of twelve (12) boreholes of depth ranging from 10 to 20 m below natural surface level (NSL) by straight rotary drilling method at designated locations within the site area.
- Execution of sixteen (16) augerholes of depth ranging from 10 to 12 m below natural surface level (NSL) by hand auger boring method at designated locations within the site area.
- Excavation of four (4) testpits up to a maximum depth of 3 m below NSL and fifteen (15) testpits up to a maximum depth of 1.5 m within the project area.
- Excavation of three (3) testpits up to a maximum depth of 2 m below NSL in borrow areas.
- Carrying out Standard Penetration Tests (SPTs) in the boreholes/augerholes, generally at 1.0 m depth interval, where possible.
- Collection and preservation of disturbed/undisturbed soil samples from the boreholes and augerholes.
- Collection and preservation of bulk & block soil samples from onsite testpits.
- Collection and preservation of bulk soil samples from borrow areas.
- Carrying out Field Density Tests (FDTs) in testpits.
- Carrying out five (5) field permeability tests at selected horizons (using constant head/ variable head) in selected boreholes.
- Laboratory testing of selected soil samples for the evaluation of classification, moisture content, density, strength, compressibility and chemical characteristics.
- Analyses of field and laboratory data and determination of foundation design parameters including soil parameters, foundation type, foundation depth, foundation size versus net allowable bearing pressure relationships and foundation settlements.
- Study of the geotechnical considerations for the construction of foundations of infrastructure and embankments for road network.

- Compilation of Geotechnical Investigations report on the basis of the above studies.

Geotechnical Studies

- Twelve (12) boreholes of depth ranging from 10 to 20 m were drilled below natural surface level (NSL).
- Sixteen (16) augerholes of depth ranging from 10 to 12 m were executed below natural surface level (NSL). The diameter of augerholes was 125 mm.
- Field borehole & augerhole logs were developed on the basis of the materials encountered at the site and were later confirmed on the basis of the laboratory test results.
- Four (4) testpits were excavated up to 3 m depth and fifteen (15) testpits were excavated up to 1.5 m depth below NSL within the project area. The testpits were excavated using conventional hand digging tools like pick-axe and hand shovel.
- Standard Penetration Tests (SPTs) were performed in the boreholes and augerholes according to the latest ASTM D 1586, generally at 1 m depth interval, where possible.

Results

The results show that the onsite overburden soils mostly comprise Lean Clay/ Lean Clay with Sand (CL), Sandy Silty Clay/Silty Clay with Sand (CL-ML), Silt/Sandy Silt (ML), Silty Sand (SM) and poorly graded Sand with Silt (SP-SM) groups as per Unified Soil Classification System (USCS).

4.6.3 Soil

The soil is sandy, while the soil of central Bahawalpur mostly consists of the plains of Indus basin,which is at the height of not more than 150 meters above sea level. But the southwestern desert, which is called Rohi or Cholistan, is mostly undulated due to the presence of sand dunes. The height of the sand dunes does not exceed 150 meters (according to Imperial Gazetteer of 1901 height of dunes was not more than 500 feet). Before the construction of Sutlej valley Project's Canal system, the irrigation was carried out with the flood water of Sutlej. This area is called "Otarh." The second major area in terms of topography, extending between the railway line andthe passage of Hakra, comprises of clay. The special ingredients are silt and sand dunes. Locally this is

known as "Hitarh" and this is the prosperous and fertile area of the dwellings and markets of the colonies of Sutlej valley Project. Imperial Gazetteer concluded had divided this area lengthwise into three great strips: Rohi or Cholistan (desert); the central tract was Bar or Pat (upland); and the third was fertile alluvial tract in river valley called Sind. (Ahmed, 1998).

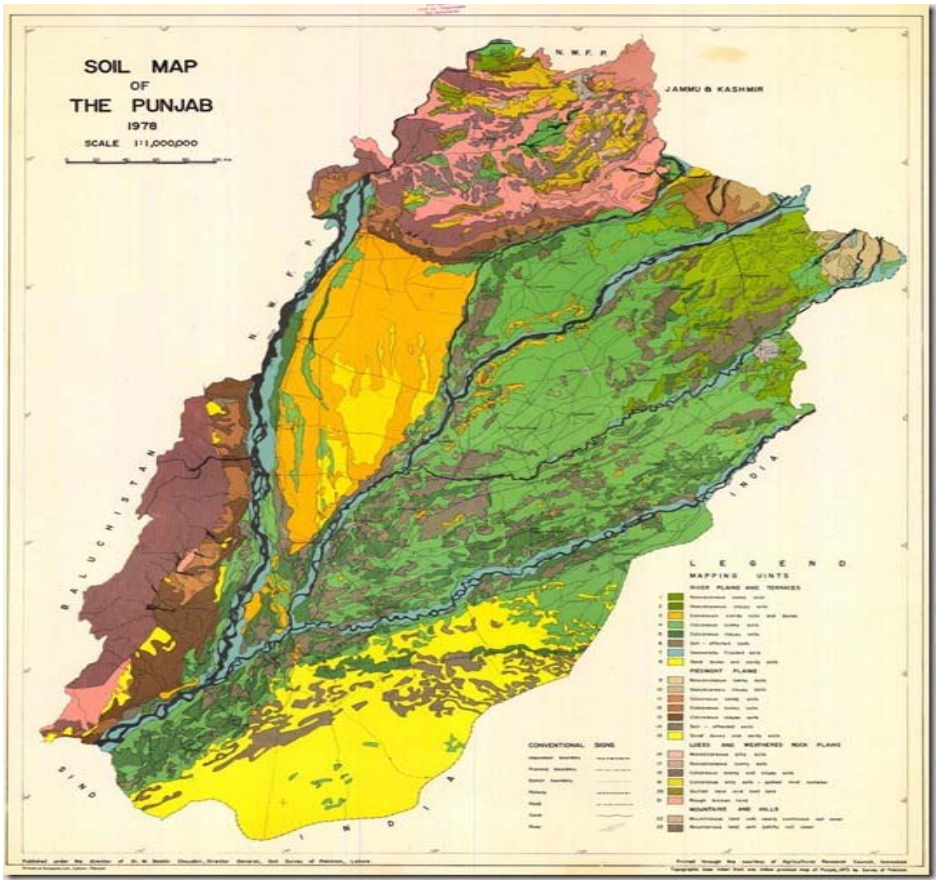


Figure 4.6: Soil Map of the Study Area

4.6.4 Hydrology

During regional groundwater investigations in Punjab, between 1954 and 1963, by Water and Soil Investigation Division (WASID), WAPDA and U.S Agency for International Development, Bari Doab was also investigated in detail. Total 69 test holes were drilled to depth 600 to 900 feet and 21 long duration pump out tests carried out to find out aquifer parameters of the Doab area. Detail of test holes in forms of geological cross-sections are given in "Water Supply Paper 1608-H, Plate-6 and pump out test data is given relevant document. An aquifer test was carried out near Lodhran (in Bari Doab), located 17 km from Bahawalpur on the northern side of River Sutlej

and may represent the project area. Salient features of the test results are:

Well Number	B-20
Depth of bore:	215 ft
Screen length:	135 ft
Discharge:	2.5 cusec
Drawdown	13.6 ft
Specific capacity:	0.184 cusec/ft
Permeability:	0.0013 ft/sec

Irrigation is largely dependent on the canals, but tube wells have also been sunk in the areas where water is fit for irrigation. The chemical quality of ground water in the district varies in different areas and at different depths. The water table is not seasonal and dug wells do not generally run dry. Groundwater sources exist in the area. Piped water supply is available in 23,569 housing units of Bahawalpur.

Irrigation and Link Canals

Following are the irrigation canals and link canals near Bhawalpur district.

i) Qasim Canal
ii) Bahawal Canal (U)
iii) Bahawal Canal (L)
iv) Pajnad Canal
v) Abbasia Canal

The major purpose of the canals is irrigation supplies.

WATER SOURCES

Groundwater Sources

Around the project area prominent facilities or settlements are Bahawalpur Grid station, Musharraf Agriculture Farm and rural settlements along Canal Head and Mari Sheikh Shujra. In all these areas groundwater is being pumped by installing private tubewells for agriculture and domestic uses. Depth to water table, in these areas, varies from 30 to 40 feet below ground surface.

Surface water Source

A non-perennial irrigation canal Ahmedpur East Branch canal flows along the

boundary of the project area. The canal is operated from April to September (Kharif Season). The project area is bounded by Distributaries 1L and 2L of Ahmedpur East Branch canal.[5]

4.6.5 Water Resources

Water well drilling industry is well developed in Bahawalpur. As reported by the local drillers, sub-surface formations, up to 400 feet depth, are mostly sands with intermittent thin layers of clay. Groundwater is reported to be generally of good to marginal quality.

Most of the town is served with water supply system whereas rest of the area is without it and people have their own sources of water mostly hand pumps / power pumps. Some areas are partly served with this facility Existing Condition. The present main source of water in Bahawalpur is ground water. Water table is 40-50[6] feet below the ground level. Theunderground water of the district is mostly brackish. Drinking water supply situation of Bahawalpur is much below as compared to all other cities; the service coverage is about 3% of population. The city faces similar issues related to drinking water supplies i.e, Low coverage ratio, Poor water quality delivered to users, Illegal connections, not enough trained and qualified staff, the water quality is reported to be poor. PCRWR carried out a survey of major cities in the Punjab among which was Bahawalpur. The results of the survey indicated that around 24% of the sampled water was polluted with E.Coli, 52% samples were found to be contaminated with Coliform bacterium, and 76% possessed excess Arsenic (As) - most of the samples contained more than 50 ppb which is 5 times more than the limits set by the WHO. The water supply network covers 10% of the town and serves 3% of the total population. Ground water in the Municipal area is generally saline except along the irrigation canals and the river. Presently PHED is executing rehabilitation and augmentation of Urban Water Supply Scheme for Bahawalpur City. This would help in drinking water supply needs and increase in service coverage. Southern Punjab Basic Urban Services Project (SPBUSP) also helping in water supply service provision and expenditure has been made of PKR 414.203 million and physical progress is 93%. Main Components of the existing system include tube wells, overhead reservoir and distribution network. The maintenance level of pumping machinery is not so reasonable. Privately installed hand

[5] **Source:***Master Planning and Detailed Designing for Development of Bahawalpur Industrial Estate*

[6] **Source:** IEE of 100 MW Solar PV Power Project in Bahawalpur Punjab - Pakistan

pumps / power pumps have been installed. Evidently, during post irrigation phase, the water table has been raised, thereby improving the sub soil water quality. The project is located on the south of the Sutlej River and lies in the Cholistan region near the Thar Desert, where effect of recharge is significant. As such, the sub soil water quality has improved over the period. The Aerial distance from project site to the River Indus is approximately 20 km away as shown in **Figure 4.7.**

Figure 4.7: Overview Map of the Bahawalpur and Sutlej River

Ground Water Hydrology

In general, subsurface stratigraphy at the site consists of three basic litho logical units as given below:

a) Lean Clay/Silty Clay
b) Sandy Silt/Silt
c) Silty fine Sand/fine Sand

The soil is alluvial with sandy textured sand dunes covering 50 to 60 percent of the area. These soils are the alluvial deposits of the recent geologic times. The soil of central Bahawalpur mostly consists of the plains of Indus basin, which is at the height of not more than 150 meters above sea level. But the southwestern desert, which is

called Rohi or Cholistan, is mostly undulated due to the presence of sand dunes. The height of the sand dunes does not exceed 150 meters Main soil types of Cholistan desert are sand dunes (44%), sandy soils (37%), loamy soils (2%) and saline-sodic clayey soils (17%). The average water table in Chak 40 DB is 40-50 feet. The water of shallow wells present in the expansion areas contains higher values of TDS and therefore is not suitable for human consumption.The depth of water table is also depleting over the period. Due to increased number of private tube wells being installed in the location of sub project, the ground water is depleting. Recharge from surface /rain water is helping in reduction of depth of sub soil water table. During dry periods, the situation sometimes becomes quite serious.

Water Supply in the Area

The water supply network covers 10% of the town and serves 3% of the total population.Ground water in the Municipal area is generally saline except along the irrigation canals and the river. The depth of water table varies from 5.5 to 10 meters. Recharge from the canal and river is balancing the extraction presently. The river Sutlej is the main stream of the area, which flows from Northeast to the Southwest. It is the main sources of water supplies and recharge of the groundwater body (in addition to precipitation). The alluvial plain of Upper Indus Basin is also fed by an extensive canal irrigation system. Unconsolidated deposits are widely distributed in the form of alluvial fans. The alluvium is mainly composed of clay, well assorted sand and silt. Near Bahawalpur, the Thar Desert with its finger-like projections of desert and alluvial plain adjoins. In such areas the alluvial projection has sweet water in so-called sweet water pockets. Sand is fine to medium grained. Recent hydrological studies have shown that highly permeable material serves as an aquifer, which is suitable for installation of more than one cusec capacity tube wells; however, water is saline at greater distances from the rivers. Presently there are two types of suitable sources for drinking water supply:

- Seepage along the Bahawalpur canal
- Sweet water tube wells along the river (between the river and the railway line).

Hydrological maps show that there is enough water for the future. Seepage or recharge along the canal is also 0.46 million acre feet (maf) per year (0.567 mill m^3/yr).[7] It is

[7] **Source**: Urban Water Supply and Sewerage Reform Strategy World Bank – Government of Punjab report 2006

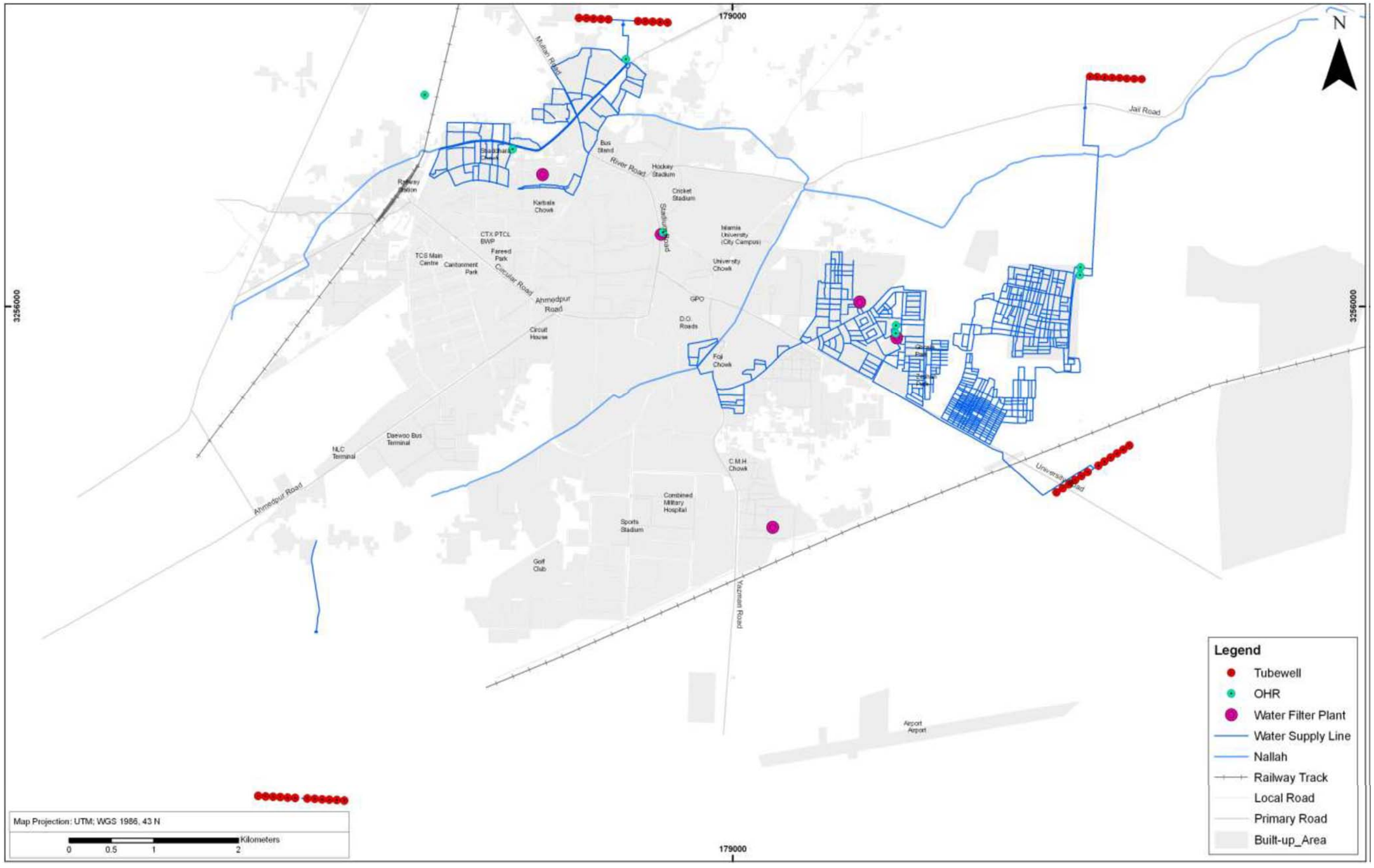
also a permanent source. In addition to the 1 cusec tube wells now operating in the area, additional tubewells can be installed to meet demand. A second option is direct supply from the canal and treatment of the water. Surface water could be available from the canal in quantities to be negotiated with the Irrigation department, if need arises. The TMA estimates 40% unaccounted for water (UfW). However since there are no water meters, this figure has to be treated as approximate.

Neither raw water nor drinking water quality is monitored on a regular basis in Bahawalpur. Water is contaminated in the distribution network through contact with sewage and other pollutants. Water quality at the tap is not monitored regularly. The pollution with agricultural chemicals or heavy metals is not monitored. Therefore, information on water quality at point of use is mainly anecdotal. PCRWR carried out a survey of major cities in the Punjab among which was Bahawalpur. The results of the survey indicated serious contamination problems. The reported situation in Bahawalpur is as follows:

- "The water samples were collected from 25 locations covering the whole city and all possible sources i.e. Tube well (13) and Hand Pump (12). Out of the 25 locations none of the sources is supplying safe drinking water to the people living in the city. After processing the analytical data it was estimated that 24% were polluted with E.Coli: 52% samples were found contaminated with Coliform bacterium:
- 76% possessing excess Arsenic (As) most of the samples containing more than 50 ppb which is 5 times more than WHO set limits:
- 4% having more Lead (Pb), 4% samples with more Nitrate (NO3) and K 12% with high Total Dissolved Solids(TDS), 32% water samples possessing excess level of Turbidity and the tube wells water of Commercial Area, Satellite Town has extreme levels of Turbidity may be due to damaged strainer pipes. 60% samples have higher concentration of Calcium (Ca) and the tube well Commercial Area, Satellite Town is pumping the water with more soluble ions of Ca (188 mg/l) be due to underground more calcareous mineral rocks, the hardness was observed beyond permissible limits in 16% water samples;
- The Sodium (Na) ions are high in 8% water samples but the hand pump water is highly brackish possessing high levels of both cautions and anions as wellas Arsenic. The hand pump is located at Govt. High School, Hamatian:

- While 4% were found with more Potassium (K) level;
- The anions like Sulphate (SO4) are also found beyond acceptable limits in 20% water samples:
- The micro element i.e. Iron (Fe) was on higher side in 64% samples, 4% samples were found contaminated with Al and Mo. The data was compared with WHO guideline values."1 According to Executive Engineering Public Health Engineering Department Bahawalpur, originally water supply scheme for Bahawalpur City approved in 1973-74 for Rs 4.966 million. And after that in 1981 the comprehensive water supply approved for Rs 13.684 million. In 1997-98 an extension of water supply scheme was approved under big city programme for Maqbool Colony Basti Rinddan & Basti Maseetan. Presently PHED is executing rehabilitation and Augmentation of Urban Water Supply Scheme Bahawalpur City. This scheme was approved in 29-11-2006 with a cost of 199.976 million. In current financial year 2010-11 an amount Rs 43.44 million is allocated. As reported by PHED about 80% works is completed, The Scope of Scheme includes;
- Replacement265,000 Rft outlived water supply pipeline-3 inch dia to 24 inch dia.
- Replacement 6200 defective house connection
- Construction 2 tube wells of 1 cusec and 6 tube wells of 0.5 cusec
- Construction 8 ground storage tanks and one overhead reservoir
- Construction of 24 Pump house2x2feet
- Provision and installation of 25 sets of Pumping machinery
- External Electrification 22 Job
- Laying of Rising main 61,520 Rft
- Establishment of One water testing Laboratory.

Existing water supply services are shown below in **Figure 4.8.**



Source: Adapted from Urban Unit″s Bahawalpur base map

Figure 4.8: Existing Water Supply System in Bahawalpur City

Rivers

Only Satluj rivers flows in the north side of this district. Its length is 176 kmfrom Head Islam to Head Panjnad. The major source of irrigation was the water of Hakra River but with the drying of the river the area was desiccated and left with only grazing lands. The river supplied water regularly to this region until 1200 BC but near 600 BC it became irregular in flow and subsequently vanished.

Floods

Bahawalpur is situated on the south of Sutlej River. History is evidenced that Bahawalpur is seldom faced flood hazard. First mentionable flood came in 1945 when the city was the part of Bahawalpur state (abolished in 1954) and affected the areas nearby river Sutlej i.e. Khanwah Khander, Goth Laskder, Jhangiwala, Dera Bakha etc. The next devastating flood was witnessed in 1988 and at that time much more damages have been occurred on both sides of the river Sutlej and people homes, installed tube wells, standing crops, model colonies and small industrial estate badly flooded. In 2013, a flood likes 2010 damages many districts of Punjab including Bahawalpur, Vihari, Dera Ghazi Khan, Rajanpur, Narowal, Multan, Sahiwal, Muzaffargarh etc. Early estimates have shown that 25 districts in Pakistan have been affected by floods according to WHO Report of 2013 where 207 people have been died and 1,122 had injured in flood. More than 13,33,066 people have been affected in country due to flooding and over 12,48,644 acres of standing agricultural crops have been damaged.

Among all provinces and territories in Pakistan, Punjab has been severely affected by flood in all sectors (National Disaster Management Authority (NDMA), 2013). Later, on the basis of updates from different sources it is found that about 46 districts in Pakistan have been flooded in 2013 flood where 25 were located in Punjab province After passing 25 years in 2013, heavy monsoon rains in upper parts of the country and huge volume of water released by India in river Sutlej (that is almost abandon from many years) caused flood in nearby areas of Goth Laskder, Jhangiwala, Dera Bakha etc. in Bahawalpur city.

Due to high flood in river Sutlej, erosion had been inundated several villages and destroyed thousands of acres of crops from Minchinabad to Ahmadpur East in Bahawalpur. In the consequence of a high tide in river Sutlej, several villages have been submerged due to breaches in embankments in different areas as hundreds of acres

were submerged due to flood in river Sutlej and Chenab at Mauza Kachi Shikrani near Uch Sharif, Ahmedpur East due to a breach in an embankment. Thus, Ahmedpur East is one of the flood prone area in Bahawalpur that is regularly been facing severe flood damages since 2010. Flood 2013 also brought similar destruction in Ahmedpur East's many Union Councils (UCs) and Mouzas. Therefore, damages assessment of flood is essential to saving these financially backward and flood prone areas to formulate a comprehensive flood prevention plan and preparedness strategy to cope up the flood risks. Bahawalpur is considered as not flood prone districts of Pakistan according to the map released by Emergency Resource Center (ERC). Below maps in **Figure 4.9** shows Flood Prone districts of Pakistan developed by World Food Programme.

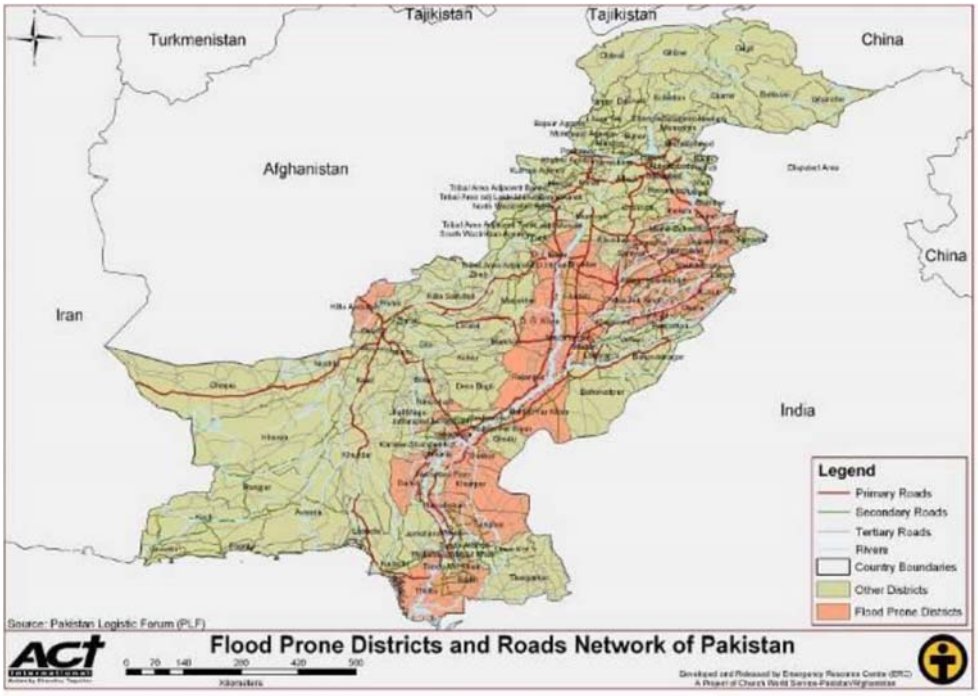


Figure 4.9: River Flood Prone Districts of Pakistan

Punjnnand Headworks is a very active and trouble some Headworks during the flood season. There was super flood of 9.62.000 cusees at this headworks during 1975 which caused serious damges in Bahawalpurand Rahimyar Khan district to some branchesin left Marginal Bund. The beds at this Headworks have been raised with a free board about 2 meters above H.L.F of 1973.

The reach RD. 38 to 52 Right Marginal Bund the first defense in 1985. A double bund was constructed in 1988 in setback position to protect valuable land,. The tendency of river persisted in 1990-1991 too. Now it has been proposed to construct a spur to divert

river on left side for reduction of its action on Right Marginal Bund.

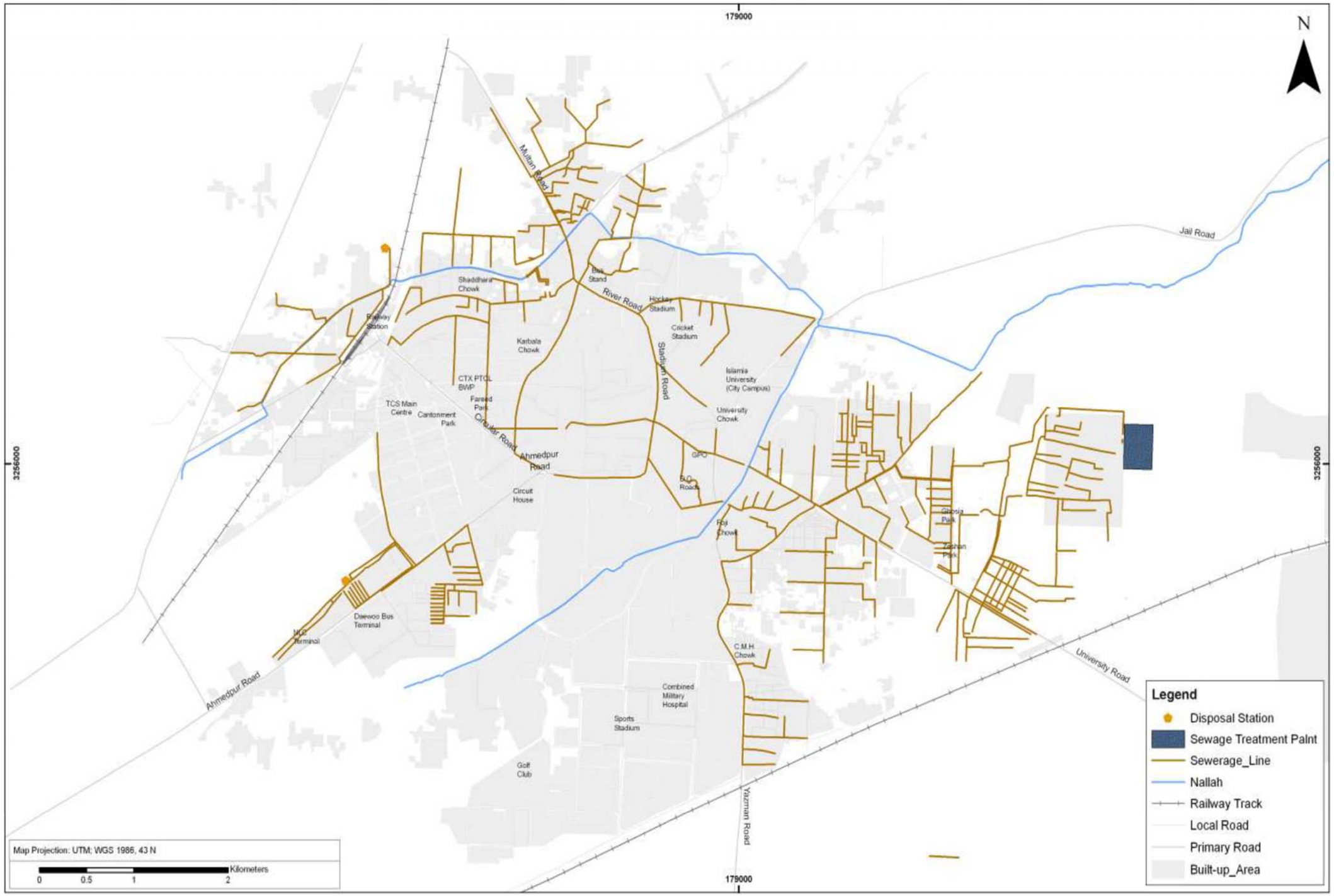
Lakes and Marshes

There are many small lakes at different places in Cholistan where the rain water remain stored. The people use this water for drinking , bathing and washing etc. these lakes are known as "Tobas" in local language. In many villages the cemented ponds or lakes have been constructed which are filled with canal water is supplied to the population of village.

Sewerage and Drainage:

The coverage of the sewerage facility is approximately 70%.There is currently no sewerage treatment. No plan is being developed to address this issue. Sanitation Services in Bahawalpur are provided by the Tehsil Municipal Administration (TMA).The major problem of the town is the inadequate network of sewers, open drains and lack of facilities for disposal of effluent. The existing Sewerage System (including the open drains) covers only 70% of the built area and serves 82% of the population.. The piped sewers have only been provided on the main roads, and most of the streets are provided with open drains only, which are connected to sewers. The total length of piped sewers is 175 km. The sewerage system has approximately 24,000 connections according to TMA information. There are 5 existing wastewater disposal (pumping) stations, which are periodically out of order. At present there is no facility for treatment of the waste water. The wastewater pumped from disposal stations is utilized without any treatment by farmers for irrigation, presenting a potential health hazard. The excess wastewater from the disposal stations is pumped either into the Sutlej River or into canals.

The major component of the Southern Punjab Basic Urban Services Project SPBUSPfor TMA Bahawalpur City is the construction of new sewerage system. However, a proper sanitation plan has still not been developed. The city has been divided into four Zonesan estimate for sewerage system, the Katchi Abadies have been included like Islami Colony, Banga Basti, Dilawer Basti, Dilawer Colony The sewerage of these low income areas will be catered of linking in the main sewer line, the main sewer line will pass along the Dr. Rafi Qammar Road, Satellite Town and up to the disposal station. Existing sewerage and drainage system is shown below in **Figure 4.10.**



Source: Adapted from Urban Unit"s Bahawalpur base map.

Figure 4.10: Existing Sewerage System in Bahawalpur City

Mines & Minerals

There are no mines or minerals (except Sand) found in the district of Bahawalpur.

4.6.6 Environmental Monitoring

The environmental parameters like ambient air quality, noise level and ground water were monitored at the proposed project site from January 12, 2018 to January 16, 2018 for analyzing the quality of ambient air, ground water and level of noise at the proposed site, for establishing the baseline profile of the area. **Table 4.2** represents the coordinates and monitoring points of environmental parameters taken at the proposed project site.

Table 4.2: Monitoring Points of Environmental Parameters at the Proposed project Site

Sr. No.	Location/Description	Coordinates	
		Northing	Easting
Ambient Air Quality			
1	West Side Near Mariwala Khu	29°18’85.28”	071°34’44.65”
2	South Side Near Mushraf Khu	29°18’49.28”	071°35’35.93”
3	East Side Of Sangla Basti	29°19’16.52”	071°36’3.32”
4	Basti Sangla North Side Of The Project	29°18’34.51”	071°35’6.43”
Surface Water Quality			
1	Fateh Wah Canal	29°31’60.26”	071°57’25.17”
Drinking Water Quality			
1	Basti Sangha Jhak Ramzan	29°32’29.24”	071°59’44.65”
2	Maliwale Khu	29°31’61.91”	071°57’91.91”
3	Mouza Nauabad Raqba Pervaiz Mushharaf	29°31’12.57”	071°60’09.50”
4	North Side Near School	-	-
Noise Level			
1	West Side Near Mariwala Khu	29°18’85.28”	071°34’44.65”

Sr. No.	Location/Description	Coordinates	
		Northing	Easting
2	South Side Near Mushraf Khu	29°18'49.28"	071°35'35.93"
3	East Side Of Sangla Basti	29°19'16.52"	071°36'3.32"
4	Basti Sangla North Side Of The Project	29°18'34.51"	071°35'6.43"

4.6.6.1 Air Quality

The ambient air quality monitoring for Carbon Monoxide (CO), Sulfur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Nitrogen Oxide (NO) and Particulate Matter (PM_{10}) was carried out at the proposed project site. The sampling was conducted for 24 hours period.

The detailed air pollutant and noise data has been given in **Annexure-IV**, while the average concentration of ambient air pollutants are given in **Table 4.3.**

Table 4.3: Average Concentration of Ambient Air Pollutants

Parameter	Unit	Monitoring Duration	Average Concentration of Pollutants				Limits As Per NEQS
			Point 1	Point 2	Point 3	Point 4	
Carbon Monoxide (CO)	mg/m^3	24 Hours	0.47	0.50	0.50	0.50	05.0 ($\mu g/m^3$) for 8 Hours
Sulfur Dioxide (SO_2)	$\mu g/m^3$	24 Hours	3.78	3.78	3.84	3.48	120 ($\mu g/m^3$) for 24 Hours
Nitrogen Dioxide (NO_2)	$\mu g/m^3$	24 Hours	10.25	12.73	13.53	13.94	80 ($\mu g/m^3$) for 24 Hours
Nitric Oxide (NO)	$\mu g/m^3$	24 Hours	3.72	3.72	3.77	03.90	40 ($\mu g/m^3$) for 24 Hours
Oxides of Nitrogen (NOx)	$\mu g/m^3$	24 Hours	13.97	16.45	17.30	17.84	150 ($\mu g/m^3$) for 24 Hours
Particulate Matter(PM_{10})	$\mu g/m^3$	24 Hours	20.32	31.32	26.40	27.24	150 ($\mu g/m^3$) for 24 Hours

Parameter	Unit	Monitoring Duration	Average Concentration of Pollutants				Limits As Per NEQS
Particulate Matter($PM_{2.5}$)	µg/m^3	24 Hours	11.88	15.38	12.71	13.72	35 (µg/m^3) for 24 Hours
Suspended Particulates Matter(SPM)	µg/m^3	24 Hours	198	178	184	184	500 (µg/m^3) for 24 Hours
Lead	µg/m^3	24 Hours	0.02	0.02	0.02	0.02	1.5 (µg/m^3) for 24 Hours
Ozone	µg/m^3	1Hours	95.05	97.21	96.97	96.24	130 (µg/m^3) for 1 Hours

µg/m^3: micrograms per cubic meter mg/m^3:milligram per cubic meter

NEQS: National Environmental Quality Standards

Table 4.3 indicates that all parameters are well within the permissible limits of National Environmental Quality Standards (PEQS) at the project site. **Plate 4.2** shows a view of Ambient air quality and noise level monitoring at West Side Near Mariwala Khu, South Side Near Mushraf Khu, East Side Of Sangla Basti and Basti Sangla North Side Of The Project.

Plate 4.2: A view of Ambient Air and Noise Level Monitoring

4.6.6.2 Noise Monitoring

Noise level monitoring was carried out at the same location where ambient air quality was monitored. Noise levels were monitored with the help of a potable digital sound meter at the project site for twenty four (24) hours. The detailed noise level monitored results are attached as **Annexure–IV** respectively. Average monitored values of noise are given in **Table 4.4.**

Table 4.4: Average Monitored Values of Noise

Sr. No.	Sampling Locations	Leq. Hourly Maximum dB (A)		Punjab Environmental Quality Standards (PEQS) 2016	
		Day Time (0600-2200 hrs.)	Night Time (2200-0600 hrs.)	Day Time (0600-2200 hrs.)	Night Time (2200-0600 hrs.)
1	Point 1	44.2	40.3	65	55
2	Point 2	48.5	44.2	65	55
3	Point 3	51.6	37.8	65	55
4	Point 4	45.6	39.3	65	55

Table 4.4 indicates that all parameters are well within the permissible limits of Punjab Environmental Quality Standards (PEQS) at the project site**.**

4.6.6.3 Surface Water Quality

Surface water sample was taken on January 22,2018 from Fateh wah Canal and was analyzed. The analysis results of surface water samples are compared with Punjab Environment Quality Standards (PEQS) for Surface Water Quality. **Plate 4.3** shows a

view of surface water sample collection while **Table 4.5** shows the results of surface water analysis.

Table 4.5: Surface Water Analysis of the Project Area

Sr. No.	PARAMETER	Unit	Results	NEQS for Drinking Water Quality
			FatehWah Canal	
1	pH@25^{o}C	-	7.4	6.0-9.0
2	Temperature	oC	12.7	-
3	Total Dissolved Solids	(TDS) mg/l	1240	3500
4	Chlorides Cl^{-1}	mg/l	43.4	1000
5	TSS	mg/l	198	200
6	BOD_5	mg/l	20	80
7	COD	mg/l	37	150
8	Boron	mg/l	1.2	6
9	Oil & Grease	mg/l	4	10
10	Cadium	mg/l	0.01	0.1
11	Mercury	mg/l	BDL	0.01
12	Arsenic	mg/l	0.05	1
13	Ammonia	mg/l	0.14	40
14	Phenolic Compound	mg/l	BDL	0.1
15	Selenium	mg/l	BDL	0.5
16	Chromium	mg/l	1.69	1
17	Copper	mg/l	BDL	1
18	Cyanide	mg/l	0.01	1
19	Fluoride	mg/l	3.1	10
20	Lead	mg/l	BDL	0.5
21	Manganese	mg/l	0.1	1.5
22	Sulphate	mg/l	121	600
23	Nickel	mg/l	BDL	1
24	Sulfide	mg/l	BDL	1
25	Ionic Detergenta as MBAs	mg/l	ND	20
26	Zinc	mg/l	BDL	5.0

Sr. No.	PARAMETER	Unit	Results	NEQS for Drinking Water Quality
			FatehWah Canal	
27	Pesticide	mg/l	ND	0.15
28	Barium	mg/l	ND	1.5
29	Silver	mg/l	BDL	1
30	Iron	mg/l	BDL	8
31	Total Toxic Metals	mg/l	BDL	2
32	Chorine	mg/l	BDL	1

Key: BDL = Below Detection Limit **ND** = Not Detectable

PEQS= Punjab Environmental Quality Standards

The above table illustrates that all parameters are well within permissible limits of PEQS 2016 of surface water except the concentration of chromium which is slightly higher than the standard values may be due to the contamination of industrial effluents.

Plate 4.3: A View Of Surface Water Sample Collection

4.6.6.4 Drinking Water Quality

Drinking water sample was taken from Hand Pump of Basti Sangha Jhak Ramzan, Maliwale Khu, Mouza Nauabad Raqba Pervaiz Mushharaf and North Side Near School near project site and was analyzed for physical, chemical and microbiological parameters. The monitored results are compared with Drinking Water Quality Standards (DWQS), 2016. Plate 4.4 shows a view of ground water sampling and Table 4.6 shows the results of analysis.

Plate 4.4: A View of Drinking Water Sample Collection

Table 4.6: Drinking Water Analysis of the Project Area

Sr. No.	Parameter	Unit	Results				Dwqs Limiting Values
			Basti Sangha Jhak Ramzan	Maliwale Khu	Mouza Nauabad Raqba Pervaiz Mushharaf	North Side Near School	
1	pH@25ºC	pH unit	7.4	7.2	7.2	7.3	6.5-8.5
2	Temperature	oC	15.2	15.1	13.4	13.9	-
3	Total Dissolved Solids	(TDS) mg/l	814	1065	1830	757	<1000
4	Chlorides Cl^{-1}	mg/l	144	120	132	123	<250
5	Escherichia Coli	E.Coli (Count/100ml)	0	0	0	0	0/100ml
6	Fecal Coliforms (E.coli)	F.Coli (Count/100ml)	0	0	0	0	-
7	Total Coliforms Bacteria	TC(Count/100 ml)	0	0	0	0	0/100ml
8	Boron	mg/l	1	1	3	1	-
9	Total Hardness as $CaCO_3$	(mg/L)	172	174	185	150	<500
10	Cadium	mg/l	ND	ND	ND	ND	0.01
11	Mercury	mg/l	ND	ND	ND	ND	<0.001
12	Arsenic	mg/l	ND	ND	ND	ND	<0.05
13	Alminium	mg/l	BDL	BDL	BDL	BDL	<0.2
14	Tubidity	NTU	2	2.4	3.7	2.7	<5
15	Selenium	mg/l	BDL	BDL	BDL	BDL	0.01
16	Chromium	mg/l	1.31	1.55	1.19	0.85	-

Sr. No.	Parameter	Unit	Results				Dwqs Limiting Values
			Basti Sangha Jhak Ramzan	Maliwale Khu	Mouza Nauabad Raqba Pervaiz Mushharaf	North Side Near School	
17	Copper	mg/l	BDL	BDL	BDL	BDL	2
18	Cyanide	mg/l	ND	ND	ND	ND	<0.05
19	Fluoride	mg/l	0.6	0.6	0.5	0.3	<1.5
20	Lead	mg/l	BDL	ND	ND	ND	<0.05
21	Manganese	mg/l	0.1	0.2	0.09	0.2	<0.5
22	Phenolic Compund	mg/l	BDL	BDL	BDL	BDL	-
23	Nickel	mg/l	BDL	BDL	BDL	BDL	<0.02
24	Nitrate		12.7	11.4	2.9	BDL	<50
25	Nitrite	mg/l	0.35	0.29	0.01	BDL	<3
26	Zinc	mg/l	0.19	0.32	0.23	0.1	5
27	Pesticide	mg/l	ND	ND	ND	ND	-
28	Barium	mg/l	ND	ND	ND	ND	0.7
29	Residual Chlorine	mg/l	ND	ND	ND	ND	0.2-0.5
30	Colour	TCU	4	7	6	7	<13
31	Odour	Odour	NO	NO	NO	NO	Objectionable/ Non-Objectionable
32	Taste	Taste	NO	NO	NO	NO	Objectionable/ Non-Objectionable

Key: **BDL** = Below Detection Limit **ND** = Not Detectable

PEQS= Punjab Environmental Quality Standards **NO=**Non-Objectionable

Table 4.6 shows that all the parameters are within the permissible limits of DWQS except for Total Dissolved Solid (TDS) which is high at Maliwale Khu and Mouza Nauabad Raqba Pervaiz Mushharaf as ground water may contain mineral ions dissolved from soil particles, sediments, and rocks as the water travels along mineral surfaces in the pores or fractures of the unsaturated zone and the aquifer. The increase in the value of TDS may also be due to the higher concentration of chloride. **Plate 4.4** shows collection of ground water near project site for physio-chemical and biological analysis.

4.6.7 Seismology

According to Seismic Zoning Map of Pakistan included in the Pakistan Building Code Seismic Provisions (2007), Bahawalpur falls in Zone 2A (Lower limit of moderate damage). The project site falls in southern part of Punjab plain which shows very low to moderate level of seismicity. The project region has also been subjected to shaking in the past due to earthquakes in the Suleiman Range located about 140 km northwest to the site. The basement rocks underlying the southern part of the Punjab Plain show very low seismicity indicating stable basement region. So the main source of shaking at the project site is related to moderate to large earthquakes in the seismically active Suleiman Range.

Probabilistic seismic hazard assessment carried out as part of the revision of the Building Code of Pakistan Seismic Provisions (2007) shows that the project area falls in Zone-2A with peak horizontal ground acceleration of 0.10g i.e. negligible damage as given in **Figure 4.11.** (ground motion with return period of about 500 years) for soft rock foundation condition.

It is therefore recommended that the project structures should be designed to cater the requirements of Zone 2A of seismic provisions (2007) of Building Code of Pakistan after giving due consideration to the soil profile at site**. Figure 4.11** shows seismic zoning map of Punjab indicating location of the proposed project.

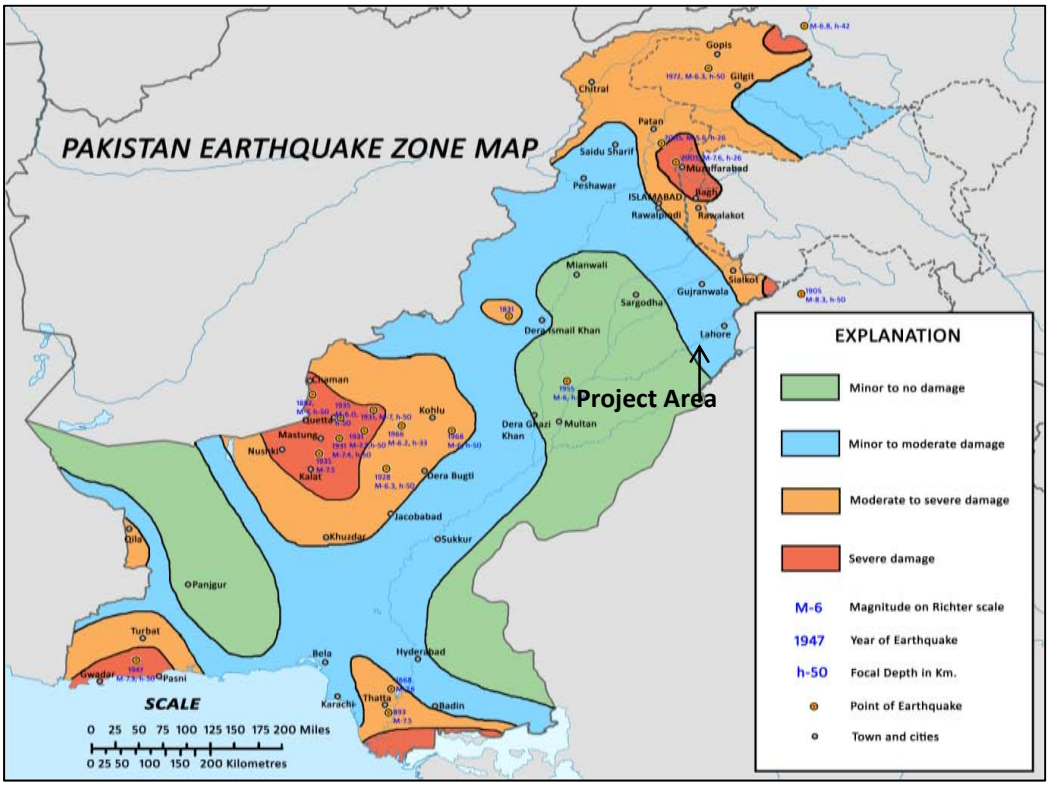


Figure 4.11: Seismic Hazard Zones of Pakistan

4.6.8 Solid Waste

The city of Bahawalpur generates approximately 280 tons of MSW every day. The existing solid waste management system (SWMS) of Bahawalpur is being managed by the Tehsil Municipal Administration (TMA). The existing solid waste collection is divided into primary and secondary collection system[8].However, Currentl y there is not any properly designed sanitary landfill site for waste disposal in the town. No proper solid waste plan has been developed. 60% of the waste generated is being collected and disposed off. This situation will worsen with the increasing population. There is no proper solid waste management system in Town that places waste in sanitary landfills. Sanitary sweepers carry solid waste by means of wheel barrow and donkey carts to secondary collection points. From here, the waste is transported to open dumping sites at different five places. These places are being used by TMA since many years Management of Solid Waste and Liquid Waste services coverage in Bahawalpur City are almost same like in other cities i.e Sargodha, Sahiwal, Rahim Yar Khan and Jhang, but far better from cities like Chiniot, Kasur, Sheikhupura, Okara, Gujrat, Dera

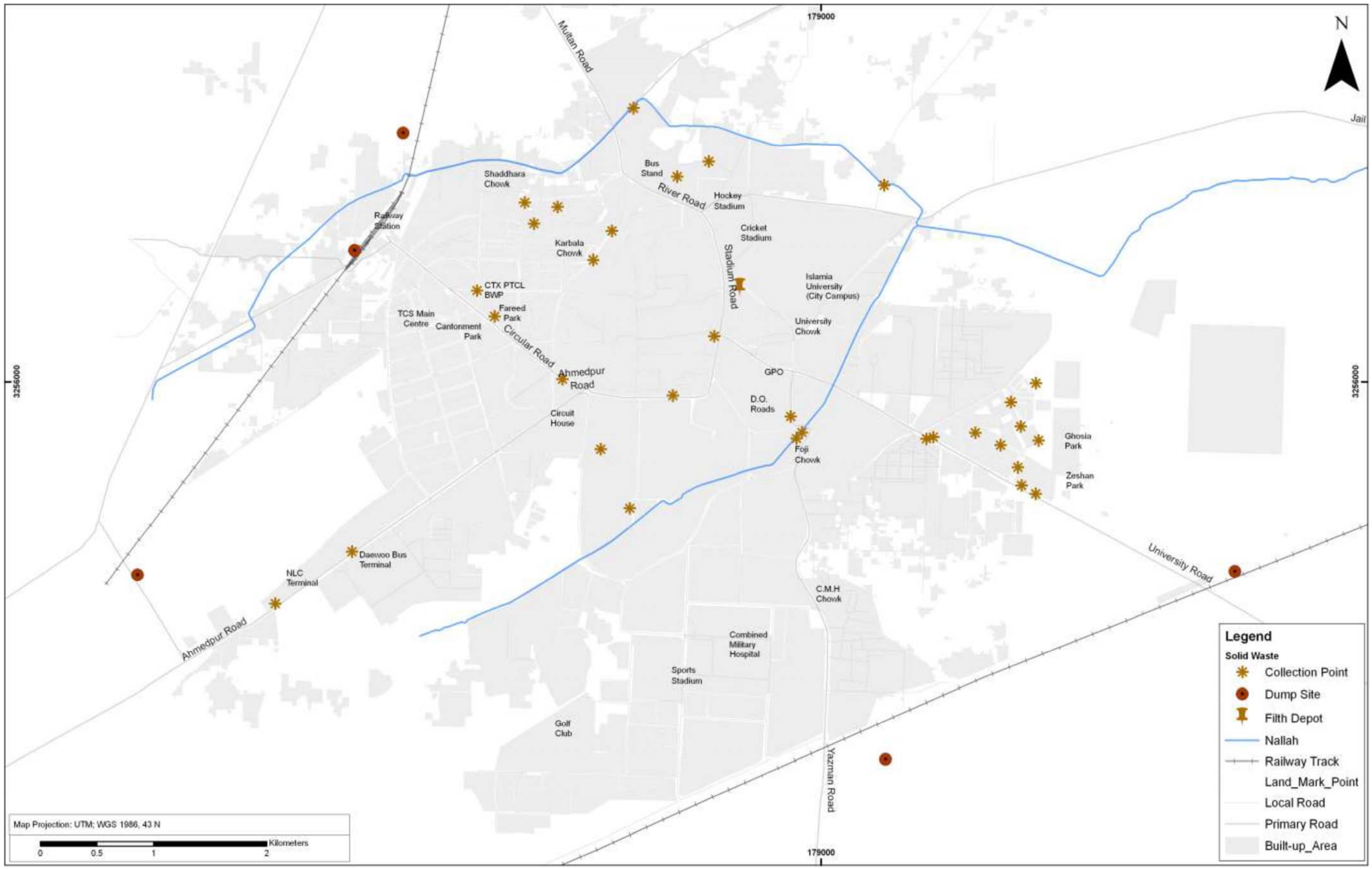
[8] **Source:** Punjab Cities Improvement Investment Program "Bahawalpur City Profile"

Ghazi Khan and Sialkot. There is no difference of ultimate disposal of both the wastes (Solid Waste and Liquid Waste) are being disposed as untreated to nearby outlets and dumping of Solid Waste near city areas. The only official site available for Waste disposal at Badar Sher is being operated without following basic principles of landfilling. This disposal site accepts only 200 tons of solid Waste every day. The Remaining chunk of MSW is being dumped in depressions, open plots and along roadside which result in serious health and environmental impacts.

BWMC envisions improvement in Solid Waste Management (SWM) and overall environment in Bahawalpur by providing scientifically designed sanitary landfill at Bhinda Dakhli. The proposed facility shall comprise of waste reception facility, weigh bridge, fencing, internal roads, surface water drainage system, leachate & landfill gas collection and treatment systems, offices, parking areas, garage and service stations etc**.** The KOICA World Bank study 2007 revealed that Bahawalpur Solid waste composed as:

- Vegetable / Putrescible 19%
- Paper & Cardboard %6
- Glass, Ceramics 10%
- Shopper Bags 6%
- PET Bottles 2%
- Plastics & Rubber 10%
- Wood, Bones, Straw 8%
- Metals 3%
- Textiles, Rags 6%
- Batteries, Syringes, etc -.
- Miscellaneous Inerts, Debris 32%

Existing solid waste management system is shown in **Figure 4.12** below.



Source: Adapted from Urban Unit"s Bahawalpur base map.

Figure 4.12: Existing Solid Waste Management System in Bahawalpur City

4.6.9 Land Use

The land use in the project area comprises of agricultural fields and sand dunes. The proposed site is also inhabited with residential settlements around it i.e Mariwala Khu, Rama and Sheikh Shajra villages etc. land use map of the project area is shown below in **Figure 4.13 (a)**, **Figure 4.13 (b)** respectivley.

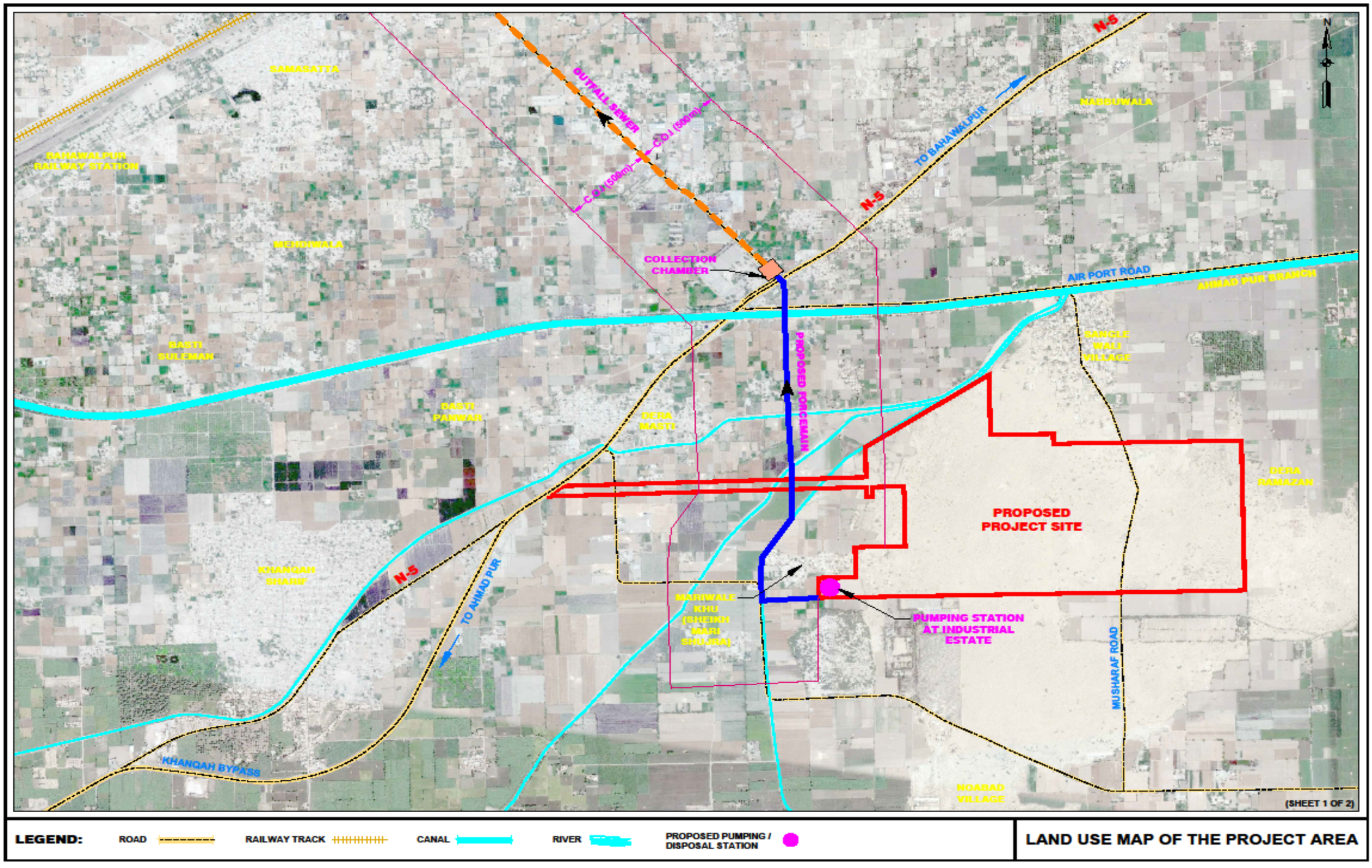


Figure 4.13(a): Land Use Map of the Project Area

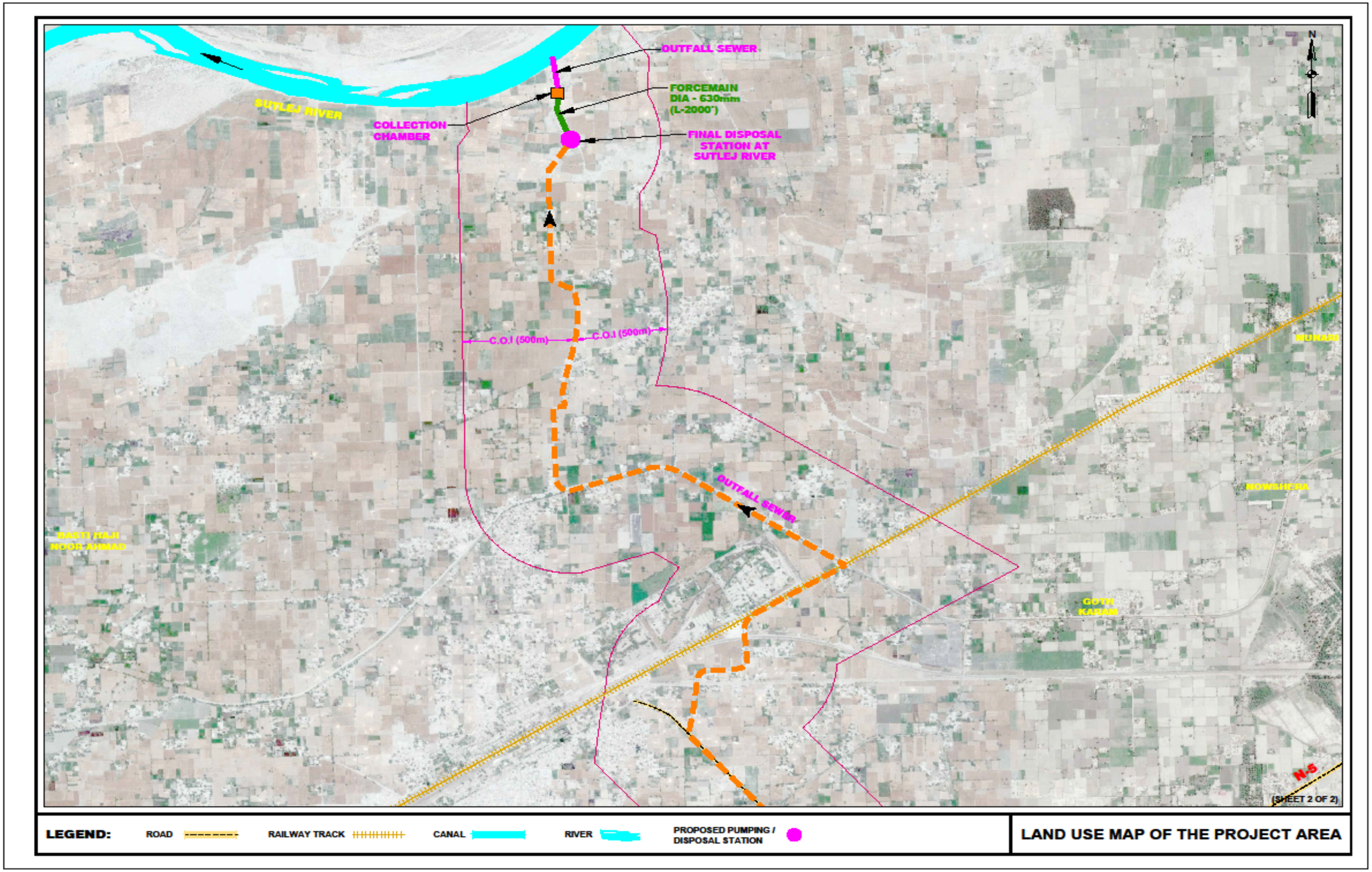


Figure 4.13(b): Land Use Map of the Project Area

4.6.10 Sensitive Receptors

Sensitive receptors within 1Km radius of the Proposed Project area were identified during the site visit. Mosques, educational institutes, graveyard and health care facilities were the sensitive receptors present within the Corridor of Impact (COI) i.e. 1Km from the Project site, whereas other sensitive receptors were present at great distances from the Project site.

A Corridor of Impact (COI) is a limit which identifies the area where direct or indirect impact of the proposed project on physical and social environment are envisaged like removal or relocation of trees, structures, utilities, and other private and public infrastructure (e.g. poles, pipes, water channels etc.) present around the Corridor of the Project.

4.6.11 Ecological Resources[9]

4.6.11.1 Flora

Flora of the district has been greatly modified by the old open forests of small trees and shrubs; there remains only a few or portions of forest which are kept as gazing ground for cattle in some area. Amongst trees the most important are Kikar (Acacia Nilotica), Frash (Tamasix Aphylla), Pillu (Salvadora Oleoides), Jand (Prosopis Spicigera), Kareer (main diet of Houbara Bustard), Phog, Khar, Grasses, Shrubs, Hurbs etc are present in the area. The main crops for which Bahawalpur is recognized are cotton, sugarcane, wheat, sunflower seeds, rape/mustard seed and rice. Bahawalpur mangoes, citrus, dates and guavas are some of the fruits exported out of the country. Vegetables include onions, tomatoes, cauliflower, potatoes and carrots. There is wild growth of mesquite bushes, and some Sirin and Kikar trees in the areas near the works, but natural forest cover in the district has been significantly reduced in the past due to clearance for cultivation. The project area has no plantation except some trees, shrubs and hurbs so there is no or minor impact on the species. The detail flora of the district ia as under:

Table 4.7: Detail Flora Of The District

Sr. No.	Trees Name	Scietific Name
1	Jand	Prosopis Spicigera

[9]District Census Report Bahwalpur, 1998

Sr. No.	Trees Name	Scietific Name
2	Karir	Capparis Aphylla
3	Farash	Tamarix Articulata
4	Pilchi	Tamarix Gallion
5	Bhos	Calliginus Polygonic Des
6	Lana	Suds Ruiteesa
7	Lani	Salsola Fostida
8	Khar	Haloxylon Recurum
9	Jawan	Alhagai Camelorum
10	Ak	Calotropis Hamiltonit
11	Lamb	Aristida Depressa
12	Chimber	Cenchrus Claria
13	Caram	Penicus Antidotale

Protected Areas/National Sanctuaries

In Pakistan there are several areas of land devoted to the preservation of biodiversity through the dedication of national parks and wildlife sanctuaries. One national park Lal Sunhara 30 km from the project site. This provides excellent feeding, breeding and resting habitats to numerous migratory as well as resident birds. The national park is located on one of the major bird migration routes of the world[10].

Lal Suhanra National Park is located in the southeastern Punjab of Pakistan with altitudes ranging from 125 to 140 meters. The flora of Park consists of 212 species belonging to 162 genera and 50 families. The Dicots having 41 families, 118 genera and 158 species, were the most diverse and dominating group of plants in this area followed by Monocots with 5 families, 40 genera and 50 species, Pteridophytes with 3 families, 3 genera and 3 species and Bryophytes represented by monotypic species. Poaceae was the leading family that contributed 43 grasses, followed by Fabaceae (16 spp.), Asteraceae (15 spp.), Chenopodiaceae (10 spp.), Euphorbiaceae (9 spp.), Boraginaceae (8 spp.), Amaranthaceae (7 spp.), Aizoaceae, Cucurbitaceae, Mimosaceae and Solanaceae (6 spp. each), Capparaceae, Caryophyllaceae and Scrophulariaceae (5

[10]Source: IEE of *Power Distribution Enhancement Multi-tranche Financing Facility– Tranche-III MEPCO New 132KV Chunawala DGS and associated Transmission Line*

spp. each), whereas, the largest genera were Chenopodium (5 spp.), Cenchrus (4 spp.) and Amaranthus (3 spp.)

a. Trees Affected by the Project

45 number of trees will be cut during construction phase of the project.

4.6.11.2 Fauna

There are no areas of wildlife significance near the project area The most common animals in the city include the hog deer, ravine deer, black buck and blue bull. Fox, jackals, hares, wild boars, porcupines, mongoose, arks, owls and hawks are also found in large numbers. Pig and hog deer are found in woodland near the river and hares are fairly common. The Bahawalpur Zoo, one of the few zoos in Pakistan, is located in Bahawalpur. Spread over an area of several acres inside the city, it contains a variety of animal species, including Asiatic lions, Bengal tigers, hyenas, leopards, and peacocks. The zoo has a collection of 130 animals and 700 birds from tropical regions, particularly those found in the Cholistan region. The zoo occasionally breeds and supply animals to other zoos in the country. It also has an aquarium and zoological museum with stuffed rare birds and animals. Located 30 kilometres east of the city is the Lal Suhanra National Park, one of the few safari parks in the country housing large animals including lions and rhinoceros.

a. Mammals

The terrestrial mammals include Cat,Dog, Horse and Donkey **(Table 4.8).**

Table 4.8: Mammals of the Project Area

Sr. No.	Scientific Name	Common Name
1.	Canis lupus familiaris	Dog
2.	Equusferus	Domestic Horse
3.	Equusafricanus	Donkey

b. Amphibians

Amphibians frequently seen in and around the project area, especially during rainy season include Frogs (Daddos) are found in great number throughout the district. Alligators (Sansars) are also found.

c. birds

Migratory birds use the Indus valley and in cold weather many varieties of duck and teal visit the district Because of intensive agriculture pesticide use is a common practice. This has impacted the bird populations adversely. Black and Grey partridges *(Francolinus francolinus and F. pondicerianus),* are the worst hit as they are also hunted and captured to be kept as pets. They need to be protected since they are affected by the spraying of pesticides. Bird species known to occur in the area are: Caracal, Chinkra, Houbara Bustard, Great Indian Bustard, Sand, Groud, Desert Costal, Grey Baridrige, Doves, Raptors, Vultures, Diversified song birds, different types of shrikes, Jackal and Jungle cat. Bashin, Tamtari, Crow and Parrot.

a. Reptiles

Snakes such as cobra, kraits etc. were once common in the tract, Kala Mushki, Sangchoor (Yellowish), Dhoi, Lundi Kharpa and Jalebi are also found. In cholistan area a very particular type of snake called Sahi Pina (breath Drinking) is also found. Lizards are of numerous and of various species, such as Sanda (the oil of which has restorative power), Spiny tailed lizard (Uromastixhardwickii) and fringed toed lizard (Acanthodactylus cantoris), are also reported in the project area. The lizards include three poisonous species called Kirla, Gohiri and Sanaha. One of these called Khanrh. **(Table 4.9)**.

Table 4.9: Reptiles of the Project Area

Sr. No.	Scientific Name	Common Name
1	Najanaja	Cobra
2	Podarcis	House Lizard

b. Fisheries

The Indus contains a variety of fish. In the winter months when the river recedes, fish are caught in greater quantity.

4.6.11.3 Wetlands

There are no wetlands in the project study area.

4.6.11.4 Endangered Species

There is no such threatening or endangers species of flora and fauna exist as indicated by IUCN red list of the species in the project study area.

4.6.11.5 Wildlife Sanctuaries and Game Reserves

No wildlife sanctuary or game reserves are located in the vicinity of the project area.

Environmentally Sensitive Area

There is not any environmentally sensitive area located in or near to the buffer zore of the project, Lal- Sohanra National Park is located approximately 30 km away from the project boundary. There is no impact of project activity on environmental sensitive area.

4.6.11.6 Critical Habitats

No wild life sanctuary or game reserve (Critical Habitats) exists in project study area and therefore it can be quantified that proposed project does not affect any critical habitat.

4.6.11.7 Cultural Heritage and Community S tructure

There are no of historical, religious or archeologically important sites in the bahwalpur district Archaeologically, and spiritually, some immensely distinguished Sufis shrines existing at Uch include those of Hazrat Jalaluddin Surkh Bukhari , Hazrat Bahawal/ Baha'al Haleem, Hazrat Syed Jalauddin Bukhari commonly known as Makhdoom Jahanian Jahangasht, and Bibi Jawanadi and Shaikh Saifuddin Ghazrooni .like Mausolleum of Syed Jalaluddin Bukhari and his family were joined by a series of domed tombs[11]. The first is said to have been built for Baha' al-Halim/ Haleem by his pupil, while the second is Jahaniyan Jahangasht's tomb is next to Bibi Jawindi Mausoleum. Channan Pir Shrine is located an hour's drive away from Bahawalpur City and 45 km from Derawar Fort. Channan Pir was a disciple of Makhdoom Jahanian Jahangasht of Uch Sharif. The city is also renowned for its many famous palaces which include Noor Mahal, Darbar Mahal, Sadiq Ghar Palace, as well as some more ancient fort of Derawar located in the Cholistan Desert and bordering India.

There are no officially protected heritage sites or historic, religious or archeologically important sites located in the project works areas. There is a major historic or archaeological feature (Masjid Al Saddiq)present within the project site 11.75Km away from the project site.

[11] *Pakistaniaat: A Journal of Pakistan Studies* Vol. 2, No. 2 (2010)

4.7 Socio-economic Baseline Structure

This section deals with the existing social conditions of the proposed project area. During the desk/ office study, available reports/ documents were comprehensively reviewed. Detailed site visits were conducted by the Consultants' EIA team (Sociologists and Environmentalists) to appraise the prevailing socio economic conditions and to assess the impacts of Construction of Bahawalpur Industrial Estate during construction on the local settlements To achieve the project objectives, it is imperative to study the prevailing socio-economic conditions of the local community. During the field survey, interviews and meetings were conducted with the local residents of the project area, shop owners, shop keepers (renters), customers, pedestrians, farmers and road users etc. Observations were made after giving consideration to the desk/ office study results. The survey tool used for the socio-economic survey is attached as an **Annexure – V.**

4.7.1 Political and Administrative Setup

The project area falls in the administrative jurisdiction of District Bahawalpur, which is under general charge of the Deputy Commissioner, followed by five Assistant Commissioners and ten Magistrates responsible for the coordination of function of all the nation building departments in the district. The judicial administration of the district is under the charge of district and session judge along with five additional district judges.

4.7.2 Study Area

The study area falls in Bahawalpur City and Saddar Tehsil. According to DCR Bahawalpur 2017, it has a population of 1,256.646 persons of which 681.696 population is of City Tehsil while 574.950 population is of Saddar Tehsil.

4.7.3 Population and Communities

Along the project area, village Mari Sheikh Shujra, Sangal Wali Pull Village, Noabad and Dera Ramazan Village were located. Brief description about each village is presented below.

Mari Sheikh Shujra Village:

Mari sheikh shujra is situated at a distance of 100 m from the proposed project site. It consists of 110 households having a total population of approximately 900 persons. Electricity facility is available in the village. Hand Pumps/Ground Water is the

available source for drinking water. Basic Heathcare Units (BHU) and dispensaries are available in the village. Educational facility is available for both boys and girls. There is no post office and commercial bamk located at Mari Sheikh Shujra Village.

Sangal Wali Pull Village:

Sangal Wali Pull Village is situated at a distance of 360 m approximately from the proposed project site. It consists of 200 households having a total population of approximately 3500 persons. Electricity facility is available in the village. People use drinking water from filtration plants installed by the government departments. are the available sources for drinking water. No Medical and Educational facility is available in the village.

Noabad Village:

Noabad Village is situated at a distance of 1770 m approximately from the proposed project site. It consists of 800 households having a total population of approximately 5000 persons. Electricity facility is available in the village. Hand Pumps/Ground Water is the available sources for drinking water. No Medical facility is available in the village. Educational facility is available for both boys and girls.

Dera Ramazan Village:

Dera Ramazan Village is situated at a distance of approximately 400 m from the proposed project site. It consists of 30 households having a total population of approximately 200 persons. Electricity facility is available in the village. Hand Pumps are the available sources for drinking water.Government Hospital facility is available in the village. Educational facility is available for both boys and girls.

4.7.4 Demographic Characteristics of Bahawalpur District

The total population of Bahawalpur District was 2,433,091as enumerated in March 1998 with an intercensal percentage increase of 67.4 since March 1981 when it was 1,453,438 souls. The average annual growth rate of population in the district during intercensal period 1998-2017 was 3.07 percent. The total area of the district is 24,830 square kilometers which gives population density of 98 persons per square kilometer as against 59 persons observed in 1981 indicating a fast growth rate of the district. **Table 4.10** gives population, its intercensal increase and average annual growth rate since 1951 of Bahawalpur district. Later on 1998, the massive efforts are made to count the population and census bureau carried out latest census and released the latest statistics

of 2017 at the national, provincial and district level. According to the results, the total population of Pakistan is measured as 207,774,520 persons with annual growth rate of 2.40% and the population of Punjab is 110,012,442 persons with annual growth rate of 2.13%. By the annual growth rate of 2.18%, the population of District Bahawalpur is estimated as 3,668,106 persons out of which 1,879,311were male and 1,788,578were female. Sex ratio is measured as 105.07 percent.

Table 4.10 Households, Population Increase, Sex Ratio and Growth Rates

Sr. No	Area	Households	Population-2017				Population 1998	Sex Ratio 2017	1998-2017 Average Annual Growth Rate
			Male	Female	Trans-gender	All Sexes			
1	Bahawalpur	584,864	1,879,311	1,788,578	217	3,668,106	2,433,091	105.07	2.18
2	Punjab	17,103,835	55,958,974	54,046,759	6,709	110,012,442	73,621,290	103.54	2.13
3	Pakistan	32,205,111	106,449,322	101,314,780	10,418	207,774,520	132,352,279	105.07	2.40

Source: Pakistan Bureau of Statistics (Census 2017)

A) Rural and Urban Distributions

The urban population was 665,304 or 27.3 percent of the total population of the Bahawalpur district, which grew at an average rate of 4.21 percent during 1981-98. The growth decreased from 4.65 percent, which was observed during 1972-81. There are one Metropolitan Corporation, two Municipal Committees, one Cantonment and four Town Committees in the District.

There were 1,216 Mauzas (a smallest revenue unit) in 1998. Of these 71 had population over 5 thousand, another 265 had 2 to 5 thousand, 232 had one to two thousand, and 389 had under one thousand persons while 259 were un-inhibited.

B) Religion

The population of the district is predominantly Muslims i.e. 98.1 percent. The next higher percentage is of Hindu with 0.9 points followed by Christian 0.6 percent. While other minorities like Ahmadis, Schedule Castes etc. are very small in number as shown in the **Table 4.11** given below:

Table 4.11: Percentage of Population by Religion and Rural/ Urban Areas

Religion	Bahawalpur District		
	All Areas (%)	Rural (%)	Urban (%)
Muslims	98.1	98.1	98.0
Christians	0.6	0.3	1.4
Hindu	0.9	1.1	0.3
Ahmadis	0.1	0.1	0.1
Scheduled Castes	*	*	*
Others	0.3	0.3	0.1

**** Refers to a very small number***
Source: DCR Bahawalpur District, 1998

C) Ethnic Structure

The main castes and groups of the Bahawalpur district are Arain, Jatt, Rajput, Pathan, Gujjar, Baloch, Qureshi and Syed. These casts have been further sub-divided in various sub- caste and sub-tribes.

D) Mother Tongue

The mother tongue refers to the language used for communication between parents and their children in any household. Siraiki is the predominant language being spoken by majority (64.3 percent) of the population of the district followed by Urdu, Pushto and Punjabi being spoken by 5.5, 0.6, and 28.4 percent.

E) Sex Ratio

Number of males for every 100 females was 111 percent recorded in 1998 Census in the district, which had decreased from 113 in 1981. The ratio was 109 percent in rural areas and it was 115 in urban areas. According to census 2017, Sex ratio is measured as 105.07 percent.

F) Marital Status

The population above 15 years was classified into never married, married, widowed and divorced. 28.0 percent of the total population was never married, 66.2 percent married, 5.5 percent widowed and 0.4 percent divorced. The percentage share of never married male was higher than that of females, being 33.2 percent and 22.1 percent respectively. The percentage of never married females was higher in urban than in rural

areas. **Table 4.12** gives details about percentage of population 15 years and above by marital status, sex and rural and urban residence.

Table 4.12: Population Percentage Distribution by Marital Status, Sex and Rural/Urban Areas

Marital Status		Bahawalpur District		
		All Areas (%)	Rural (%)	Urban (%)
Never Married	Both Sexes	28.0	26.2	32.5
	Male	3.23	31.8	36.7
	Female	22.1	20.1	27.4
Married	Both Sexes	66.2	67.9	62.0
	Male	63.0	64.2	60.3
	Female	69.7	71.8	64.0
Widowed	Both Sexes	5.5	5.6	5.2
	Male	3.5	3.8	2.8
	Female	7.7	7.5	8.1
Divorced	Both Sexes	0.4	0.4	0.3
	Male	0.2	0.3	0.2
	Female	0.6	0.6	0.5

Source: DCR of Bahawalpur District, 1998

G) Migration

The total number of life time in-migrants in Bahawalpur district was 150,785 or 6.2 percent of the population of the district. Of total life time in-migrants 59,823 persons settled in the towns. Of total district migrants 77.2 percent came from other districts of the Punjab, 4.3 percent were from Sindh, NWFP and Baluchistan while remaining 18.5 percent were Pakistanis who repatriated from other countries. There is no case of migrants whose birth place was not reported. **Table 4.13** throws light on life time in-migrants with their decomposition by place of origin and settlement in rural and urban areas of the district.

Table 4.13: Life Time Migrants in the District by Rural/ Urban Areas, 1998

Description	Migrants by Residence		
	All Areas (%)	Rural (%)	Urban (%)
Total in-migrants	100	100	100
Migrants from the same province	77.2	80.5	72.1
Migrants from other provinces	4.3	4.5	4.1
Migrants from AK/ NA	**	**	**
Migrants from other countries	18.5	15.0	23.8
Migrants from places not reported	0	0	0

Source: DCR of Bahawalpur District, 1998
*** Including FATA and Islamabad Capital Territory**
**** refers to very small number**

4.8 Economic Conditions

A) Economically Active Population of the Bahawalpur District

The economically active population is defined here as the persons working most of the time during the year preceding the census date i.e. 5th March 1998, looking for work, lay off and un-paid family helpers assisting their family. The economically active population as enumerated in the last census was 26.4 percent of the total population or 38.4 percent of the 10 years and over i.e. the population exposed to the risk of entering the economically active life at any time. The formal percentage is known as Crude Activity Rate (CAR), while the latter is known as Refined Activity Rate (RAR). Of the total male population 49.3 were economically active, while 50.7 percent were inactive, 30.8 percent children under 10 years, 10.1 percent students, 1.6 percent domestic workers, while 8.2 percent were landlords, property owners, retired persons, disabled etc. Further details can be seen in **Table 4.14.**

Table 4.14: Percentage (%) of Population by Economic Categories, Sex and Rural/Urban Areas, 1998

Economic Category	All Areas (%)			Rural (%)			Urban (%)		
	Both Sexes	Male	Female	Both Sexes	Male	Female	Both Sexes	Male	Female
Economically Active	26.4	49.3	1.0	26.2	49.5	0.7	26.9	48.7	1.4
Economically Inactive	73.6	50.7	99.0	73.8	50.5	99.3	73.1	51.3	98.4
Children under 10	31.4	30.8	32.0	32.4	32.1	32.8	28.6	27.5	29.9

Economic Category	All Areas (%)			Rural (%)			Urban (%)		
	Both Sexes	Male	Female	Both Sexes	Male	Female	Both Sexes	Male	Female
Students	5.6	10.1	0.5	4.5	8.2	0.4	8.4	14.9	0.9
Domestic Workers	32.3	1.6	66.4	32.5	1.8	66.0	32.0	1.2	67.5
Others	4.4	8.2	0.1	4.4	8.4	0.1	4.1	7.7	0.1
Unemployment Rate	19.8	20.0	6.1	19.3	19.4	8.7	21.1	21.6	2.9

Source: DCR of Bahawalpur District, 1998

B) Unemployment

Unemployment rate is measured as ratio of looking for work and laid off in total economically active population comprising employed, looking for work, laid off and unpaid family workers, generally representing in percentage. The unemployment rate was 19.8 percent, which was mainly due to unemployment amongst males representing 20.0 percent, while female unemployment rate was just 6.1 percent. This is because of their small proportion in total economically active population. The detail is given in above in **Table 4.19.**

C) Employed Population by Occupations

In 1998 of the total employed persons, 34.8 percent had elementary occupations, followed by service workers, and shop and market sale workers, 9.2 percent and professional 3.5 percent. In rural areas people having elementary occupations, were again in majority followed by skilled agricultural and fishery works and service workers and shop and market sale workers represented 56.3, 31.7, and 5.3 percent respectively. The highest percentage in urban area is of elementary occupations too, followed by service workers and shop and market sales workers having 43.1and 19.4 percent respectively. Further details are given in **Table 4.15.**

Table 4.15: Percentage of Employed Population by Occupation & Rural/Urban Areas, 1998

Occupation		All Areas (%)	Rural (%)	Urban (%)
Sr No.	Description			
1	Legislators, Senior Officials and Managers	0.3	0.4	0.2
2	Professional	2.3	1.1	5.5
3	Technicians and Associate Professionals	2.6	1.3	5.9
4	Clerks	0.9	0.5	2.1
5	Services Workers and Shop and Market Sales	9.2	5.3	19.4

Occupation		All Areas (%)	Rural (%)	Urban (%)
Sr No.	Description			
	Workers			
6	Skilled Agricultural and Fishery Workers	44.7	56.3	14.0
7	Craft and Related Trade Workers	3.5	2.2	6.9
8	Plant and Machine Operators and Assemblers	1.6	1.1	2.9
9	Elementary Occupations	34.8	31.7	43.1
10	Others	0.2	0.1	0.2

Source: DCR of Bahawalpur District, 1998

D) Industry, Trade and Trade Centers

The Most famous industries lying in Bahawalpur area include Fertilizer, Sugar, Cotton, and Textile, Beverages, flour & Cottage Industries. Fuji Fertilizer Company , Unilever , Jamal Din wali Sugar Mill, Hamza Sugar mill, Itehad Sugar Mills are the most important industries playing fundamental role in the economy of the area. Being an industrial expanding city the government has revolutionized and libertised various markets allowing the Caustic Soda, Cotton Ginning & Pressing, Flour Mills, Fruit Juices, General Engineering, Iron & Steel Re-rolling Mills, Looms, Oil Mills, Poultry Feed, Sugar, Textile Spinning, Textile Weaving and Vegetable Ghee & Cooking Oil industries to flourish.

4.9 Educational Facilities

The district has literacy rate of 35% (1998 census) with male literacy rate at 44.9% and female at 24%. Looking across regions, 57% of urban population (Male: 52.9%; Female: 47.1%) and 26.3% rural population (Male: 36.4%; Female: 15.1%) of Bahawalpur are literate. However, according to (Multiple Indicator Cluster Surveys) MICS 2007-08 survey, the literacy rate above 10 years is 45% (Male 51.66%; Female: 48.34 %). Similarly, urban rural distribution shows 65% urban population (Male: 52.5 %; Female: 47.5%) and 37% rural population (Male: 51.3 %; Female: 48.7%) is literate. There are over 1600 government primary schools- 45% of which are for girls. Middle schools are 226, over 60% are for girls, and 39% for boys, while high schools are 125 and 62% are for boys. As level of education increases, percentage of boys schools increases in the district. However, higher secondary schools are the same in the district, 14 each. Total number of arts and science degree colleges are 18 having enrolment of almost 20,000 students and teaching strength of 543. The higher education institutions in Bahawalpur district include; Islamia University of Bahawalpur, Asian

college of Technology Hasilpur Road Bahawalpur, Rise School of Accountancy, Tebiya College, Four Elementary colleges for teaching training, Quaid-e-Azam Medical College (QAMC), Government Sadiq Egertin College (SE College), Government Sadiq Degree College for Girls, Millat College and Post Graduate College Baghdad Road. Number of educational institutions by sex and type is given in the **Table 4.16** below.

Table 4.16: Educational Institutions by Sex and Type

Sr. No.	Name of Institutions	Institute		
		Male	Female	Private
1	Primary	797	756	138
2	Middle	80	85	120
3	High/Secondary	04	03	-
4	Intermediate Colleges	03	02	-
5	Degree Colleges	02	03	-
6	Vocational Institute	02	01	-
Total		**888**	**850**	**258**

Source: DCR of Bahawalpur District, 1998

Project Area

In the project area, government educational system is found named as government girls primary school in Mari Sheikh Shujra village.

4.10 Health Facilities

Health conditions are one of the major determinants of a society's social development and quality of life. Healthy manpower is imperative for advancement and economic growth. The major health facilities available in the district are District Headquarter Hospital, Tehsil head quarters Hospital at each Tehsil along with M.C. Health Centre, Primary Rural Health Centers, Primary Dispensaries, Basic Health Units, TB Centers and 72 Dispensaries. The Zila Council is also running dispensaries, MC Centers and Veterinary Hospitals.

Project Area

The proposed project area includes Basic health unit (BHU) in Mari Sheikh Shujra village.

4.11 Socioeconomic Baseline Survey

The information regarding socioeconomic baseline survey is based on the primary data collected from the project area. Baseline survey was carried out to identify the socioeconomic conditions and their impacts & magnitudes on the affected population. A sample of 100 respondents was selected on the basis of simple random sampling technique, which includes farmers, shop keepers (renters), customers, local residents, pedestrians, road users and students etc. During the survey, both males and females were included in the sample.

Efforts were made to include the different types of stakeholders according to their stakes in the sample and contact the maximum population during the survey. The survey tool used for the socio-economic survey is attached as an **Annexure – V.**

4.12 Methodology

Data Source

Data collection for socioeconomic study of the proposed project involved socio-economic baseline survey of the proposed project area.

i) Primary Data

Primary data was collected through socio-economic baseline survey. For the selection of respondents simple random sampling technique was adopted and 100 households residing within the project area and in the vicinity of proposed project were selected. After determining sample size, an interview schedule was developed for the collection of baseline data. That includes demographic characteristics, livelihoods, economic conditions, family patterns, household sizes, quality of life and land acquisition and settlement patterns etc.

The collected data was analyzed by a software called "Statistical Package for Social Sciences" (SPSS), because it has an easier and quicker access to basic functions and also useful to get the actual and accurate results of baseline data.

Spread sheet format was created in SPSS in the form of quantitative data. After entering, checking, sorting, and transforming the data, the basic operation, data analysis was taken place through descriptive analysis by finding out the percentages and the frequencies of the respondent's views in the form of tables and charts/graphs. These

percentages, frequencies and charts/graphs of baseline data were automatically generated by this software.

ii) Secondary Data

Secondary data was collected from District Census Report (DCR) Bahawalpur, 1998, Pakistan Bureau of Statistics (Census 2017) for socio economic baseline survey.

4.12.1 Field Survey

A site visit of the proposed project was carried out during the month of January, 2018. This included the collection of demographic and socio-economic baseline information. During the survey major focus was to collect information about educational levels, economic resources and dependencies, family patterns, household sizes, quality of life, availability of facilities, water resources and its use & satisfaction, perceived impacts of the project, their protective measures, basic needs, the means to safeguard their interests during project implementation. Along the project area, village Mari Sheikh Shujra, Sangal Wali Pull Village, Noabad Village and Dera Ramazan Village were included in the sample survey. A Written feed back from the respondents in the project area attached as an **Annexure –VI.**

4.12.2 Survey Results

1. Demographic Characteristics of the Respondents

Demography is defined as statistical analysis of data about the characteristics of a population, such as the age, sex / gender, religion, ethnic structures, mother tongue, marital status of the people within the population. According to survey, demographic characteristics of sampled population are described hereunder;

a) Sex Ratio of the Respondents

The sex ratio is proportional distribution of the sexes in a population aggregate, expressed as the number of males per 100 females. During the baseline survey, 100 respondents were interviewed, comprising 100% males and no females. **Table 4.17** shows sex ratio of the respondents.

Table 4.17: Sex Ratio of the Respondents

Sex Ratio of the Respondents			
Sr. No.	**Sex Ratio**	**Number**	**Percentage (%)**
1	Male	100	100
2	Female	00	00
Total		**100**	**100**

Sex ratio of the respondents is shown in the following pie chart **(Figure 4.14)**.

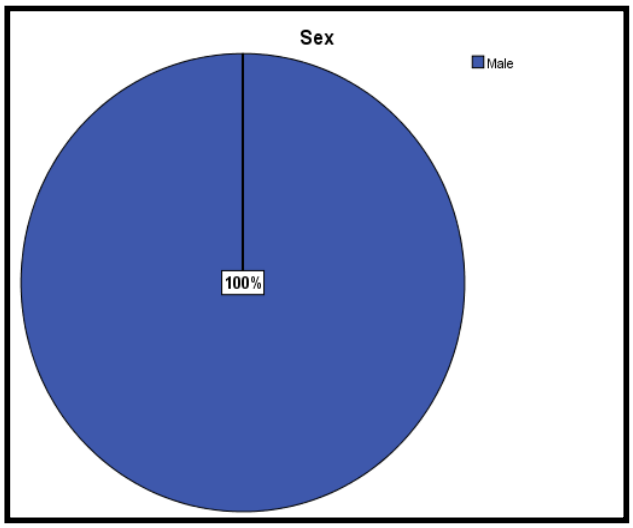


Figure 4.14: Sex Ratio of the Respondent

b) Age Composition of the Respondents

The demographic characteristics of the sample survey (**Table 4.18**) showing that 20% of the respondents were up to 25 years of age, 18% of the respondents were aged between 26 – 35 years while, 28% were 36 – 45 years and 34% respondents were more than 45 years of age. These figures show that sampled respondents were mature enough to give their opinion about the proposed project and have envisioned of its impacts.

Table 4.18: Age Composition of the Respondents

Age Composition of Respondents			
Sr. No.	**Frequency Distribution**	**Number**	**Percentage (%)**
1	15-25	20	20
2	26-35	18	18
3	36-45	28	28
4	Above 45	34	34
Total		**100**	**100**

The pie chart **(Figure 4.15),** given below shows the age composition of the respondents.

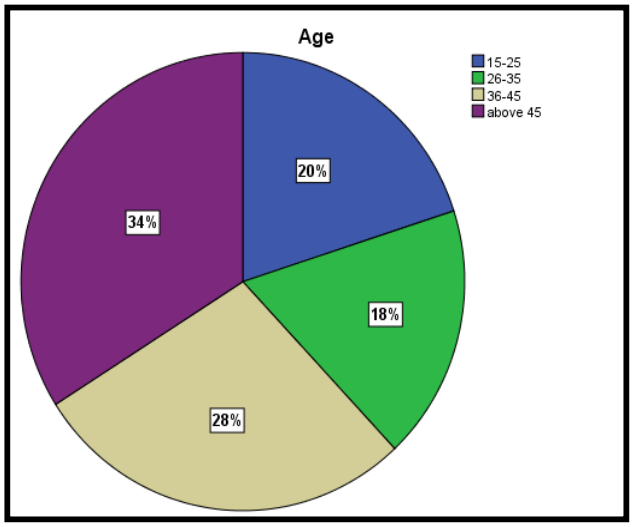


Figure 4.15: Age Composition of the Respondents

c) Religion

According to baseline survey results 100 respondents, 100% of the respondents interviewed were Muslims (**Table 4.19).**

Table 4.19: Religion of the Respondents

Religion			
Sr. No.	**Religion**	**Number**	**Percentage (%)**
1	Islam	100	100
Total		**100**	**100**

The pie chart **(Figure 4.16),** given below shows the religion of the respondents.

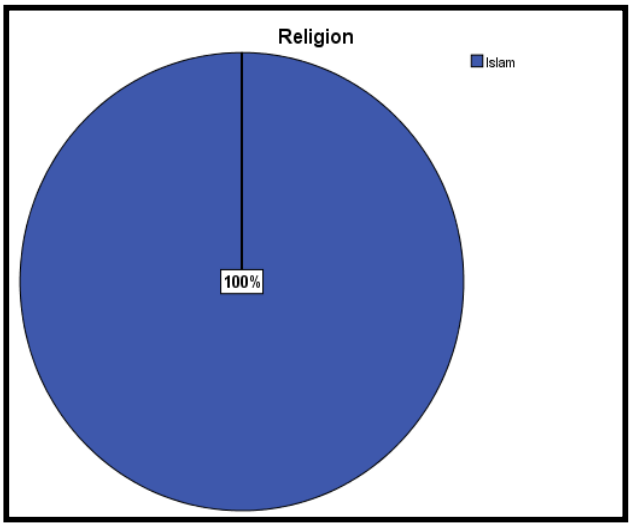


Figure 4.16: Religion of the Respondents

d) Marital Status

In sampled respondents, the percentage share of the married respondents was higher than that of the unmarried. Majority of the respondents i.e. 90% were married while 10% were unmarried **(Table 4.20).**

Table 4.20: Marital Status of the Respondents

Marital Status			
Sr. No.	**Marital Status**	**Number**	**Percentage (%)**
1	Married	90	90
2	Unmarried	10	10
Total		**100**	**100**

The pie chart **(Figure 4.17)** given below shows the marital status of the respondents.

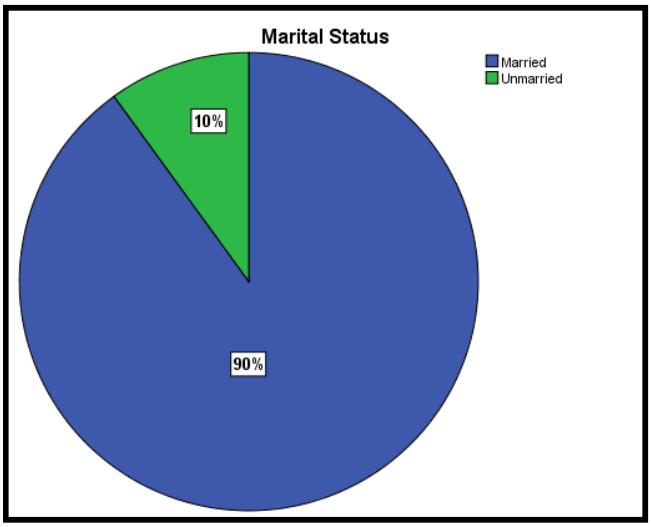


Figure 4.17: Marital Status of the Respondents

e) Mother Tongue

When respondents were asked about their mother tongue then it was observed that Siraiki language is the predominate language being spoken in the project area. (100% respondents) **Table 4.21** shows the language being spoken by the respondents.

Table 4.21: Mother Tongue of the Respondents

Mother Tongue			
Sr. No.	**Mother Tongue**	**Number**	**Percentage (%)**
1	Siraiki	100	100
Total		**100**	**100**

The mother tongue used by the respondents is illustrated in the following pie chart **(Figure 4.18)**.

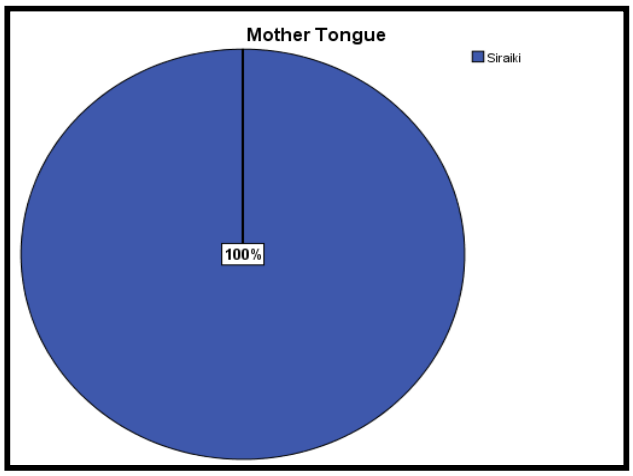


Figure 4.18: Mother Tongue of the Respondents

f) Caste / Ethnic Group

According to baseline survey, it was found that the largest part of the respondents i.e. 38% were Larah, 24% were Jutt, 14% were Lashari, 08% were Qureshi, and 06% were Bhutta. While 04% were Syed and Khokar each and 02% were Chohan. The castes of the sampled respondents are given in **Table 4.22.**

Table 4.22: Caste / Ethnic Group of the Respondents

Caste / Ethnic Group			
Sr. No.	**Caste / Ethnic Group**	**Number**	**Percentage (%)**
1	Larah	38	38
2	Jutt	24	24
3	Lashari	14	14

Caste / Ethnic Group			
Sr. No.	**Caste / Ethnic Group**	**Number**	**Percentage (%)**
4	Qureshi	08	08
5	Bhutta	06	06
6	Syed	04	04
7	Khokar	04	04
8	Chohan	02	02
Total		**100**	**100**

The pie chart below **(Figure 4.19)** shows the caste distribution of the respondents

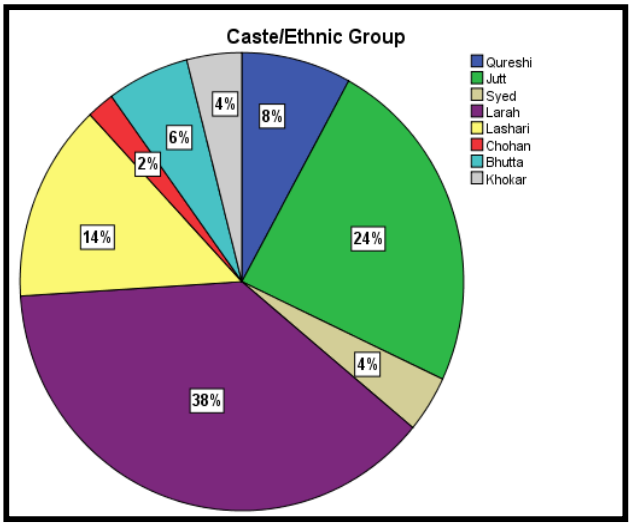


Figure 4.19: Caste/Ethnic Group of the Respondents

2. Quality of Life

a) Educational Status of the Respondents

From survey results (**Table 4.23)** it was found that educational attainment for sampled population of project area is very low because out of 100 respondents, 48% were illiterate. 24% respondents were educated up to primary level, 12% were up to middle level, 08% respondents were up to metric level, 06% respondents were up to intermediate level whereas only 02% respondents were above intermediate level.

Table 4.23: Educational Status of the Respondents

Educational Status of the Respondents			
Sr. No.	**Educational Status**	**Number**	**Percentage (%)**
1	Illiterate	48	48
2	Primary	24	24
3	Middle	12	12
4	Metric	08	08

Educational Status of the Respondents			
Sr. No.	**Educational Status**	**Number**	**Percentage (%)**
5	Intermediate	06	06
6	Above Intermediate	02	02
Total		**100**	**100**

The pie chart given below in **(Figure 4.20)** shows the educational status of the respondents.

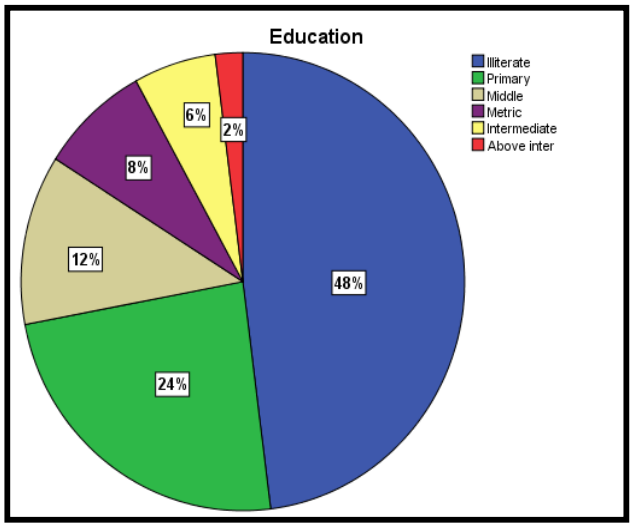


Figure 4.20: Educational Status of the Respondents

b) Professional Status of the Respondents

According to socioeconomic survey findings, it was witnessed that out of 100 respondents, 02% are doing government and private jobs each, 04% are doing their own businesses and working on their shops, majority i.e. 44% respondents are working as labor, 32% of the respondents were involved in agriculture / farming on their lands and 04% are doing livestock business while 12% belong to other categories.

During survey, efforts were made to amalgamate with people from all walks of life. The detailed statistics based on sample survey, regarding professional status of the respondents are shown in **Table 4.24**

Table 4.24: Professional Status of the Respondents

Professional Status of Respondents			
Sr1. No.	**Professional Status**	**Number**	**Percentage (%)**
1	Labor	44	44
2	Agriculture	32	32

Professional Status of Respondents			
Sr1. No.	**Professional Status**	**Number**	**Percentage (%)**
3	Business/Shop	04	04
4	Livestock	04	04
5	Govt. Job	02	02
6	Private Job	02	02
7	Any Other	12	12
Total		**100**	**100**

Pie chart **(Figure 4.21)** shows the professional status of the respondents is given below.

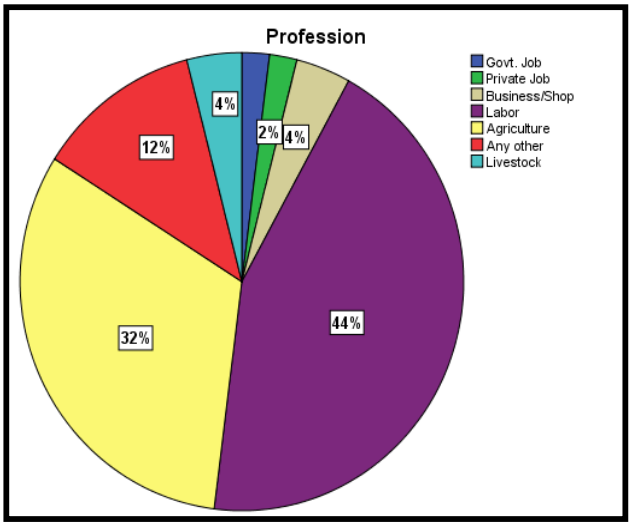


Figure 4.21: Professional Status of the Respondents

c) Source of Income

Socioeconomic survey findings depicted that out of 100 respondents, majorities i.e. 46% are doing labor, 36% of the respondents are working as farmers in agricultural fields, 08% are doing their own businesses, 04% of the respondents are doing services and livestock and 02% belongs to some other source of income which they do not want to mention here. Source of income of the respondents are shown in **Table 4.25.**

Table 4.25: Source of Income of Respondents

Sr. No.	Source of Income	Number	Percentage (%)
1	Business/shop	08	08
2	Labor	46	46
3	Agriculture	36	36
4	Livestock	04	04
5	Service	04	04

Sr. No.	Source of Income	Number	Percentage (%)
6	Any Other	02	02
Total		**100**	**100**

Pie chart **(Figure 4.22)** which shows the source of income of the respondents is given below.

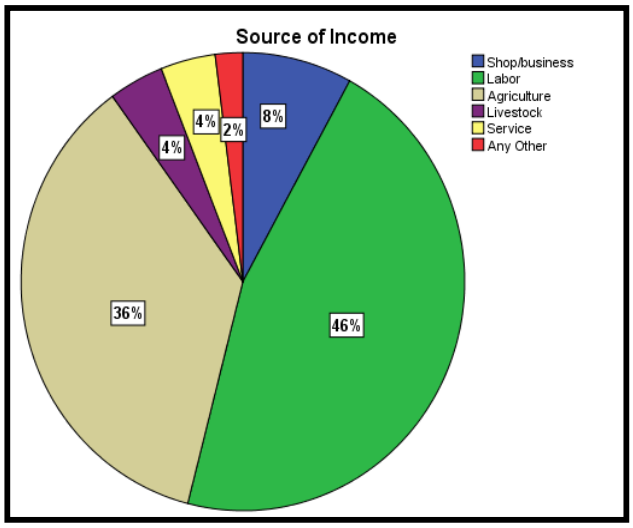


Figure 4.22: Source of Income of the Respondents

d) Average Monthly Income

The income status of the respondents was evaluated by dividing the respondents into different income categories. During field survey, it was observed that out of 100 respondents, 02% respondents earn up to Rs.13,000, 92% respondents fall within the income range of Rs.13,000 to 26,000, 04% of the respondents are earning up to Rs.26,001-39,000 and 02% earn above Rs.39,000. **Table 4.26** shows income status of the respondents.

Table 4.26: Average Monthly Income of the Respondents

Average Monthly Income of the Respondents			
Sr. No.	**Distribution**	**Number**	**Percentage (%)**
1	Rs.Up to 13,000	02	02
2	Rs.13,000 to 26,000	92	92
3	Rs.26,001 to 39,000	04	04
4	Rs.above 39,000	02	02
Total		**100**	**100**

In the Pie chart **(Figure 4.23),** the income groups of various respondents are shown below.

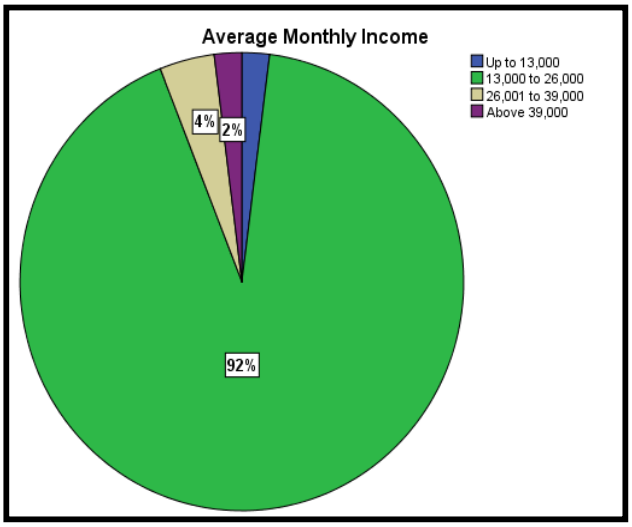


Figure 4.23: Average Monthly Income of Respondents

e) Average Monthly Expenditures

Table 4.27 shows expenditure distribution of the respondents. Out of 100 respondents, majority of 94% respondents fall in average monthly expenditure range of Rs.13,000 to 26,000, while 04% respondents fall within the expenditure range of Rs.26,001 to 39,000 and only 02% respondents have the expenditure range of above 39,000 rupees.

Table 4.27: Average Monthly Expenditures of the Respondents

Average Monthly Expenditures of the Respondents			
Sr. No.	**Distribution**	**Number**	**Percentage (%)**
1	Rs.13,000 to 26,000	94	94
2	Rs.26,001 to 39,000	04	04
3	Rs.above 39,000	02	02
Total		**100**	**100**

In pie chart **(Figure 4.24),** the average monthly expenditures of various respondents are shown below.

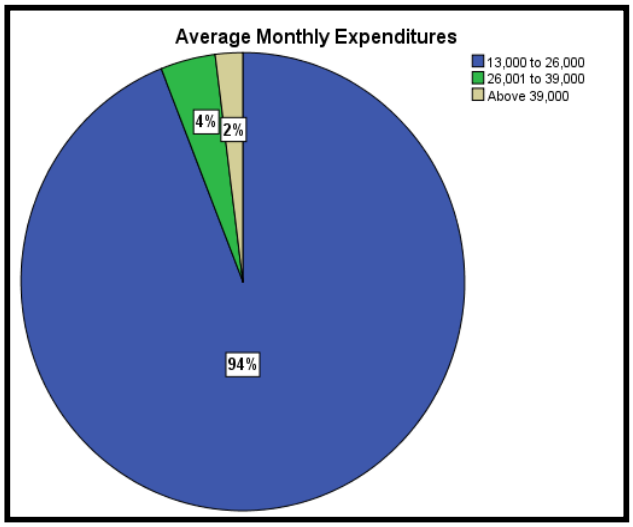


Figure 4.24: Average Monthly Expenditures of Respondents

4. Family Pattern and Household Size

a) Family System

Survey result shows that majority of the respondents i.e. 86% are living in the joint family system in which parents and children live with other combinations of family members while 14% are living in the nuclear family system (**Table 4.28)**.

Table 4.28: Family System of the Respondents

Family System			
Sr. No.	**Type**	**Number**	**Percentage (%)**
1	Joint	86	86
2	Nuclear	14	14
Total		**100**	**100**

Pie chart given below **(Figure 4.25)** shows the family system of the respondents.

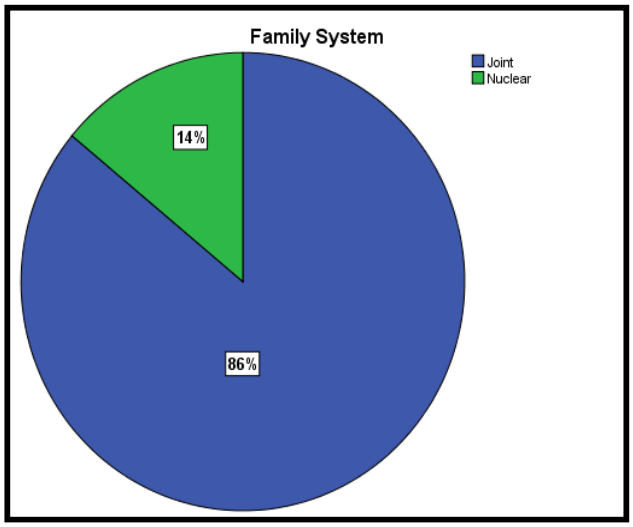


Figure 4.25: Family System of the Respondents

b) Average Household Size

It is clear from data presented in the **Table 4.29** that the majority of the respondents 48% reported their household size ranging from 6-8 persons, 34% respondents have the household size ranging from 3-5 persons whereas 18% families had household size of above 8 family members.

Table 4.29: Average Household Size of Respondents

Average Household Size			
Sr. No.	**Distribution**	**Number**	**Percentage (%)**
1	3 to 5	34	34
2	6 to 8	48	48
3	Above 8	18	18
Total		**100**	**100**

The pie chart given **(Figure 4.26)** shows the average household size of the respondents.

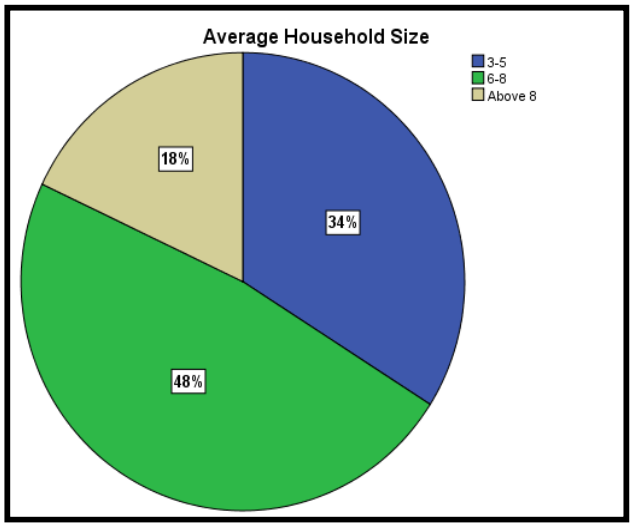


Figure 4.26: Average Household Size of Respondents

5. Housing & Settlement Pattern

a) Ownership Status of the Houses/Shops

Ownership status of the house depict that how much respondents belong to self owned or rented structures (houses and shops). During field survey it was observed that out of 100 respondents, majority of the respondents i.e. 90% have self owned houses/shops and remaining 10% of the respondents are the renters. Following **Table 4.30** shows the ownership status of the respondents.

Table 4.30: Ownership Status of the Houses

Ownership Status of Houses			
Sr. No.	**Status**	**Number**	**Percentage (%)**
1	Self-Owned	90	90
2	Rented	10	10
Total		**100**	**100**

The pie chart given below **(Figure 4.27)** shows the ownership status of the respondents.

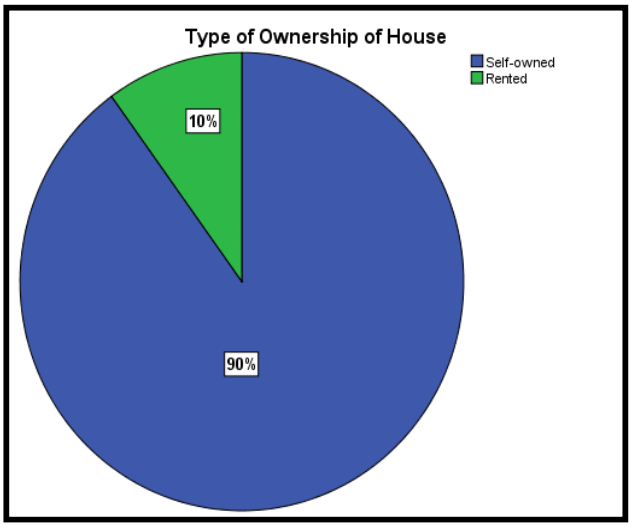


Figure 4.27: Ownership Status of the Houses

b) Type of Construction of the Houses

Out of 100 respondents, 08% of them live in the pacca houses made up of bricks and concrete whereas 16% live in the semi-pacca houses. While majority i.e. 76% respondents live in the kaccha houses. **Table 4.31** shows the type of construction of the houses.

Table 4.31: Type of Construction of the Houses

Type of Construction of the Houses			
Sr. No.	**Type**	**Number**	**Percentage (%)**
1	Pacca	08	08
2	Semi-Pacca	16	16
3	Kaccha	76	76
Total		**100**	**100**

The pie chart below **(Figure 4.28)** shows the type of construction of houses.

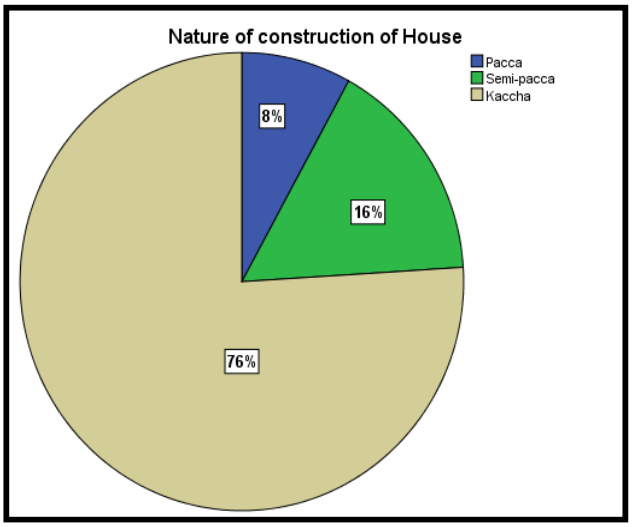


Figure 4.28: Type of Construction of Houses

c) Cropping Pattern in the Project Area

The major crops grown in project area are Wheat and Cotton. Out of 100 respondents, 10% of the respondents were growing wheat and cotton in their cropping pattern, 44% were growing Wheat, Cotton and Sugarcane in the vicinity of the project area whereas 46% of the respondents did not give their response regarding the cropping pattern of their agricultural land in the project area. (**Table 4.32)**

Table 4.32: Cropping Pattern

Cropping Pattern			
Sr. No.	**Pattern**	**Number**	**Percentage (%)**
1	Wheat, Cotton	10	10
2	Wheat, Cotton, Sugarcane	44	44
3	No Response	46	46
Total		**100**	**100**

The pie chart below **(Figure 4.29)** shows the cropping pattern of the project area.

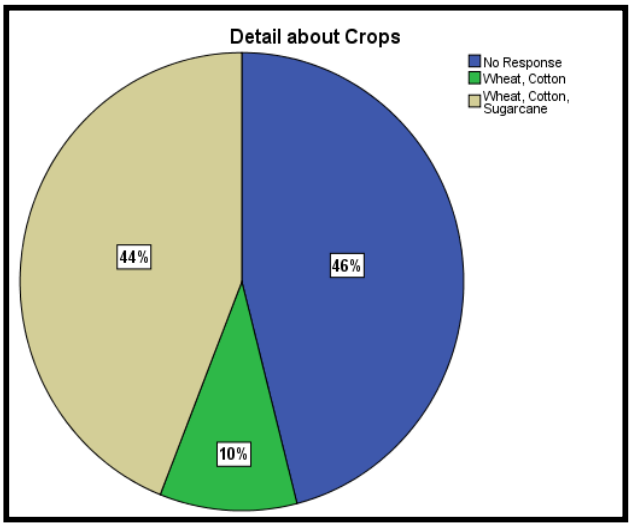


Figure 4.29: Cropping Pattern

d) Source of irrigation

Out of 100 respondents, 39% of the respondents' uses canal water for their agriculture lands whereas 61% of the respondents depend upon tube well water for farm and irrigation purposes. (**Table 4.33)**

Table 4.33: Source of irrigation

Source of irrigation			
Sr. No.	**Status**	**Number**	**Percentage (%)**
1	Canal	39	39
2	Tube well	61	61
Total		**100**	**100**

The pie chart below **(Figure 4.30)** shows the source of irrigation of the respondents.

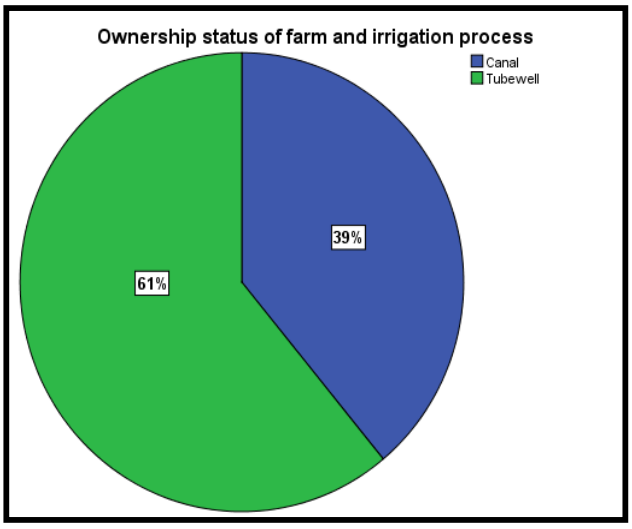


Figure 4.30: Source of irrigation

6. Basic Amenities

a) Availability of Electricity

The availability of facilities and development of this community is noticed by visiting the proposed project area. **Table 4.34** shows that 100% of the respondents have access to Electricity in their area.

Table 4.34: Availability of Electricity

Availability of Facilities			
Sr. No.	**Facilities**	**Number**	**Percentage (%)**
1	Electricity,	100	100
Total		**100**	**100**

In the pie chart **(Figure 4.31),** the availability of Electricity for various respondents is shown below.

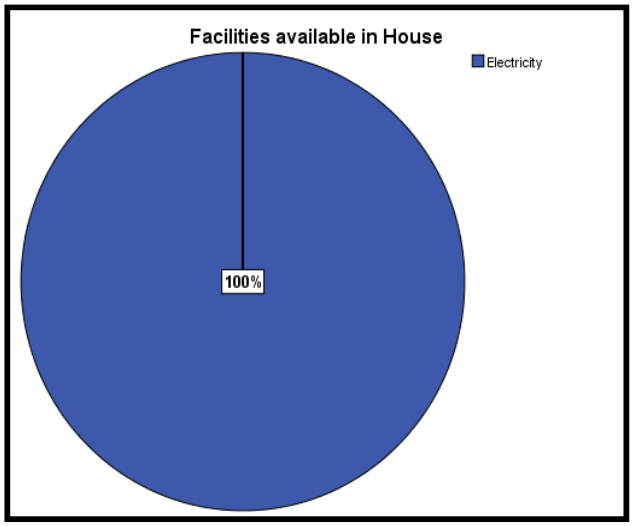


Figure 4.31: Availability of Electricity

7. Source of Water and its Satisfaction Level

a) Source of Water for Domestic Use

Sampled respondents are depending upon a number of sources of water for domestic use which is shown in **Table 4.35.** Hand pumps/Electric motor is the main source of water for domestic use in the proposed project area (93%) respondents get water from this source and remaining 07% respondents use Filtration plants as the source of water for domestic purpose.

Table 4.35: Source of Water for Domestic use

Source of Water in Project Area			
Sr. No.	**Source of Water**	**Number**	**Percentage (%)**
1	Hand pumps/Electric motor	93	93
2	Filtration plant	07	07
Total		**100**	**100**

In the pie chart **(Figure 4.32),** source of household water for domestic use is shown below.

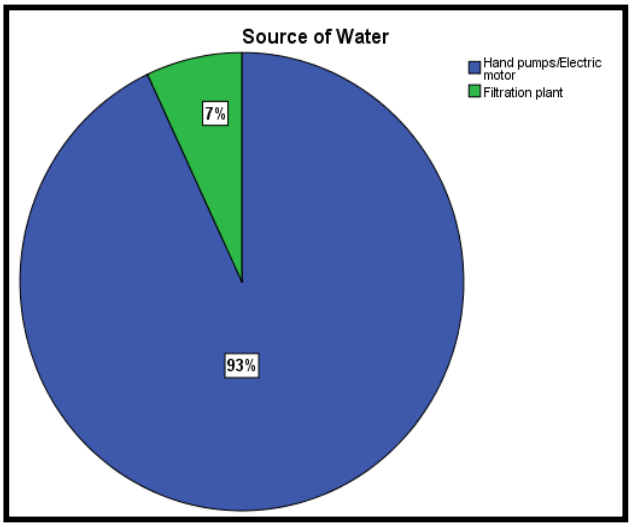


Figure 4.32: Source of Water for Domestic use

b) Satisfaction Level with Water Quality

The quality of water is directly linked to the quality of health. **Table 4.36** depicts the perception of people about water quality in the proposed project area. It was noticed during the baseline survey that the quality of water is satisfactory. 60% of the respondents are satisfied with the water quality while 40% respondents are not satisfied with the quality of water.

Table 4.36: Satisfaction Level with Water Quality

Satisfaction Level with Water Quality			
Sr. No.	**Opinion**	**Number**	**Percentage (%)**
1	Satisfied	60	60
2	Not Satisfied	40	40
Total		**100**	**100**

In the pie chart **(Figure 4.33),** satisfaction level with quality of water is shown below.

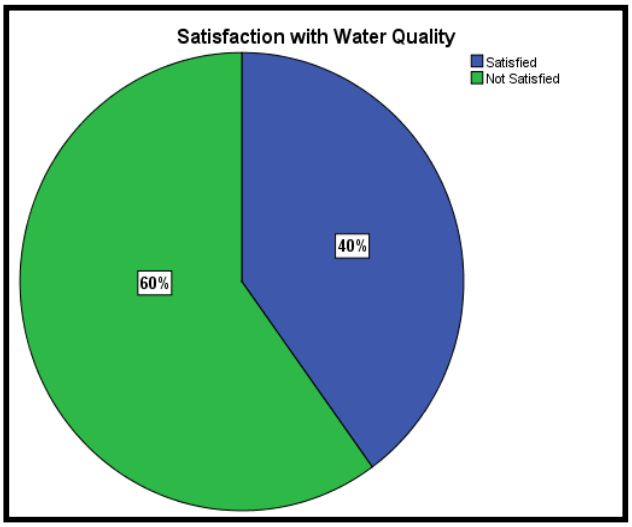


Figure 4.33: Satisfaction Level with Water Quality

8. Awareness & Implementation of Proposed Project

a) Awareness about the Project

The analysis of the socio economic baseline survey shows the awareness level about the proposed project in **Table 4.37**. Majority of respondents i.e. 98% had awareness about the proposed project while remaining 02% respondents had no knowingness about the proposed project.

Table 4.37: Awareness about the Proposed Project

Awareness about the Proposed Project			
Sr. No.	**Response**	**Number**	**Percentage (%)**
1	Yes	98	98
2	No	02	02
Total		**100**	**100**

In the pie chart **(Figure 4.34),** awareness about proposed project is shown below.

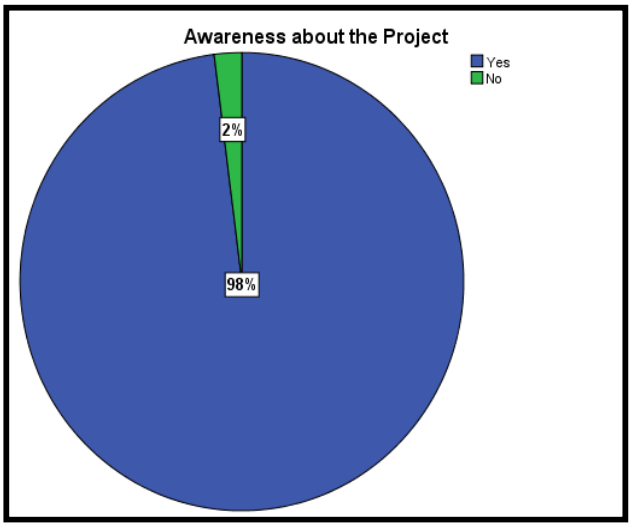


Figure 4.34: Awareness about the Proposed Project

b) Implementation of the Proposed Project

Table 4.38 shows the willingness of the respondents about implementation of the proposed project. 70% were in favor of the construction of proposed project while 30% respondents were against the proposed project.

Table 4.38: Implementation of the Proposed Project

Project Implementation			
Sr. No.	**Opinion**	**Number**	**Percentage (%)**
1	Yes	70	70
2	No	30	30
Total		**100**	**100**

In the pie chart **(Figure 4.35),** the perception of various respondents about the proposed project is shown below.

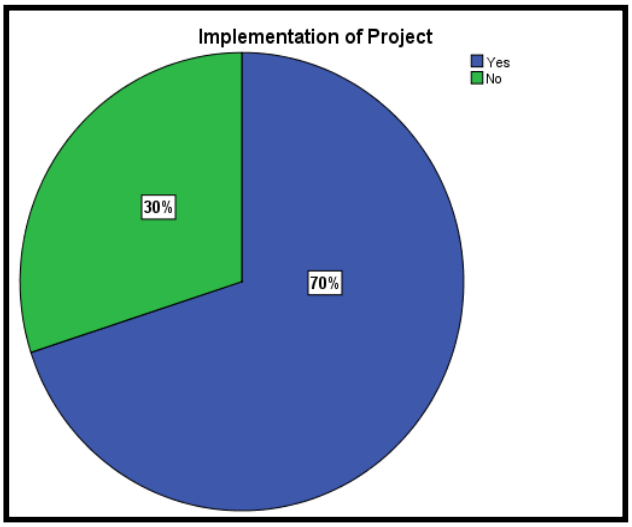


Figure 4.35: Implementation of Proposed Project

c) Reasons of Acceptance of the Proposed Project

Out of 70% respondents (who are in favor of this project), 27% believed that it will be a good project in all aspects, 13% were of the opinion that income generating activities will increase, 17% results in better standard of living, 40% said that value enhancement of the area will increase while 03% were of the view that infrastructural development of the project area will occur. (**Table 4.39)**

Table 4.39: Reasons of Acceptance of the Project

Reasons of Acceptance			
Sr. No.	**Reasons**	**Number**	**Percentage (%)**
1	Good project	19	27
2	Increase in income generating activities	09	13
3	Increase in standard of living	12	17
4	Value enhancement of the project area	28	40
5	Infrastructural development of the project area	02	03
Total		**70**	**100**

In the pie chart **(Figure 4.36),** the reasons of acceptability of various respondents are shown below;

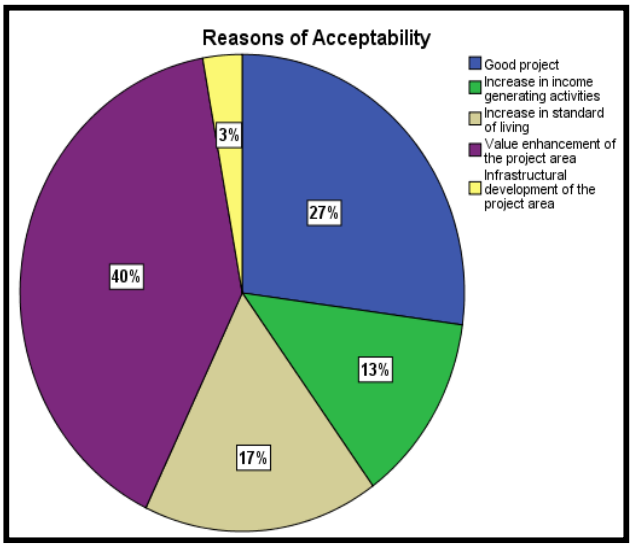


Figure 4.36: Reasons of Acceptance of Project

a) Reasons of Rejection of the Proposed Project

Out of 100 respondents, 80% said that land acquisition will occur due to this project, 13% respondents said that dust and noise pollution generate during the construction phase of the proposed project, While 07% respondent's have traffic issues regarding the project area. (**Table 4.40)**

Table 4.40: Reasons of Rejection of the Project

Reasons of Rejection			
Sr. No.	**Reasons**	**Number**	**Percentage (%)**
1	Land Acquisition	24	80
2	Dust & Noise pollution	04	13
3	Traffic Issues	02	07
Total		**30**	**100**

In the pie chart **(Figure 4.37),** the reasons of rejections of various respondents are shown;

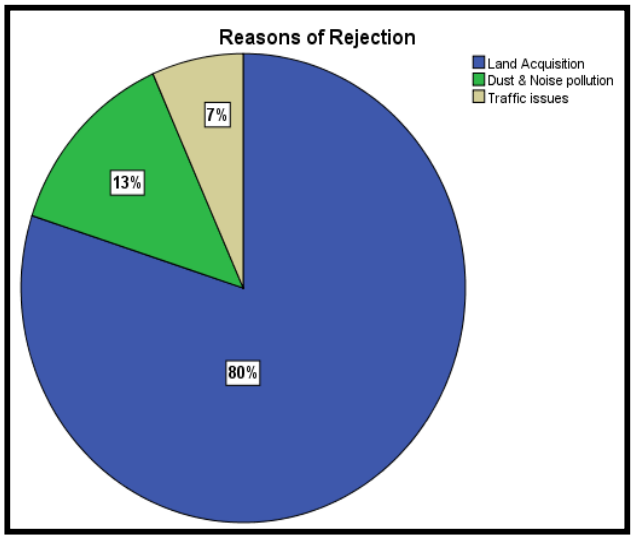


Figure 4.37: Reasons of Rejection of Project

15. Perceived Impacts during and after Construction

Table 4.41 & **Table 4.42** provide us the various impacts perceived by the respondent during and after construction of Bahawalpur Industrial Estate.

Perceived Impacts of the Project during Construction

The big trepidation of the respondents i.e. 38% was about noise and dust issues during the construction phase of the proposed project, 20% have traffic issues during the construction phase of the proposed project, 24% said that land acquisition will occur due to this project, 14% of the respondents have safety hazards due to the construction of the proposed project while 04% of the respondents have privacy issues due to the construction of the project.

Table 4.41: Perceived Impacts (During Construction)

Perceived Impacts of the Project (during construction)			
Sr. No.	**Impacts**	**Number**	**Percentage (%)**
1	Dust & Noise Issues	38	38
2	Land Acquisition	24	24
3	Traffic Issues	20	20
4	Safety Hazards Due To Construction	14	14
5	Privacy Issues	04	04
Total		**100**	**100**

The perceived impacts of the respondents during construction are shown below in pie chart **(Figure 4.38)**

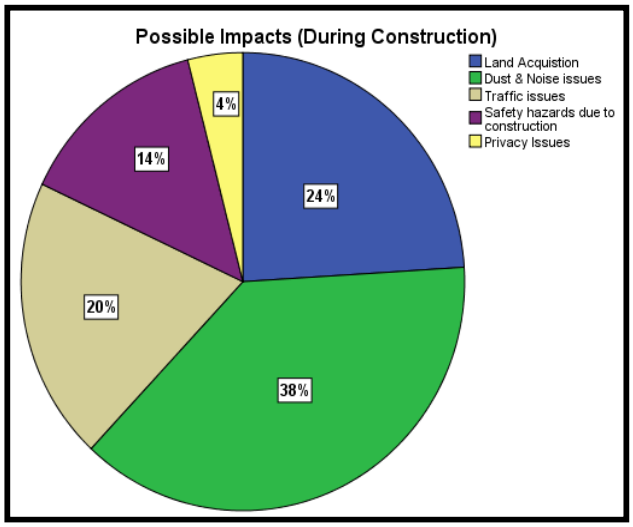


Figure 4.38: Impacts Perceived by Respondents

a) Perceived Impacts of the Project after Construction

When respondents were asked about impacts which they can perceived after construction phase, majority of respondents i.e.36% said that the area will be developed and it is good for people of the project area, 22% said that value enhancement of the area will increase, 12% said that Employment Opportunities will increase due to the construction of this industrial estate, 04% said that they have access to better facilities, 02% said that will it will save mobility time for the road users and 24% respondents have some other impacts regarding the project area.

Table 4.42: Perceived Impacts (After Construction)

Perceived Impacts of the Project (after construction)			
Sr. No.	**Impacts**	**Number**	**Percentage (%)**
1	Time saving	02	02
2	Employment Opportunities	12	12
3	Value enhancement of the area	22	22
4	Development of the area and good for people	36	36
5	Easy access to better Facilities	04	04
6	Any Other	24	24
Total		**100**	**100**

The perceived impacts of the respondents after construction are shown below in pie chart **(Figure 4.39)**.

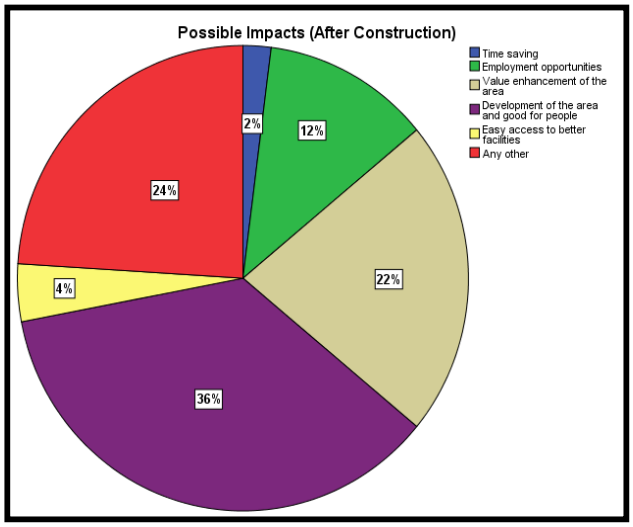


Figure 4.39: Impacts Perceived by Respondents

16. Pressing Needs of the Project Area

Survey Results are shown in **Table 4.43**, which depict that out of 100 respondents, 35% of them revealed that provision of basic facilities is the dire need of the people. 09% respondents said that the proper medical facilities should be provided to the local residents and this institution should also be upgraded with the passage of time. 56% do not show any response regarding this project.

Table 4.43: Pressing Needs

Pressing Needs of the Project Area			
Sr. No.	**Pressing Needs**	**Number**	**Percentage (%)**
1	Provision and up gradation of basic facilities	44	44
2	Provision and up gradation of medical facilities	02	02
3	Provision and up gradation of proper waste management system	02	02
4	Project layout should be in such a way to avoid land acquisition	28	28
5	Any Other	24	24

Pressing Needs of the Project Area			
Sr. No.	**Pressing Needs**	**Number**	**Percentage (%)**
Total		**100**	**100**

In the pie chart below **(Figure 4.40)** the pressing needs suggested by the respondents are shown.

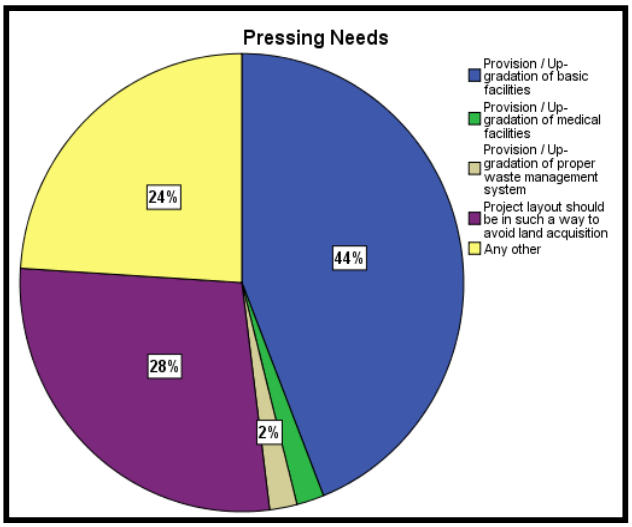


Figure 4.40: Pressing Needs of Project Area Suggested by Respondents

17. Suggested Measures and Needs

a) Protective Measures

From the data given in **Table 4.44**, majority of respondent's i.e.57% respondents highlighted that the construction activities should be completed without any delay, 43% respondents suggested that Proper diversion plan should be given to avoid traffic movement for the local residents.

Table 4.44: Protective Measures

Protective Measures			
Sr. No.	**Protective Measures**	**Number**	**Percentage (%)**
1	Project should complete well in time	57	57
2	Proper diversion plan should be given to avoid traffic movement problem	43	43
Total		**100**	**100**

In the pie chart below **(Figure 4.41)** the protective measures suggested by the respondents are shown.

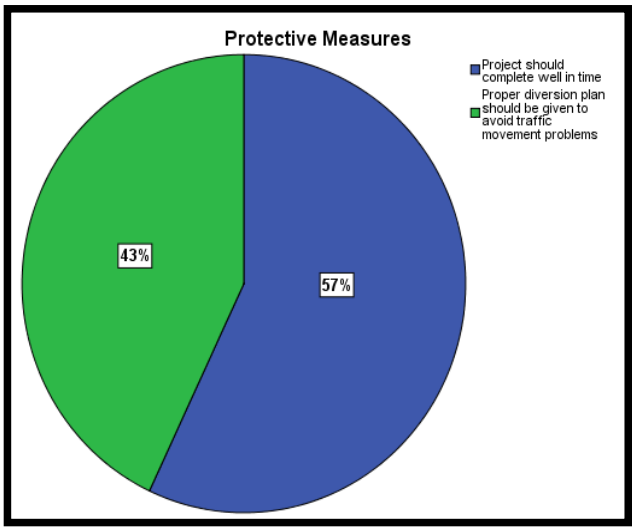


Figure 4.41: Protective Measures Suggested by Respondents

SECTION - 5
PUBLIC CONSULTATION

5.1 General

This section describes the outcome of the public consultation sessions held with different stakeholders that may be directly or indirectly affected by the proposed project. Public Consultation is a mandatory part of the EIA process for development projects. 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.

The consultation process was carried out in accordance with the requirements of Pakistan Environmental Procedures. The objectives of this process were to:

- Informing the public about the 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 socio-economic 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 (positive & negative) of construction and operation related activities;
- 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; and
- Reduce the chances of conflict through the early identification of controversial issues, and consult them to find acceptable solutions.

5.2 Consultation and Participation Process

For ascertainin 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 proposed project. The meetings with

stakeholders were carried out from 12 to 15 January, 2018.

5.3 Methods of Public Consultation

Public Consultation was carried out in order to establish stakeholder's opinion regarding project implementation. The following methods were used for public consultation with project stakeholders:

- Scoping Sessions
- Formal Meetings
- Informal Meetings
- Individual Interview

5.4 Identification of Stakeholders

Stakeholders are those who have a direct or indirect interest in the project development, and who will be involved in the consultationon process. During the field survey, significant efforts were made to identify the possible categories of stakeholders and their stakes. The stakeholders identified during field survey were the Forest Department (District Forest Officer), Archaeology Department (Sub-Divisional Officer), Bahawalpur Waste Management Company (BWMC) (Manger Operations), Wildlife and Fisheries Department (Wildlife Inspector), Office of the Deputy Director Environment (Deputy Director), Office of the Punjab Industrial Estate Development and Management Company (PIEDMC) and local residents. All the stakeholders had different type of stakes according to their professions which are listed down along with their apprehensions. Informal group discussions were also held as an additional tool for the assessment of the perceptions of the stakeholders.

5.5 Categories of Stakeholders Contacted

The stakeholders contacted, are given in the **Table 5.1.**

Table 5.1: Stakeholders Contacted in the Project Area

Sr. No.	Stakeholder Category
1	Forest Department
2	Archaeology Department
3	Bahawalpur Waste Management Company (BWMC)
4	Wildlife and Fisheries Department

Sr. No.	Stakeholder Category
5	Office of the Deputy Director Environment
6	Local residents

5.6 Major Stakeholders and their Apprehensions

Among all stakeholders some major stakeholders were identified in the proposed project area. **Plate 5.1** shows the pictorial view of Interviews and consultation meetings held with the stakeholders. **Table 5.2** contains the list of major stakeholders and their apprehensions.

Table 5.2: Major Stakeholders and their Apprehensions in the Project Area

Sr. No.	Stakeholders	Apprehensions
1	Forest Department	Tree cutting and harm to existing plantation.
2	Archaeology Department	No Harm to archaeological/historical sites
3	Bahawalpur Waste Management Company (BWMC)	Concerned about environmental pollution and solid waste
4	Office of the Deputy Director Environment	Site selection criteria should be considered
5	Local Residents	Movement problem for local residents, dust and noise problem, privacy / safety issues

Consultation Meeting with Sub Divisional Officer in Archaeology Department

Consultation Meeting with Sub Divisional Officer in Irrigation Department

Consultation Meeting with Manager Operations BWMC

Consultation Meeting with District Forest Officer

Consultation Meeting with Inspector Wildlife

Consultation Meeting with Deputy Director Environment

Plate 5.1: Interviews and Group Discussions with Different Stakeholders

5.7 Consultation Meetings and Formal & Informal Group Discussions

Consultation meetings regarding project impacts, their magnitude and mitigation measures were held with the Forest Department, Archaeology Department, Bahawalpur Waste Management Company (BWMC), Wildlife and Fisheries Department, Office of the Deputy Director Environment, Office of the Punjab

Industrial Estate Development and Management Company (PIEDMC) and local residents to know their concerns regarding proposed project.

Scoping sessions were conducted with the local residents. These sessions were carried out in and around the vicinity area of Industrial estate in Bahawalpur.

Generally, it was found that people were aware of the proposed project. After the meetings, 70% respondents including local residents and other stakeholders showed their full support for the proposed project without any delay for the industrial estate. This project will be beneficial in terms of good infrastructure development, not only for the local residents but also good for the development of the area.

5.8 Concerns / Suggestions of the Stakeholders

The most commonly raised concerns during the meetings are listed below:

- Industry should be made in time without any delay.
- Exposure of noise and dust pollution will cause disturbance and health & safety issues to the local residents and other stakeholders throughout the construction stage due to the movement of construction machinery and transportation of construction materials. The effects of noise and dust pollution on the local residents should be minimized by making necessary arrangements. Dust pollution should be controlled by water sprinkling on regular basis;
- During construction period local residents will face difficulties while moving to places in the vicinity of proposed project area. Appropriate diversion plan should be developed to avoid the disruption of all the people due to use of heavy machinery in day timings and should avoid disturbance for the local residents living in the project vicinity;
- Local residents should be given priority for jobs during the construction phase;
- Tree cutting should be avoided as much as possible;
- Solid waste produced during construction period should be disposed of timely; and
- Construction material and asphalt plant should be located outside the residential area.

5.9 Mitigation Measures Proposed by EIA Consultants for Addressing the Stakeholder's Concerns

The contractors and design consultants may include the following environmental and safety provisions in the project design in order to protect the surrounding communities from the anticipated impacts of pre and post construction activities:

- Significant efforts including change in design should be adopted to minimize the physical and economical disturbance of the local residents.
- Local residents should be given priority while hiring during construction phase of the proposed project;
- Construction machinery should be placed at adequate locations away from the sensitive areas to minimize the impacts related to the noise;
- Project facilities should be located outside the existing residential areas. In order to avoid restricting the daily movement of the local stakeholders, construction vehicles should remain confined within their designated areas of movement;
- Solid waste generated during construction at site should be disposed of safely at the waste disposal sites approved by the BWMC; and
- All necessary measures should be taken to ensure the safety of traffic during construction, including barricades (including signs boards, pavement markings, flags, and lights). All such barricades will be set up to facilitate the local traffic.

5.10 Details of Meetings with the Stakeholders

The detailed schedule of meetings at site with the stakeholders and the issues raised by the respondents are given below in **Table 5.3.**

Table 5.3: Schedule of Meetings with Stakeholders and their Apprehensions and Suggestions

Sr. No.	Agency / Department / Stakeholder	Date	Time	Representative	Apprehensions Raised	Suggestions
1.	**Proponent PIEDMC**	12-01-18	2.30 pm	**Mr. Sarfraz**	• During consultation, it was concluded that structures present in Mauza Aghapur have an illegal status of their land and structures.	• No provision of cost has been made in the total cost of the project for compensation of land and structures.
2.	**Responsible Authority-** (Office of the Deputy Director Environment)	15-01-18	9.30 am	**Mr. Zafar Iqbal (Deputy Director)**	• Site selection criteria should be considered as mentioned in guidelines. • Access road should be widened and away from the settlements. • Location of industrial plots in layout should be away from the existing settlements.	• Army should be consulted for site selection and National Highway Authority should be consulted for site selection. • Project layout should be changed in such a way to avoid any land acquisition.

Sr. No.	Agency / Department / Stakeholder	Date	Time	Representative	Apprehensions Raised	Suggestions
3.	**Forest Department**	13-01-18	12:30 pm	**Mr. Tajjamul** (District Forest Officer)	• Site should be selected / planned in such a way to avoid minimum tree cutting.	• Significant efforts should be made to minimize the tree cutting in the project area. • A comprehensive tree plantation plan should be formulated (if tree cutting is unavoidable). • Appropriate mitigation measures should be adopted to minimize the harmful effects on the existing plantation.
4.	**Archaeology Department**	15-01-18	2:30 pm	**Mr. Muhammad Sajjad** (Sub-Divisional Officer)	• After thorough review of project layout and location of project site, no heritage site and monument fall within the radius of 10km of the proposed project site.	• In case of discovery of any artefact during construction; the contractor shall immediately report Directorate General (DG) of Archaeology to take further suitable actions to preserve those antiques or sensitive remains.

Sr. No.	Agency / Department / Stakeholder	Date	Time	Representative	Apprehensions Raised	Suggestions
6.	**Wildlife and Fisheries Department**	13-01-18	11.30 am	**Mr. Kaleem Sarfraz** (Wildlife Inspector)	• No apprehension raised regarding the proposed project as no threatened species exist in the project area.	• Nil
7.	**BWMC** (Bahawalpur Waste Management Company)	13-01-18	9.00 am	**Mr. Imtiaz Ullah** (Manager Operations)	• The environmental pollution due to dumping of solid and construction waste should be avoided.	• Solid and construction waste should be disposed of in an environment friendly manner. • Waste management plan should be formulated in liaison with BWMC.

Sr. No.	Agency / Department / Stakeholder	Date	Time	Representative	Apprehensions Raised	Suggestions
8.	**Wider Community**	12-15/01/2018	_	**Local Residents (Mari sheikh Shujra Village, Sangal Wali Pull Village, Noabad Village, Dera Ramzan Village)**	• In village, (Mari Sheikh Shujra) local residents raise their concern about the project layout that it should be changed to avoid land acquisition. • Exposure of noise and dust particles will cause disturbance and health issues to the local residents throughout the construction phase due to the movement of construction machinery and transportation of construction materials. • Privacy issues were raised by local residents during the construction phase due to the working of labourers in the project area. • Traffic will be congested on the access road and on main road	• Project layout should be changed in such a way to avoid any land acquisition. • Proper compensation should be given to affectees of land and structures. • The effects of noise and dust pollution on the local residents should be minimized by making necessary arrangements. Dust pollution should be controlled by water sprinkling on regular basis. • Labour should bound to work and stay in the designated area or camp sites. • Provision of diversion route to minimize the traffic problems during construction phase.

Sr. No.	Agency / Department / Stakeholder	Date	Time	Representative	Apprehensions Raised	Suggestions
					during the construction phase of the proposed project. It will be difficult for all local residents to reach their destination and more time will be consumed. • During construction phase pedestrians will face difficulties while walking to nearby places in the vicinity of proposed project area. • The project is a good step for the development of the project area. • Increase in traffic and safety hazards will create problems to local population and surrounding communities. • The operation of the industries will cause air emissions and will cause	. • Appropriate detour plan should be developed to avoid the disruption of pedestrians. • Efforts should make to complete the construction as soon as possible. • A detailed health and safety plan may be develop and implement to mitigate the construction and operation risks of the proposed project on the local residents and surrounding communities.

Sr. No.	Agency / Department / Stakeholder	Date	Time	Representative	Apprehensions Raised	Suggestions
					health issues for the nearby communities.	• It should be ensured that all the industries should install air pollution control equipment and comply with the NEQS.

SECTION 6
ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

6.0 General

This section provides the analysis of the potential impacts during pre-construction/design, construction and operational phases of the proposed project on the physical, biological and socio-economic environment of the project area. In addition, it also describes the measures that will mitigate the project's potential environmental impacts. Environmental sensitivity of the project area is described through a sensitivity map and evaluation of significance of impacts is carried out through environmental impact matrices.

6.1 Evaluation of Identified Impacts

Methodology adopted for the identification, evaluation and analysis of environmental impacts by the proposed project is "Matrix Method and Significance Rating of Impacts".

6.1.1 Environmental Impact Matrices

The environmental impact matrices have been developed to evaluate magnitude of the impacts of various project activities on different environmental settings for construction and operation phases and are shown in **Table 6.1** and **Table 6.2** respectively.

A Matrix method helps in identifying the potential temporal & spatial impact and screens the project for environmental and social soundness. Each project activity is screened separately with regard to its construction and operation phases according to the various physical, ecological and social parameters. These impacts are characterized on the basis of extent, timing, magnitude, reversibility, probability, nature and duration. **Table 6.3** shows the characterization of impacts.

Table 6.1: Environmental Impacts Evaluation Matrix During Construction Phase

Components	Valued Ecological Components VEC's	VEC's Rating	Activities							Impact Score
			Establishment & functioning of construction camps, workshops etc.	Excavation operations of burrow & quarry areas	Transportation of construction materials and equipment's	Open storage of construction materials, fuel etc.	Operation of concrete batching/ asphalt plants	Functioning of Power generators	Solid & liquid waste management	
Biophysical Environment	Air Quality & Dust	0.10	-3	-3	-2	-2	-3	-2	-2	**-1.7**
	Soil erosion and Contamination	0.05	-2	-2	-2	-2	-3	-1	-3	**-0.8**
	Ground water quality	0.10	-2	-2	-1	-2	-2	-1	-2	**-1.2**
	Noise	0.10	-3	-4	-2	0	-3	-3	-1	**-1.6**
	Flora	0.12	-1	-2	-2	0	-1	0	-1	**-0.8**
	Fauna	0.06	-2	-2	-2	-1	-2	-2	-2	**-0.8**
Socio-Economic Environment	Traffic Management	0.20	-3	-3	-4	-3	-3	-1	-2	**-3.8**
	Social and Cultural Conflicts	0.07	-3	-1	-1	-1	-1	-1	-2	**-0.7**
	Health and Safety of workers and community	0.10	-3	-3	-3	-2	-3	-2	-3	**-1.9**
	Employment/ Economic Activity	0.10	3	3	2	0	1	1	3	**1.3**

Legend							
	+ positive	O	no impact	2	minor impact	4	severe impact
	- negative	1	negligible impact	3	moderate impact		

Note: The above table reveals that in biophysical environment air and noise pollution are considered to be significant (adverse) impact while in socio-economic environment traffic management and health & safety of workers and community are considered to be significant (adverse) impact during construction phase.

Table 6.2: Environmental Impacts Evaluation Matrix During Operation Phase

Components	Valued Ecological Components (VECs)	VECs Rating	Activities			Impact Score
			Movement of Industrial Vehicles	Industrial Emissions	Disposal of wastewater	
Biophysical Environment	Air Quality & Dust	0.15	-3	-4	0	-1.05
	Flora	0.025	-1	-2	0	-0.075
	Fauna	0.025	-1	-1	0	-0.05
	Noise & vibration	0.05	-3	-2	0	-0.25
	Drainage	0.2	-2	-3	-3	-1.6
Socio-Economic Environment	Road safety	0.15	-4	0	0	-0.6
	Economic Activity	0.2	3	0	3	1.2
	Health of workers and nearby residents	0.2	-4	-4	-4	-2.4
		1.00				

Legend	+ positive	**O**	no impact	**2**	minor impact	**4**	severe impact
	- negative	**1**	negligible impact	**3**	moderate impact		

Note: The above table reveals that in biophysical environment impact on air quality & dust and drainage are considered to be significant (adverse) impact while in socio-economic environment health of workers and nearby residents is considered to be significant (adverse) impact and economic activity is considered to be significant (beneficial) impact during the operation phase

Table 6.3: Characterization of Impacts

Extent	Timing	Magnitude	Reversibility	Probability	Nature	Duration
Site specific	Short term	Negligible	No change	Very unlikely	Indirect	Temporary
Local impact	Medium term	Low	Reversible	Unlikely	Direct	Permanent
Area impact	Long term	Medium	Slowly reversible	Likely		
Regional impact	Multi-year and permanent impact	High	Irreversible	Certain		

In addition to assigning the numerical values to each marked box in the Matrix, plus (+) or minus (-) sign are used to show whether an impact is beneficial or adverse.

The weighted matrix was applied to the environmental components listed on the y-axis against the activities of the proposed project listed on the x-axis prior to mitigation measures. In this process, numerical values were assigned from 0 to 1 for biophysical environment and socio-economic environment to indicate the significance of the affected environmental and social components. These numerical values were than multiplied with the individual project activity rating/values and all added to get an overall impact score. This impact score gives the relative significance of impacts for a specific component. The highest impact score gives the level of significance of that impact.

6.1.1.1 Identification of VECs

Valued Environmental Components (VECs) are defined as broad components of the biophysical and human environments that, if altered by the project, would be of concern to regulatory agencies, indigenous community, resource managers, scientists, stakeholders, and/or the general public. VECs are typically selected for assessment on the basis of regulatory issues, guidelines, and requirements; consultation with regulatory agencies, the public, stakeholder groups; field reconnaissance; and the professional judgment of the Study Team.

6.1.2 Significance Rating of Impacts

The overall significance of the impacts was defined based on the result of a combination of the ratings. Each identified impact was analyzed individually according to a number of criteria including descriptions of their extent, timing, magnitude, reversibility, probability, nature and duration. Taking into account these criteria, potential significance was classified as either:

- Low: The impact which has a slight influence on the natural and socio-economic environment;
- Medium: The impact which can be eliminated/ mitigated after applying the appropriate mitigation measures; and
- High: an impact, which, if not mitigated, could stop the project from proceeding.

6.2 Delineation of Project Corridor of Impact (COI)

COI is a limit which identifies the area where direct and indirect impacts of the project activities are envisaged like existence of forests, game reserves, wetlands, archaeological sites etc. The limit for COI for the proposed project was taken as One (1) kilometer radius for collection of baseline information, impacts assessment and mitigation measures of physical, ecological as well as social resources.

As the location of construction/contractor camps, vehicles, equipment yard, material quarry areas and access tracks have not been identified yet, so impacts evaluated due to these facilities in this section will be of generic nature.

6.3 Environmental Sensitivity

A comprehensive sensitivity map showing sensitive receptors of the project area such as educational institutes, health care facilities, commercial area, open area, green belt religious and residential area and is presented in **Figure 6.1** and map showing distances of sensitive receptors is shown in **Figure 6.2.** The list of sensitive receptors along their coordinates is attached as **Annexure-VII.**

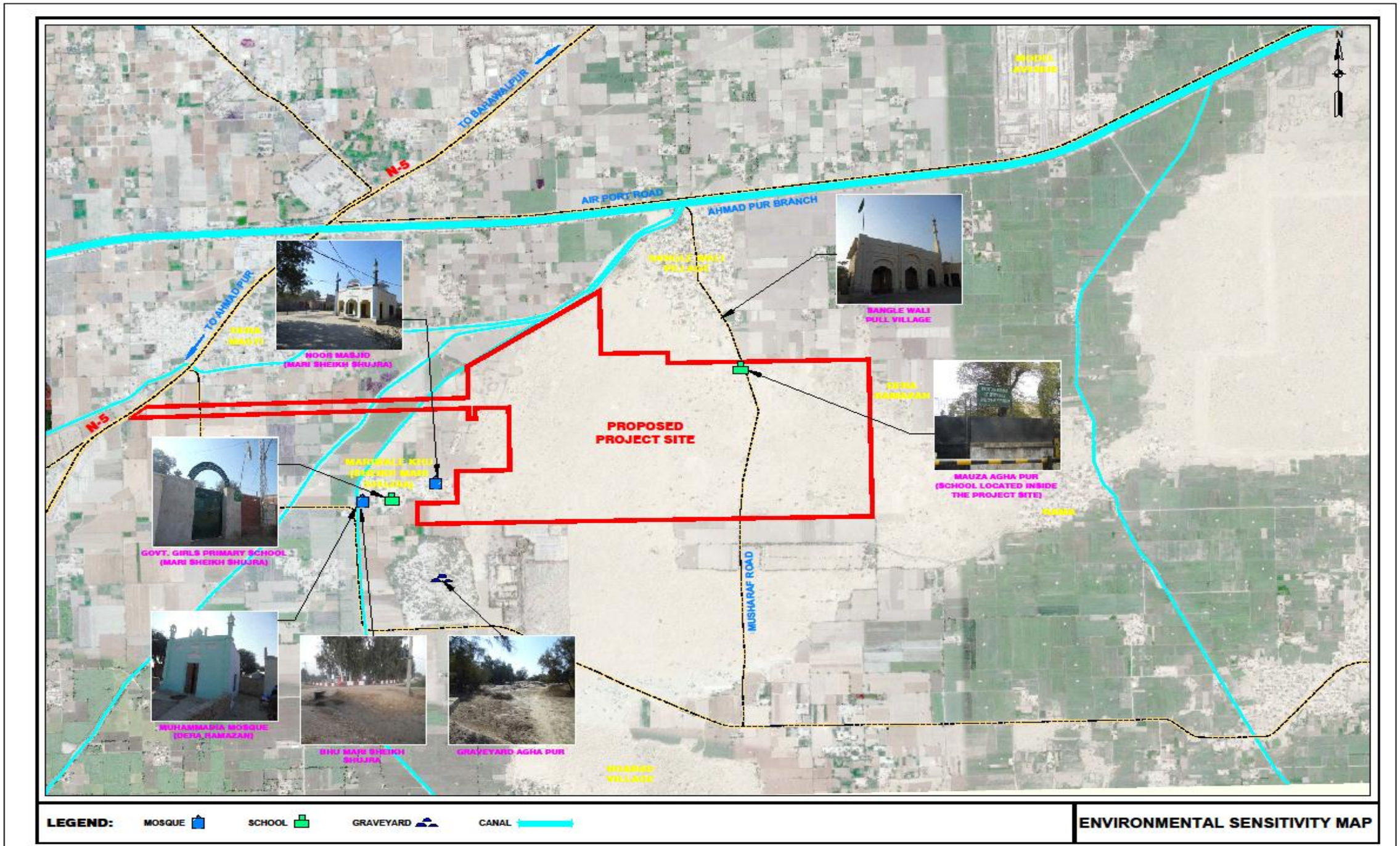


Figure 6.1: Environmental Sensitivity Map of the Proposed Project Area

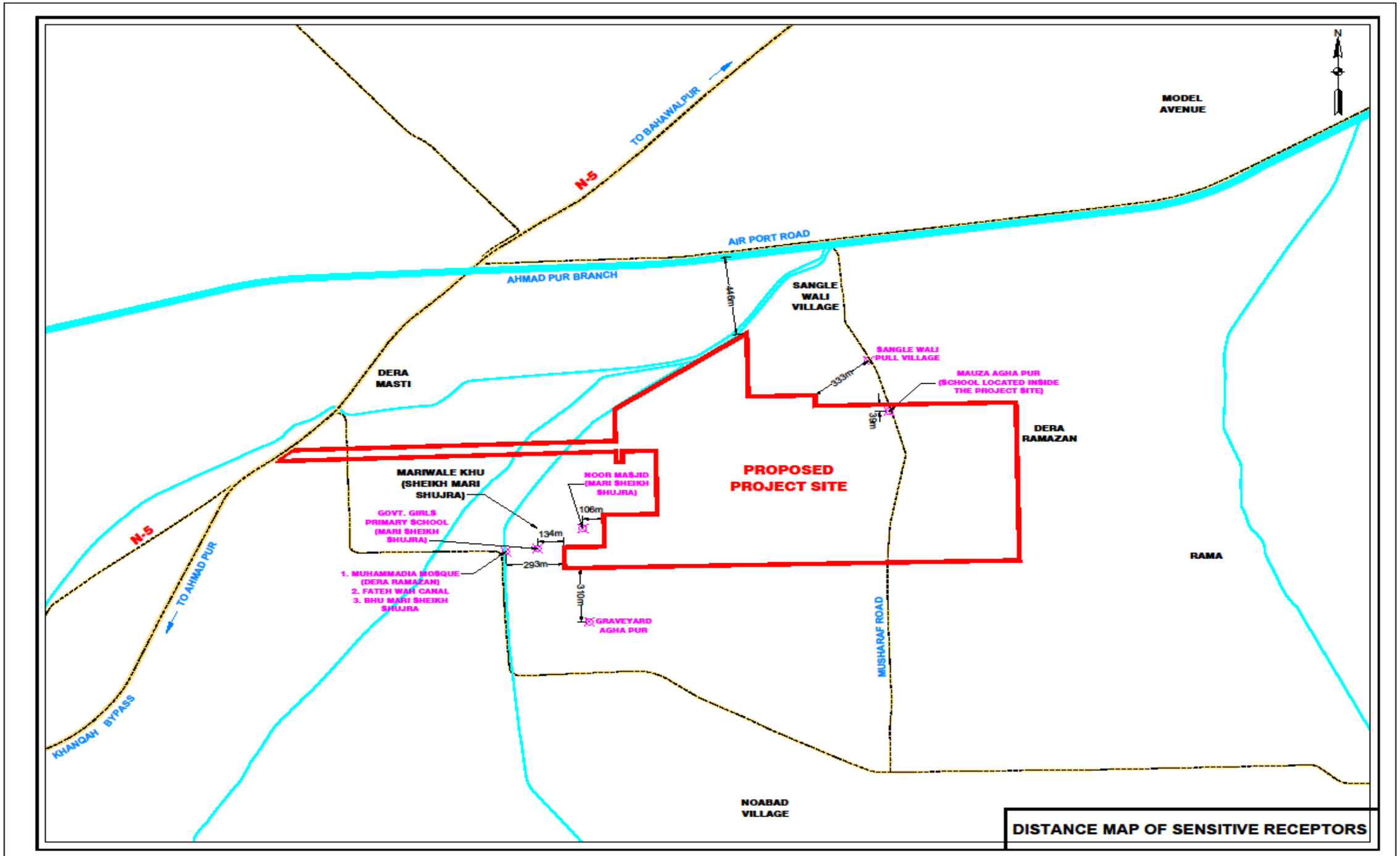


Figure 6.2: Distance of Sensitive Receptors from the Proposed Project Site

6.4 Anticipated Impacts during Planning/Design Phase

Following are the impacts envisaged during planning stage and mitigation measures for this are also suggested.

6.4.1 Site Identification

According to site selection criteria outlined in Sectoral Guidelines for Environmental Reports – Industrial Estates (Pakistan Environmental Protection Act, 1997), an industrial site shall be identified at least at following distances from the features listed:

- 25 Km from ecological or otherwise sensitive areas
- 25 Km from projected growth boundary of major settlements (population of 3 million or larger)
- 0.5 Km from high tide line in coastal areas
- 0.5 Km from natural or modified flood plain boundary
- No conversion of prime agricultural land to industrial use

The site selection shall also consider the following as per afore-mentioned guidelines are:

- No conversion of forest land to non-forest activity to sustain the industry
- Sufficient space on-site to provide for storage of solid waste and appropriate treatment and reuse of wastewater
- Provision for a 0.5 Km wide "greenbelt" around the site perimeter.
- Adaptability of the proposed facilities to the landscape, so that scenic features is not altered by the development.

The project site is located within 12 km from major settlements (Bahawalpur City). The protected site i.e. Jamia Masjid Al-Sadiq which is declared as Protected Site by the Government of Punjab under Punjab Special Premises Ordinance 1985 is located at an aerial distance of 11.75 km from the proposed site. Ecologically sensitive area, Lal Sunhara, a land devoted to the preservation of biodiversity through the dedication of national parks and wildlife sanctuaries is located approx. 30 km from the Bhawalpur City which is the largest manmade forest listed with IUCN as wildlife sanctuary. It provides excellent feeding, breeding and resting habitats to numerous

migratory as well as resident birds. The national park is located on one of the major bird migration routes of the world. Because of high diversity of wildlife, microhabitats and landscapes, the area was designated as Protected Area in 1972.

National Highway N5 is passing in North West of the project site, at a distance of 1.6 km. The project site is bounded by Rama Village in the east, Mari Sheik Shujra Village in the west, Basti Yar Muhammad and Noabad Village in the south and Sangal Wali Pull Village and Airport Road in the north. Ahmed Pur East Canal is passing along Airport road at north of the project site. Sutlej River is flowing in the north west of the project site, at a distance of 10 km (approx.). The residents may have issues of access, noise, and air pollution. The air pollution of the industries and access issues may affect the local residents of the area during the construction and operation phases. Provision of buffer zone around the site perimeter has not been considered in design.

Keeping in view the above mentioned *Sectoral Guidelines for Environmental Reports – Industrial Estates by Pakistan Environmental Protection Agency (PEPA), 1997*, the activities during the construction and operation phases may affect the residents of surrounding settlements in terms of environmental quality, access, health and traffic.

Mitigation measures will include:

- Keeping in view the Sectoral Guidelines for Industrial Estates regarding the site location, effective environmental measures should be considered during the design phase of the proposed project. These measures must address the impacts of air, water, noise, waste and social parameters to make the project environmentally sustainable and socially acceptable. These measures may include but not limited to creating buffer zones (green belts) around the perimeter of the industrial estate, waste management plan, treatment of wastewater and installing air pollution control devices.

6.4.2 Land Acquisition

No land acquisition is involved for the construction of proposed Industrial Estate. The project will be constructed on the land already being owned by the PIEDMC.

6.4.3 Solid Waste

Large quantities of industrial and hazardous waste along with municipal solid waste will be produced at the different stages of the project. Without a proper solid waste management system and engineered land filling practices, solid waste may result in odor, breeding ground for disease vector, and aesthetic concerns. No area has been allocated for disposal of hazardous waste within the proposed industrial estate. Solid waste may result in leachate production and percolation in groundwater. *Hazardous Substance Rules, 2003* must be followed for the handling of hazardous waste.

Mitigation measures will include:

- Planning for disposal sites with reasonable distance from the human settlements following the siting criteria for landfill site;
- Disallow siting for work camps, including waste dump sites, in a distance closer than one (1) kilometer to any inhabited areas;
- Incorporate technical design features for refuse collection containers at sites that would minimize burning impacts;
- Devise sustainable plans for the reuse and recycling of waste materials produced in the industrial estate by different industries;
- Devise plan(s) for safe handling, storage and disposal of harmful materials; and
- Burning of waste within and surrounding of the industrial estate should not be allowed in any case.

6.4.4 Groundwater

The groundwater quality and quantity may significantly be affected by the project activities. The minimum depth of water table in project area is about 30 to 40 feet below ground surface (9m-12m); therefore it is more likely to be contaminated due to seepage, infiltration and inflows.

The quality of water is good along Ahmadpur Branch Canal while deteriorates going away from canal. The number of tube wells required to meet the estimated water requirement of the Industrial zone will depend upon the discharges of the proposed new tube wells at recommended sites. Excess/Illegal use of groundwater may lead to decrease in groundwater table of the project area.

The proposed mitigation measures will include:

- Planning for protection of groundwater reserves from any source of contamination such as the construction and oily waste that will degrade its potable quality during construction phase;
- Planning to disallow/prohibit use of excess water during construction and operation phase; and
- Sustainable policy should be devised by the PIEDMC for the efficient use of groundwater.

6.4.5 Surface Water

The surface water body near the proposed Industrial Estate is Ahmadpur East Branch Canal. The water requirement for the Industrial Estate is planned to be catered through tube wells and therefore, no surface water extraction will be done during the operation phase. The storm water from the project area is planned to be disposed of in the Canal/Sutlej River. As the storm water carries large quantities of TSS, TDS, grease and oil; it may contaminate the water. TDS will reduce the DO of water and TSS will increase sediment loadings. Sedimentation will reduce the carrying capacity of the Canal and River and may create shortage of water for tail end user.

If this water with high sediment loadings will be used for the irrigation, it would cause sedimentation in the agricultural fields and may clog the soil, thus reducing the water and nutrient uptake limiting the crop yield. This impact is low adverse in nature.

The proposed mitigation measures will include:

- PIEDMC should ensure that the water requirement of the Industrial Estate should be met in the proposed design;
- Permission must be sought out from the Irrigation Department Punjab for disposal of wastewater in Canal/River; and
- Storm water should be treated for removal of TSS, TDS, oil and grease.

6.4.6 Wastewater

Wastewater of the proposed industrial estate is planned to be disposed of in River Sutlej which flows in the North West side of the proposed project site at a distance of 10 km. It will significantly affect the nearby settlements due to foul odor and may

serve as breeding ground for disease vectors. The situation may exacerbate in the rainy seasons. Since the depth of ground water table is shallow in the area, therefore, the seepage of wastewater at the bottom of the receiving water body may also contaminate the ground water. Throwing the industrial effluent in River Sutlej without treatment is not an eco-friendly option.

The proposed mitigation measures will include:

- CETP should be designed for the proposed Industrial Estate in order to avoid contamination of the receiving water body;
- A policy should be devised to ensure that all the industries in the industrial estate should install a wastewater treatment plant;
- Plan to restrict the solid waste dumping into gravity sewer and force main;
- Provision should be made in the design to cover the gravity sewer and force main; and
- Alternative options should be considered such as using treated water for agriculture purpose by meeting the standards for irrigation and prior consultation with farmers of the nearby villages to take the views regarding willingness to use this water.

6.4.7 Flora

A total number of forty five (45) trees of varying species and sizes will be cut.

The proposed mitigation measures will include:

- Incorporate technical design measures to minimize removal of these trees, as far as possible;
- Provision for a 0.5 Km wide "greenbelt" around the site perimeter;
- A Tree Plantation Plan is formulated in compensation of trees affected by the establishment of the proposed Industrial Estate and attached as **Annexure VIII.** This plan may be considered during the operation phase;
- A plan for transplantation of trees may be considered;
- Compensatory planting of ten (10) trees against each fallen tree of similar floral function should be planned; and
- PHA should ensure that there should be no exotic species in the plantation plan with known environmental setbacks (Eucalyptus, etc.).

6.4.8 Seismic Hazard

The project area is located in Seismic Zone 2A, where 2A (lower limit of moderate damage) represents peak horizontal ground acceleration from 0.08 to 0.16 g. In this Zone, designing of various types of structures should be done on the basis of Peak Ground Acceleration (PGA). A low to moderate intensity earthquake impacting the project site can adversely impact the development. This factor requires special consideration of the designers keeping in view the recent earthquake of October 08, 2005 and September 25, 2013 and recent tremors within past few months. The proposed project shall be designed and constructed to withstand low to moderate earthquakes.

Mitigation measures will include:

- The structures of the proposed project should be designed and constructed keeping in view low to moderate earthquakes. For seismic hazard analysis, updated structural and seismic evaluations should be conducted by the design engineer/consultant;
- Seismic Building Code of Pakistan 2007 (SBC-07) should be adopted for designing of buildings. This code specifies minimum requirements for seismic safety of buildings and has to be applied and used by engineers in conjunction with the necessary understanding of the concepts of structural, geotechnical and earthquake engineering; and
- The structure of the proposed project should also be studied by the proponent (PIEDMC) to evaluate its durability/strength to withstand moderate to high intensity earthquake.

6.4.9 Air Pollution, Noise and Vibration

Air Pollution could be a major concern of the nearby settlements from the proposed Industrial Estate. The gaseous emissions and fugitive dust emissions may deteriorate the air quality of project area during pre-construction (site clearing) and construction phase of the proposed project due to construction activities (operation of construction machinery, dust emissions, vehicular movement, etc.) which results in increase in both air and noise pollution along with the associated health risks to the nearby residents.

During the operation phase various primary and secondary air pollutants would be emitted. The gaseous emissions in the form of plumes will create an air-shed of pollutants within 15 – 20 Km distance and affect the recipients in the downwind direction of the industries and may cause chronic or acute respiratory diseases like asthma and nausea and will also have effect on the faunal and floral species.

Mitigation measures will include:

- A policy should be devised at the planning stage for the strict enforcement of PEQS, 2016 for industrial gaseous emissions by all the industries during the operation phase;
- Provision of air pollution control equipment's must be considered for respective industries;
- Each industry would submit its separate IEE/EIA as stated in PEPA Act, 1997.
- Plan for using other options of dust controlling/suppressing techniques;
- Scheduling of water sprinkling by the construction contractor prior to construction activities;
- Plan and budgeting for provision for noise barriers for the construction site, particularly for the sensitive receptors;
- Plan for scheduling the noisy construction work during night time;
- Consultations of the proponent at the pre-construction phase with the traffic police and contractor to devise a traffic management plan for smooth flow of traffic during the construction phase in order to reduce dust and noise pollution; and
- Selection/budgeting of air and noise emission control devices by the contractor prior to construction activities.

6.4.10 Emergency Management

Disasters such as earthquakes, floods, fire events, explosions, spills, terrorist activities and accidents due to operational failures may occur. The losses may vary from minor injuries to mortalities and financial losses in the form of reduced man hours and/or equipment damage.

Mitigation measures will include:

- A comprehensive Emergency Response Plan should be devised which should be implemented in close consultation with the Rescue 1122 Service, Fire Fighting Department, bomb disposal squad and paramedics;

- Provision of regular training of the staff/employees regarding the emergency procedures/plans;
- Provision of medical facility should be provided in the industrial estate; and
- Provision of firefighting and emergency exits should be given in the design.

The Emergency Response Plan is attached as **Annexure IX**.

6.4.11 Physical Cultural Resources

The Physical Cultural Resources situated in the project area are; mosques (Noor Masjid, Mari Sheikh Shujra, Muhammad Mosque, Dera Ramzan) and graveyard (Agha Pur). These places are visited by local people regularly (mosques) and occasionally (Graveyard). No relocation is involved in the project. Thus, no impact will occur on the physical and cultural resources due to the establishment of the industrial estate.

6.4.12 Public Utilities

Due to the proposed project, public utilities like power transmission lines and poles will not be affected and will not create disruption of public services and economics.

6.4.13 Transmission Lines

There is a grid station along the south- west boundary of Project site terminating six (06) 132 kV & 220 kV transmission lines which are passing through the Project site. Following are the main environmental and social issues which are specifically related to the construction and operation of a transmission line:

A. Aesthetics

The overall aesthetic effect of a transmission line is likely to be negative to most people, especially where proposed lines would cross natural landscapes. The tall steel or wide "H-frame" structures may seem out of proportion and not compatible with agricultural landscapes. Some people however, do not notice transmission lines or do not find them objectionable from an aesthetic perspective. To some, the lines or other utilities may be viewed as part of the infrastructure necessary to sustain our everyday lives and activities. To others, new transmission lines may be viewed in a positive light because it represents economic development. Aesthetic impacts depend on:

- The physical relationship of the viewer and the transmission line (distance and sight line);
- The activity of the viewer (living in the area, driving through or sightseeing); and
- The background, or context, of the transmission line, such as whether the line stands out or blends in.

A transmission line can affect aesthetics by:

- Degrading the surrounding environment (intruding on the view of a landscape); and
- Enhancing a resource (evoking an image of economic strength in a developing business or industrial area).

Mitigation of Aesthetic Impacts:

Electric transmission lines can be routed to avoid areas considered scenic. Routes can be chosen that pass through commercial/industrial areas or along land use boundaries. The form, color, or texture of a line can be modified to minimize aesthetic impacts. The color and construction material of poles can be chosen to blend with or complement the landscape around them. Lines constructed using H-frame poles may blend in better with natural surroundings. Stronger conductors can minimize line sag. ROW management can mitigate aesthetic impacts by planting vegetative screens to block views of the line leaving the ROW in a natural state along the road. In the end, aesthetics are, to great extent, based on individual perceptions.

B. Agricultural Land

Transmission lines can affect farm operations and increase costs for the farm operator. Potential impacts depend on the transmission line design and the type of farming. Transmission lines can affect field operations, irrigation, and wind breaks.

Mitigation of Agricultural Impacts:

- Single-pole structures placing the existing road
- Longer spans as far as practically possible can be used to span them.

- Effects of windbreak removal can be mitigated by trimming the windbreak vegetation selectively, replanting lower-growing trees and brushes beneath the line, or creating a new windbreak elsewhere.

C. Electric and Magnetic Fields (EMF)

Health concerns over exposure to EMF are often raised when a new transmission line is proposed. Exposure to electric and magnetic fields caused by transmission lines has been studied since the late 1970s. These fields occur whenever electricity is used. The magnetic field is created when electric current flows through any device including the electric wiring in a home. Every day we are exposed to many common sources of EMF from vacuum cleaners, microwaves, computers, and fluorescent lights.

The research to date has uncovered only weak and inconsistent associations between exposures and human health. To date the research has not been able to establish a cause and effect relationship between exposure to magnetic fields and human disease, nor a plausible biological mechanism by which exposure to EMF could cause disease. The magnetic fields produced by electricity do not have the energy necessary to break chemical bonds and cause DNA mutations.

Reducing EMF Levels of Transmission Lines

Magnetic fields can be measured with a gauss meter. The size of the magnetic field cannot be predicted from the line voltage but is related to the current flow. A 69 kV line can have a higher magnetic field than a 115 kV line. Magnetic fields quickly dissipate with distance from the transmission line.

Mitigation:

A common method to reduce EMF is to bring the lines closer together. This causes the fields created by each of the three conductors to interfere with each other and produce a reduced total magnetic field. Magnetic fields generated by double-circuit lines are less than those generated by single-circuit lines because the magnetic fields interact and produce a lower total magnetic field. In addition, double circuit poles are often taller resulting in less of a magnetic field at ground level.

D. Noise

Vibrations or humming noise is noticeable most often on older lines. It is usually the result of conductor mounting hardware that has loosened slightly over the years and can be easily repaired by the utility.

The other types of noise are sizzles, crackles, or hissing noises that occur during periods of high humidity and are usually associated with high-voltage transmission lines (500 kV lines). These noises are very weather dependent. They are caused by the ionization of electricity in the moist air near the wires. Though, this noise is audible to those very close to the transmission lines, it quickly dissipates with distance and is easily overshadowed by typical background noises.

E. Radio and Television Reception

Transmission lines do not usually interfere with normal television and radio reception. In some cases, interference is possible at a location close to the ROW (especially along the road) due to weak broadcast signals or poor receiving equipment. If interference occurs because of the transmission line, the electric utility is required to remedy problems so that reception is restored to its original quality.

F. Fallen Lines

Transmission lines are designed to trip out of service (turn off), if they fall or have contact with trees. Transmission lines are not likely to fall unless hit by a tornado or truck.

G. Lightning

Power poles, trees and other tall objects are more likely to intercept lightning strikes. Transmission lines are therefore usually built with a grounded shield wire at the top of the poles. This protects the transmission line from lightning. Lightning is not more likely to strike houses or cars near the transmission line. Shorter objects under or very near a line may actually receive some protection from lightning.

H. Induced Voltage

People or animals can receive a shock by touching a metal object located near a transmission line. The shock is similar to that received by touching a television after walking across a carpet. The magnitude and the strength of a charge are directly related to the mass of the ungrounded metal object and its orientation to the transmission line.

Induced current can be prevented or corrected by grounding metal objects near the transmission line. Grounding chains can be installed on tractors. Metal fences can be connected to a simple ground rod with an insulated lead and wire clamp. Electric fences with proper grounding should continue functioning properly even when subject to induced voltage.

Overall Mitigation measures will include:

- Provision of keeping the distance of 15m ROW of either side of the transmission lines as per National Transmission and Dispatch Company (NTDC) should be considered before finalizing the Master Plan of the industrial estate.

6.4.14 Drainage

For the proposed Industrial Estate, a separate system has been proposed for the collection of wastewater and storm water. Keeping in view the economy and limited budget available with the client, it is proposed that storm water collection system will be designed as a part of this project, however its construction may be taken up in next phase upon colonization of the industrial area. Till that period, a part of storm water along the roads will be catered through wastewater pipes (partially combined system) and infiltration in empty industrial plots. Therefore, the wastewater collection system will work as partially combined system till construction of storm water drains. No impact is envisaged of the drainage of proposed Industrial Estate.

6.5 Potential Impacts during the Construction Phase

6.5.1 Topography

The project area has bad land topography. The irregular sand dunes deposited all over the project area which are 1 to 5 meters (3 to 15 feet) high from adjacent agriculture land. The surface is irregular throughout the project area and a large scale excavation is

involved. The establishment of the industries, associated infrastructure and road network will change the natural topography of the project site permanently.

6.5.2 Soil

Following impacts on soil quality are envisaged due to construction activities and construction camps:

- Excavation of earth/cutting operations, clearing of vegetation and land levelling activities can destabilize the surrounding land surface;
- In case any artifact, antiques and sensitive remains are discovered, Chance Find Procedures (**Annexure X**) should be adopted;
- The unspent materials and debris produced from consumed up materials, if left as such and allowed to mix with soil underneath, can degrade the quality of soils;
- Leakages of oils, lubricants, chemicals and other similar substances from their storage sites and from engines of the generators, machines, equipment and vehicles can spoil the receiving soils and may undermine ability of the spoiled soils to support growth of vegetation and plants;
- Non-provision of septic tanks with the temporary worksite toilets, constructed for the labour and others, can contaminate the effluent receiving soils because of raw nature of the effluents; and
- Washing of the gadgets, machinery and equipment without proper drainage of the washout water can adversely affect the soil quality.

The impact is considered to be moderate adverse in nature.

Mitigation measures will include:

- All spoils will be disposed of at designated site and the site will be restored back to its original conditions;
- Avoid use of heavy machinery on wet soil to prevent damage to soil structure;
- Non-bituminous wastes from construction activities will be dumped in approved sites, in line with the legal prescriptions for dump sites;
- As applicable and needed, plantation of grasses and shrubs will be done at appropriate place where required;
- Excavations would be kept confined to the specified foundation spots as per the approved engineering drawings. Unnecessary excavations should be avoided;
- Quarry Management Plan (attached as **Annexure XI**) should be adhered;

- Site camps for the resident labor should not be setup on the land earmarked for developing green belts and lawns;
- Oils, lubricants, chemicals, and other listed hazardous materials should be stored safely at their designated spots, enclosures or store rooms, which should be safe from rainfall and away from any potential source of fire and Hazardous Substance Rule 2003 should be followed;
- Septic tanks of adequate capacities should be constructed for receiving and treating wastewater from all temporary worksite toilets and at the temporary container offices, if any. The toilet wastewater should not be discharged untreated onto the adjacent lands;
- Vehicles should be parked and repaired at designated site containing oil collection & sumps arrangement; and
- All the unspent and left over materials be completely removed offsite upon completion of construction and the site be restored to original or near to original condition; and washout from washing of equipment and gadgets should be drained into either a septic tank or a sand-gravel bed for removal of the grit and contaminants.

6.5.3 Surface Water/Groundwater Quality

The potential sources of water pollution associated with the construction of proposed project are:

Runoff from the construction works site may contain increased load of sediments, suspended solids and other contaminants. Potential sources of pollution from the site include:

- Runoff and erosion from exposed soil surfaces, earth work areas and stockpiles e.g. grouting and cement material with the rain;
- Wash water from dust suppression sprays;
- Fuel and lubricants from maintenance of construction vehicles and mechanical equipment;
- Spillage of liquids stored on-site such as oil, diesel, and solvents etc. are likely to result in water pollution; and
- Uncontrolled discharge of debris and garbage such as packaging, construction material and refuse.

Wastewater would be generated from the workforce during the construction phase. However, wastewater can be adequately treated by interim sewage facilities, such as portable toilets, which can be installed within the construction site.

Construction waste, if left unattended will result in forming leachate that will percolate through the soil strata and will reach underground water table and hence, will end up contaminating groundwater. There is a probability that various materials like fuel, lubricant oil and other oily products, which are used during the construction phase may contaminate groundwater and channels carrying water.

Mitigation measures will include;

- Protection of groundwater reserves from any source of contamination such as the construction and oily waste;
- Water required for construction may be obtained in a sustainable way that the water availability and supply to nearby communities remain unaffected;
- Stockpiles of cement and other construction materials should be kept covered when not being used;
- Avoid fuel and other chemicals being stored at numerous locations around the site;
- Maintenance of vehicles and plant should be carried out only on impermeable areas where any oil spillages can be contained;
- Oils, fuel and chemicals should be stored at fuel stores;
- Careful planning of the works to avoid soil excavation works during rainy seasons;
- All kinds of waste shall be stored in covered containers and disposed of safely as soon as possible;
- Temporary sanitary facilities, such as portable chemical toilets, should be employed on-site. A licensed contractor should be hired for appropriate disposal and maintenance of these facilities; and
- Sand/silt removal facilities such as sand traps, silt traps and sediment basins will be provided to remove the sand/silt particles from run-off. These facilities will be properly and regularly maintained. These facilities will be carefully planned to ensure that they would be installed at appropriate locations to capture all surface water generated on site.

6.5.4 Air Quality

Air quality will be affected by various construction activities. Emissions may be carried over longer distances depending upon the wind speed, direction, temperature of surrounding air and atmospheric stability. In certain climatic condition such as hot summer, airborne dust can become a major nuisance if control techniques are not properly employed. The critical sources of air pollution during the construction phase will be:

- Unpaved road surface;
- Transportation of materials;
- Excavation operations
- Construction equipments;
- Vehicular exhaust; and
- Burning of fuel for cooking by workers.

The air emissions may cause health impacts such as dryness and roughness of the throat; eyes, nose, etc. to the workers and staff of the contractor. These emissions may also affect the bio-physical environment. Major air sensitive receivers identified in the project area are Mosque Muhammadia, Noor Masjid, Govt. Girls Primay School, Mari Sheikh Shujra. The impact is major adverse and temporary in nature.

Mitigation measures for emissions include the following:

- All vehicles, machinery, equipment and generators used during construction activities should be kept in good working condition, properly tuned and maintained in order to minimize the exhaust emissions;
- Open burning of solid waste from the contractor's camps should be strictly banned;
- Use of fuel with substantially lower sulphur content;
- Proper maintenance and repair of power generators and construction machinery is needed to minimize the hazardous emissions;
- Personal Protective Equipment (PPE) like masks, goggles and gloves etc. shall be provided to workers; and
- NEQS applicable to gaseous emissions generated by construction vehicles, equipment and machinery should be enforced during construction works.

Dust problems caused during the construction phase of the project could be effectively mitigated by the implementation of simple procedures by the contractor including but not limited to the following:

- Regular water sprinkling on the site and access roads should be carried out to suppress excessive dust emission(s);
- Construction workers should be provided with masks for protection against the inhalation of dust;
- The vehicles carrying construction materials and the construction material storage areas should be covered with tarpaulin;
- Vehicle speed in the project area should be prescribed not more than 20 km/ hr and controlled accordingly;
- Tires of all the vehicles leaving the site should be washed. No earth, mud and dust shall be deposited on the public road; and
- Any material dropped on the paved roads will need to be cleaned up immediately to prevent dust nuisance.

6.5.5 Noise and vibration

Main sources of noise will be heavy machinery such as bulldozers, excavators, stabilizers, concrete mixing plant, pneumatic drills and other equipment. Noise generated by construction machinery is likely to affect sensitive receptors located within 500 meters of the project area.

Health risks associated with exposure to continuous noise levels includes increase in blood pressure, hypertension, annoyance and sleep disturbance. temporary threshold shift etc. Major noise sensitive receivers identified in the project area are Masjid Muhammadia, Noor Masjid, Govt. Girls Primay School, Mari Sheikh Shujra and residential area around project site. The impacts of noise would be temporary and highly adverse in nature.

The likely impacts due to noise are:

- Psychological effects of distraction of attention, irritation and short temperedness in the exposed persons due to persistently higher noise levels; and

- Noisy settings and higher background levels can cause temporary threshold shift and the consequent habit of speaking loud, which may cause damage to vocal cords in the persons exposed.

This impact is temporary and moderate adverse in nature.

Mitigations:

There are a variety of ways by which construction equipment and worksite noise can be controlled. The following is a list of ways to control noise level at the worksite of the proposed Project:

- ***Quieter Equipment***

A cost-effective way to reduce noise at a construction worksite is to buy quiet equipment. In addition, equipment in use should be the most suitable for the job. Avoid using equipment that is over-powered and, conversely, avoid using under powered equipment. Whenever possible the quietest equipment alternative should be used. In general, electronic powered equipment is quieter than diesel powered equipment and hydraulically powered equipment is quieter than pneumatic power.

- ***Modifying Existing Old Equipment***

The most common way to reduce the noise levels of common construction equipment is through worksite modifications. Some common worksite modifications consist of retro-fitting existing equipment with damping materials and mufflers.

- ***Barrier Protection***

An effective way of reducing noise is to locate noisy equipment behind purpose-built barriers. The barriers can be constructed on the work site from common construction building material (plywood, block, stacks or spoils) or the barriers can be constructed from commercial panels which are lined with sound absorbing material to achieve the maximum shielding effect possible. To be effective, the length of the barrier should be greater than its height. The noise source should not be visible and barrier should be located as close as possible to either the noise source or the receiver.

- ***Work Activity Scheduling***

Work activity scheduling are administrative means to control noise exposure. Planning how noise sources are sited and organized on a work site can reduce noise hazards.

Jobs can be rotated so that exposure time is limited. Transferring workers from a high exposure task to a lower exposure task could make the employee's daily noise exposure acceptable. Administrative controls include activity planning, for example, scheduling pavement breaking operations so as to reduce the number of work site workers exposed. In addition noisy equipment should not be run for periods longer than necessary and should be switched off when not in use.

- ***Maintenance***

Increased attention to maintenance of tools and equipment will reduce worksite noise levels. Maintaining plant and equipment in good order not only increases its life, but makes it safer to use and quieter. Loose and worn parts should be fixed as soon as possible. Ideally, the worksite should have a system in place for checking and servicing the various machines and power tools.

- ***Noise Perimeter Zones***

Noise perimeter zones (NPZ) are another administrative control to limit exposure to noisy processes or equipment to as few workers as possible. NPZ are areas where noise levels of 90 dB (A) or more are roped off and marked to keep out all workers who don't have to be there.

NPZ can be set up using a sound level meter to find the safe distance from the source (90 dB (A)) and the NPZ can be set up at that distance. Noise does not radiate from the source at the same level in all directions. Noise from machinery can be higher in one direction than another because the noise can also be either absorbed or reflected from surfaces it contacts, such as the ground or a wall. Therefore, measurements should be taken at several points in an area where people might be working. Once noise levels that are 90 dB (A) or more are determined, rope off this area as the Noise Perimeter Zone. Exclude all workers who do not need to be in that zone. All workers who need to work within the zone must wear hearing protection.

Following are the general mitigation measures to minimize the impacts of noise:

- Provide construction workers with suitable hearing protection like ear cap, or earmuffs and training them in their use;
- Preferably, restrict construction vehicles movement during night time near the residential areas and camp sites;

- Locate the concrete mixing, and materials shipment yards at least 2km from residential areas, particularly schools and health centers;
- Selection of up-to-date and well maintained plant or equipment with reduced noise levels ensured by suitable in-built damping techniques or appropriate muffling devices; and
- Heavy machinery like percussion hammers and pneumatic drills should not be used during the night.

Vibrations will be caused due to operation of heavy machinery. No structural damage, even for older or heritage buildings, will be expected as a result of construction activities.

All mitigation measures mentioned below should be taken in order to minimize the impacts of vibrations in the project area. These measures include, but are not limited to the following:

- Residents should be notified earlier before commencement of excavation operations, if any;
- Earth retaining walls should be constructed to contain the vibrations; and

6.5.6 Solid Waste

Due to construction activities municipal and construction waste will be generated from construction activities and contractors' camps. Improper dumping of waste may generate odor and attract mosquitoes and other disease vectors. Empty containers containing the toxic, flammable and corrosive materials may pose hazard to the workers. This may result in health risk to work force and public, if disposal site is improperly selected. This impact is temporary and minor negative in nature.

Mitigation measures will include:

- The waste generated from the camp site will be disposed of at approved sites;
- Burning of waste shall be prohibited;
- Containers with covers shall be provided on site to store waste;
- General and hazardous waste shall be labelled and segregated;
- Solid Waste shall be safely stored in demarcated waste disposal sites; and
- The contractor shall ensure implementation of waste management plan.

6.5.7 Flora

Trees are vital ecosystem, which perform variety of functions for the improvement of environment such as reduction in air pollution, noise abatement, cooling effect on earth and supply of oxygen.

Nearly 45 trees of different species mostly young trees exist in the project area. These trees are likely to be effected, during construction stage. Construction of various industrial units in the estate, shall involve cutting and removing of these trees, which shall have a negative effect on the flora of the tract.

Following impacts are expected on the flora of the project area:

- Trees act as a binding force as their roots are spread in the soil, which helps to keep the soil intact. With the removal of trees, however less, this binding force will be vanished and the soil will be liable to increased erosion;
- Exhaust of noxious gases from movement of heavy machinery will further pollute air which will adversely affect health of plants;
- Establishment of Contractors camps and warehouses for storage of equipment, material etc. will involve clearing of vegetation from the area, causing an adverse impact; and
- During construction activities the Contractor's workers may damage the vegetation and trees (for use as fire-wood to fulfill the camps requirements).

This impact will be permanent and moderate negative in nature.

Mitigations measure will include:

- The affected/uprooted ornamental trees should be re-planted;
- Flowering and fruiting shrubs should be planted along the project boundary to beautify the landscape. Plantation would however be done keeping in view the principles of landscape designing;
- The contractor's staff and labour should be strictly directed not to damage any vegetation such as trees or bushes. They should use the paths and tracks for movement;

- Construction vehicles, equipments and machinery should remain confined within their designated areas of movement;
- Contractor should supply gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel should not be allowed; and
- Camp sites and asphalt plants should be established on waste/barren land rather than on forested or agriculturally productive land. However if such type of land is not available, it should be ensured that minimum clearing of the vegetation is carried out and minimum damage is caused to the trees.
- Establishment of Contractor's camp and warehouses for storage of equipment, material etc. shall involve clearing of grassy vegetation, mostly Dab and Kana vegetation from the area causing a negative impact;
- During the entire construction period dust laden polluted air will form a dust film on leaves thus blocking sunshine and stomata consequently hindering photosynthesis processes causing detrimental effect on the plant health;
- Exhaust of noxious gases from movement of heavy machinery will pollute air which will adversely affect health and vigor of plants; and
- During construction activities the Contractor's workers may damage the vegetation and trees (for use as fire-wood to fulfill the camps requirements).

Tree Transplantation

Maximum efforts should be made by the PHA to transplant all the uprooted trees to be affected due to construction of proposed flyover.

A decision to transplant a tree should be based on a balancing consideration of its conditions (e.g. form, health and structure), size, species, conservation status, amenity value, suitability for transplanting, environmental and cultural factors, functional and engineering considerations and cost effectiveness. **Figure 6.3** shows the basic work flow with key considerations of tree transplanting for a typical construction project.

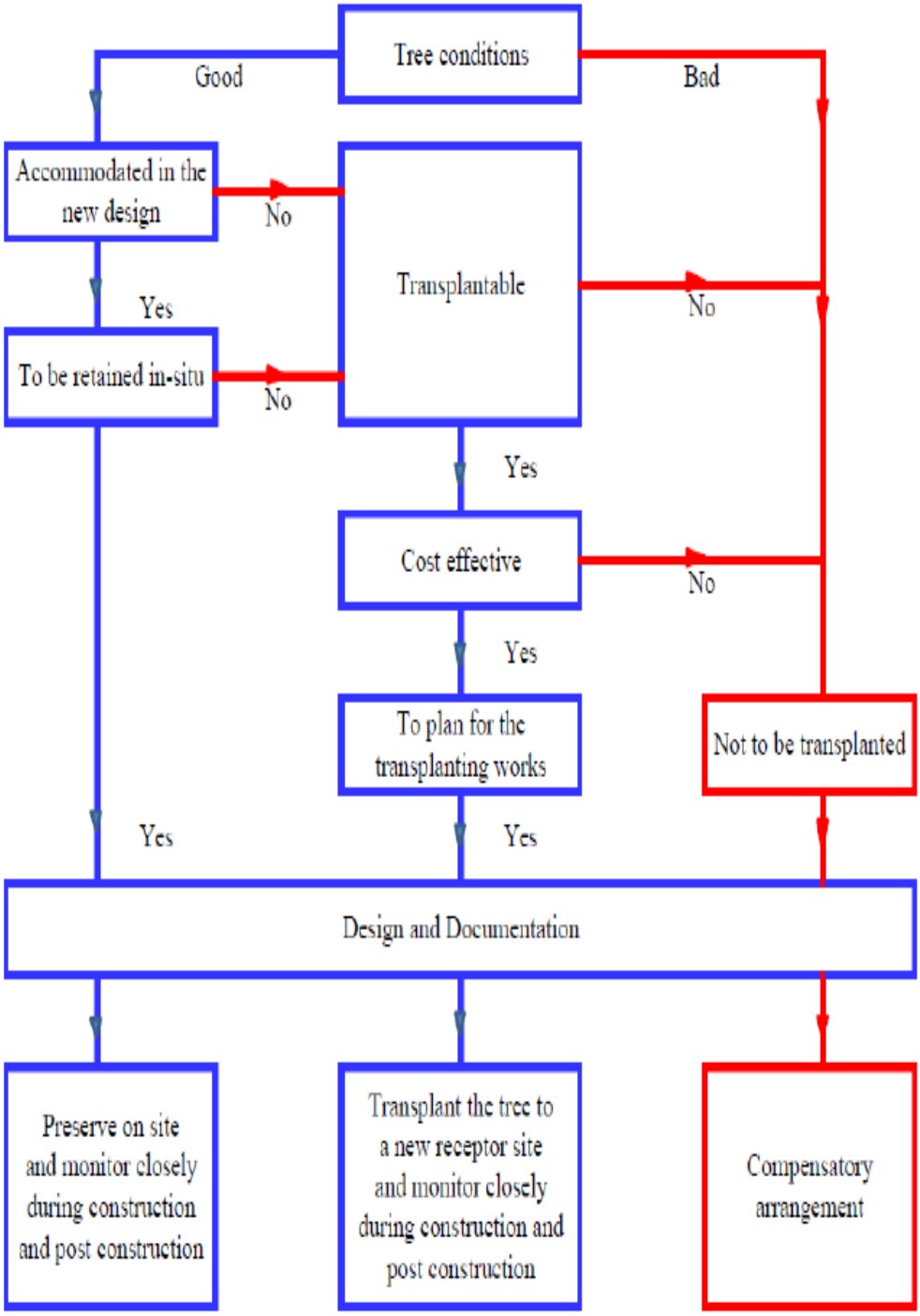


Figure 6.3: Basic Work Flow With Key Considerations of Tree Transplanting[1]

Improper technique, design and documentation of transplantation may lead to death of trees. The impact is considered to be permanent and moderate adverse in nature.

[1] *Guidelines on Tree Transplanting, Greening, Landscape and Tree Management Section, Development Bureau, The Government of the Hong Kong Special Administrative Region, September 2014*

Mitigations:

- Trees should be properly preserved and no trees should be unnecessarily removed;
- Trees that are suitable for and worthy of preservation are identified in the planning or feasibility stage and should be properly preserved through careful and proper planning, design, implementation and post construction maintenance;
- Removal, i.e. transplanting or felling should be considered only if preservation is impractical;
- Tree transplanting should be properly planned by PHA implemented to ensure that sufficient space to accommodate the existing tree and its future growth, and adequate time for preparation of transplanting are available;
- For situations where retaining the trees at their existing locations are not practicable, priority should be given to transplant the affected trees to other permanent locations within the project site where appropriate, so as to increase the trees' survival rate after transplanting and minimize the loss of greenery in the local environs; and if not practicable, transplant the affected trees to a suitable permanent location ex-situ. Location of the receptor site should preferably be in proximity to the project site for retention of amenity effect in the vicinity; and
- A larger root ball is recommendable for more mature trees to enhance better recovery after transplanting.

6.5.8 Fauna

The trees provide nesting and resting places to the fauna. The cutting of these trees will have a negative impact on the fauna as well. During the construction phase, there will be negative impacts on the mammals and reptiles of the area, due to construction activities involving excavation, access roads, movement of labor, carriage of goods and machinery to various sites along the project corridor. Mammals, such as dogs, cats, jackals etc. will avoid these areas for fear of being persecuted. Same will be the case with reptiles; some reptiles might be killed during the digging and piling operations. Following are the major impacts envisaged on the fauna during the construction activities:

- Eatable and refuse goods of the Contractor's camps may attract wildlife that might be hunted by the workers;
- Due to establishment of labor camp, food storage, setting up of kitchens production of sewage and waste water may result in multiplication of rodents like rats, mice and shrew etc. and vectors like mosquitoes, bugs and flies which will have a negative impact;
- Birds will try to find shelter and food somewhere else and will tend to move away from the Project Area due to the activities mentioned above for fear of being hunted/caught; and
- The constructing activates might affect the threatened and vulnerable species around the Study Area.

Following measures will be adopted during construction stages:

- Noise control measures should be enforced during the construction phase such as provision of silencers on heavy construction vehicles. It is further recommended that activities, which are expected to generate more noise should be executed during the daytime only;
- Moreover, over speeding shall be prohibited and construction machinery, vehicles and equipment will remain confined within their designated areas of movement to avoid and minimize any accidental killing of Fauna;
- The camps will be properly fenced and gated to check the entry of wild animals in search of eatable goods. Similarly wastes of the camps will be properly disposed of to prevent the chances of its eating by wild animals, which may prove hazardous for them; and
- Hunting, poaching and harassing of animals and birds will be strictly prohibited and contractor shall be held responsible for any such act of his men;
- Hunting of the species must be restricted through existing regulations and if necessary, more stringent laws should be enacted for preservation of this valuable species;
- Local People and construction workers should be given awareness for protection of wildlife as wildlife has also right to live and it makes the surroundings more attractive and colorful. Promotion of awareness to individuals shall accelerate the process of wildlife preservation;

- All construction activities must be in coherence with the behavior and habits of threatened species in the area; and
- Contractor should make close liaison with the Wildlife Department and Game inspectors to develop strategies for protection and conservation of Species.
- During construction, fencing of area is mandatory to confine and protect the species.
- During the hunting season, a framework should be developed in order to record the number of birds killed in a specific area. This is an essential component because it helps in generating necessary information in order to show not only the number of birds killed in each year from a specific area but the annual population estimates can also support the sustainable use concept; and
- Rats in the area must be curtailed as it is suspected that they eat eggs and chicks (Houbara Bustard).
- Turtle hatcheries should be established and protection of nesting sites should be ensured. Surveys should be conducted to identify suitable places for establishing hatcheries for freshwater turtles. Protection of nesting sites of turtles is necessary for their survival. Nest protection during breeding season can be promoted;

6.5.9 Resource Conservation

The materials used in construction of proposed project would include coarse aggregates (crush), fine aggregates (sand), steel, water, asphalt and cement etc. Almost all the materials to be used in the construction of proposed project are non-renewable and therefore their sustainable use is necessary for the future use.

Fuel will be used to operate construction machinery and asphalt and batching plants. Sustainable use of energy resources is very important not only to continue future use but also to help to reduce air emissions. For conservation of energy, efficiency of the engines and burning processes is very important. The impact is minor negative but is important as these fuels are nonrenewable resources of energy.

Following practices should be adopted to conserve these natural resources.

- Diesel and fuels with low sulphur content will be used to operate construction machinery and equipment's.

- The efficient and well maintained equipment's and machinery should be used;
- The equipment's and machinery should be turned off when not in use;
- Recycling practices of waste should be adopted wherever possible;
- Reuse of construction waste wherever possible; and
- Regular maintenance of machinery to avoid fuel leakages.

6.5.10 Construction Camps/Camp Sites

The construction camps may lead to environmental and social impacts in the project area specially arising from camp sites. However, these impacts will be temporary and minor negative in nature. **Table 6.4** summarizes potential impacts and proposed avoidance and mitigation measures associated with construction camps.

Table 6.4: Summary of Worker Camp Impacts & Mitigation Measures

Potential Impact	**Proposed Avoidance and Mitigation Measures**
Environmental • Temporary habitat loss or disturbance • Temporary visual intrusion • Noise emissions at a single location • Waste generation • Discharge of sanitary effluents and rainwater run-off.	***Environmental*** • Reinstate any temporary facilities to pre-existing conditions in ecologically sensitive areas. • Implement landscaping plan for all facilities in areas where high landscape value and visual vulnerability to the proposed activities warrants site-specific landscape restoration measures. • Operate equipment in a manner sympathetic to the ambient noise environment. Do not leave equipment idling unnecessary. • Provide adequate warnings of impeding works to all potential receptors within a 1 km corridor surrounding the right-of-way via public notices and local news.
Social • Worker camp site: consultation	***Social*** Employment policies which aim to maximize

surrounding potential construction camp sites revealed concerns regarding the location of proposed sites for worker camps.	job opportunities for local people will help to minimize tensions caused by different socio-cultural values. Training will be provided to all staff on camp management rules and overall discipline and cultural awareness. This will include, in appropriate languages: • A briefing on camp rules • A community relations orientation to increase awareness about the local area, cultural sensitivities and the project Code of Conduct • Awareness-raising on health considerations, including STDs. The construction contractor is required to develop a Construction Camp Management Plan to address: • Discipline • Community liaison • Ethnic tensions and • Communicable diseases. A Code of Conduct and Camp Rules will be required within the Construction Camp Management Plan, which provides policies and a disciplinary framework with respect to worker behavior.

6.5.11 Health and Safety of Workers and Public

a) Occupational Health and Safety

Workers may be exposed to unsafe and/or unfavorable working environment due to storage, handling and transport of hazardous construction material. Workers should be provided with safe and healthy working environment taking into account the following mitigation measures:

- Providing basic medical training to specified work staff and basic medical service and supplies to workers;
- Obligatory insurance against accidents for labourers/workers;
- Layout plan for camp site, indicating safety measures taken by the contractor, e.g. firefighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents;
- Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for labourers;
- Protection devices (ear muffs) should be provided to the workers doing job in the vicinity of high noise generating machines;
- Provision of adequate sanitation, washing, cooking and dormitory facilities including light up to satisfaction;
- Provision of protective clothing for labourers handling hazardous materials, e.g. helmet, adequate footwear for bituminous pavement works, protective goggles, gloves etc;
- Ensure strict use of wearing these protective clothing during work activities;
- Elaboration of a contingency planning in case of major accidents;
- Ensure that the site is restricted for the entry of irrelevant people particularly children; and
- Adequate lightning devices, barriers, yellow tape and safety signage shall be posted.

b) Community Health and Safety

The construction activities and vehicular movement at construction sites and access service roads may also result in road side accidents particularly inflicting local communities who are not familiar with presence of heavy equipment and machinery.

This is a temporary and minor negative impact. Quality of ground water and surface water resources available in the nearby local communities may get contaminated due

to the construction activities, oil spillage and leakage, roadside accidents etc. The labourers work with different transmittable diseases may cause spread out of those diseases in the local residents.

Mitigation measures will include:

- There should be proper control on construction activities and Oil spillage of vehicles;
- The labourers with different transmittable diseases should be restricted within the construction site;
- Efforts will be made to create awareness about road safety among the drivers operating construction vehicles;
- Timely public notification on planned construction works;
- Close consultation with local communities to identify optimal solutions for diversions to maintain community integrity & social links;
- Provision of proper safety signage, particularly at sensitive/accident-prone spots;
- If identified, consider guard rails at accident-prone stretches and sensitive locations;
- The communicable disease of most concern during construction phase, like Sexually-Transmitted Diseases (STDs) such as HIV/AIDS, should be prevented by successful initiative typically involving health awareness; education initiatives; training heath workers in disease treatment; immunization program and providing health service;
- Reducing the impacts of vector borne diseases on long-term health effect of workers should be accomplished through implementation of diverse interventions aimed at eliminating the factors that lead to disease, which includes: Prevention of larval and adult propagation of vectors through sanitary improvements and elimination of breeding habitat close to human settlements and by eliminating any unusable impounding of water;
- Fencing around the camps should be strong enough so that it cannot be broken easily by local people for making passages; and
- Use of water should not disturb public water availability and source of water should be selected carefully.

6.5.12 Emergency Response

Natural disasters and accidents such as fire, falls, slips and trips may result in injuries, financial losses and may even lead to deaths. The workers shall be trained and facilitated to cope with such emergencies.

Mitigation measures include the following:

- Implementation of emergency response plan shall be ensured by the contractor;
- Training of the staff/employees regarding the emergency procedures/plans shall be regularly conducted; and
- Minor incidents and near misses shall be reported and preventive measures shall be formulated accordingly.

6.5.13 Traffic disruption

Traffic load on N5, Air Port Road and connecting access roads would be increased due to the project activities and movement of heavy machinery, but this will not be a significant concern as the construction will be carried in different packages and traffic can be diverted easily using proper traffic management plan. Thus, the impact is temporary and minor negative in nature.

The mitigation will include devising a traffic management plan in coordination with traffic police and PIEDMC.

6.5.14 Social Issues

Due to the proposed project, residents and farmers may face inconvenience in their daily activities. People will have problem of access to mosques (Masjid Muhammdia, Noor Masjid), educational institutes (Govt. girls Primary School Mari Sheikh Shujra), and graveyard. Residential area adjacent to the proposed industrial estate boundary, may have access issue in the future.

Existing road network is not sufficient for proposed intervention. It will lead to disturbance for daily commuters and congestion of traffic volume during project construction phase.

A traffic management plan or some alternate routes in order to minimize traffic hazardous and polluted environment. Widening of roads will also be necessary in the execution of the project.

The utmost benefit of implementation of industrial estate is socioeconomic development of area. It will enhance employment opportunities for locals and promotion of trade corridor on large scale by empowering them economically to live improved life ahead.

Mitigation measures will include:

- Preparation and implementation of traffic management plan for the entire construction phase; and
- Public should be notified before the commencement of the project and be educated about the traffic management plan.

6.5.15 Borrow/ Open Pits

The site for borrow pits/ quarry areas has not been identified at this stage of the project. Hence, the impacts discussed for borrow pits/ quarry areas are of generic nature. Borrow/ open pits and its excavation activities may result in land disputes, soil erosion, loss of vegetation, landscape degradation, and damage to road embankments. Since the project site has bad land. The irregular sand dunes deposited all over the project area which are 1 to 5 meters (3 to 15 feet) high from adjacent agriculture land. The surface is irregular throughout the project area, fill material will be required to increase the ground level of the site with respect to its surroundings. Fill material Borrow/ open pits and its excavation activities may result in land disputes, soil erosion, loss of potential cropland, loss of vegetation, landscape degradation, and damage to road embankments.

Borrow/ Open pits may also result in potential sources of mosquito breeding and may prove hazardous to human beings. This will also degrade hygienic condition of the project area. Quarry Management Plan is attached as Annexure-XI. This impact is permanent and moderate adverse in nature.

Mitigation measures will include:

- Borrow areas must not be selected on agricultural land;
- Necessary permits must be obtained for any borrow pits from the concerned authorities;
- In borrow pits, the slope must not be steeper than 1:4;
- Soil erosion along the borrow pit shall be regularly checked to prevent / mitigate impacts on adjacent lands;
- In case borrow pits fill with water, measures have to be taken to prevent the creation of mosquito-breeding sites; and
- Borrow pits may be utilized for aqua culture.

6.5.16 Employment

Employment opportunities for skilled and unskilled labour will be generated during all the activities related to construction. This is major positive impact in nature.

6.5.17 Construction Waste and Hazardous Waste

Due to construction activities, waste will be generated at construction and contractors camp site. The construction waste will include wastewater, oil spillage from machinery, domestic waste and solid waste etc. As the project deals with the construction of the proposed Industrial Estate, so no hazardous waste will be generated during the construction waste. But the handling and storage of oil, asphalt/bitumen may be a source of environmental pollution as a hazardous waste. This will result in unhygienic conditions, health risk to work force and public at the camp site. This impact is temporary and minor negative in nature. Pesticides may be used while raising plants for planting on both sides of road. Most of the pesticides are hazardous for human. Insecticides may also be used at the camp sites and there use also needs to be regulated.

Mitigation measures will include:

- Wastewater effluent from contractor's workshop and equipment washing yards would be passed through gravel/ sand beds to remove oil/ grease contaminants before discharging it into natural streams;
- Training of working force in the storage and handling of materials and chemicals that can potentially cause soil contamination;

- Solid waste generated during construction and camp sites should be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan;
- Proper labelling of containers, including the identification and quantity of the contents, hazard contact information etc.;
- Training employees involved in the transportation of hazardous material regarding emergency procedures;
- The sewage system for camps will be properly designed (pit latrines or, as required, septic tanks) to receive all sanitary wastewaters;
- Lined wash areas will be constructed within the camp site or at site, for the receipt of wash waters from construction machinery;
- Use of pesticides in nurseries should be done deemed necessary and suggested by the experts;
- Use of less toxic pesticide should be preferred;
- Those insecticides should be used which are less toxic to human health.

- No refuelling, storage, servicing or maintenance of equipment should take place within 150 feet of drainages or other sensitive environmental resources;
- Any fluids drained from the machinery during servicing will be collected in leak proof container and taken to an appropriate disposal or recycling facility; and
- A comprehensive plan for construction waste management (Flow chart of Construction Waste Management Plan is shown in **Figure 6.4** and attached as (**Annexure-XII**) may be adopted.

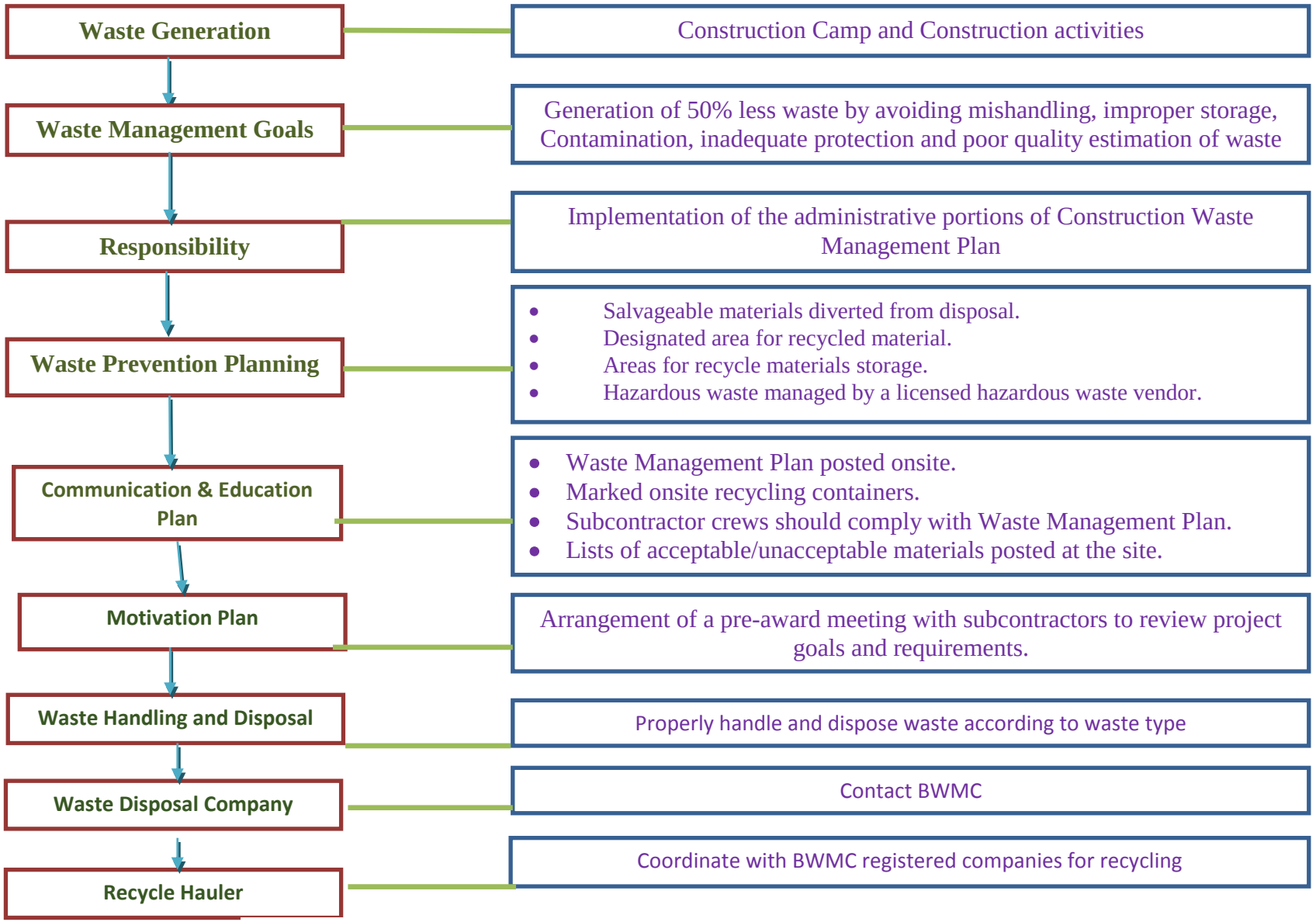


Figure 6.4: Flow Chart of Construction Waste Management Plan

6.5.18 Groundwater

There is a possibility that various materials like fuel, lubricant oil and other oily products, which are used during the construction phase may contaminate groundwater, if they are not handled properly. During the construction phase, the sanitary wastewater will be generated at the workers' camp(s). If this wastewater is allowed to stagnate in water ponds on the site, it can percolate into the soil, thereby, contaminating groundwater. This impact is temporary and minor negative in nature.

Mitigation measures will include:

- Protection of groundwater reserves from any source of contamination such as the construction and oily waste that will degrade its potable quality;
- The solid waste should be disposed of in designated landfill sites to sustain the water quality for domestic requirements;
- Water required for construction is obtained in such a way that the water availability and supply to nearby communities remain unaffected;
- Regular water quality monitoring according to determined sampling schedule; and
- Prohibit washing of machinery and vehicles outside washing yard, provide sealed washing basins and collect wastewater in sedimentation/retention pond.

6.5.19 Disposal of Mucking Material

Inevitable cut and fill earthwork operations will open up scars on the land around the project area. This impact is temporary and minor adverse in nature.

Mitigation measures will include:

- The excavated materials that are unsuitable for use will need to be stored, transported and disposed of appropriately at designated sites by PIEDMC.

6.5.20 Disturbance to People

Approach/ hindrance problems for the residents, students movement of the daily commuters will be disturbed around the nearby villages of the proposed industrial estate due to construction activities. This impact is temporary and minor adverse in nature.

Mitigation measures will include:

- Ensurance of timely completion of the construction works according to the agreed schedule by PIEDMC and provision of alternate routes for the project site where the construction is being carried out.

6.5.21 Economic Activity

Due to the construction of the proposed project, economic activity will be generated in the project area as the laborers and semi-skilled staff will have an opportunity to work for the construction of the proposed project. This will help in developing their skills and capacities. This is a moderate beneficial impact.

6.6 Anticipated Impacts during Operation Phase

The anticipated impacts related to the proposed project have been studied for the operation phase and discussed hereunder.

6.6.1 Flora

During the operation phase, new saplings of different plants and trees would be planted. Raising of new plants/trees at available spaces in the project area will have a positive impact of permanent nature. No negative impacts are envisaged on the flora during the operation phase. The presence of adequate flora and the green belt around the perimeter of the proposed industrial estate will absorb flue gases, emitting from a large number of vehicles and public transport passing through the project area, which shall improve the air quality.

Mitigation measures will include:

- The saplings planted in the project area against the trees affected should be properly maintained throughout their initial growth period in terms of water requirement and necessary nutrients by Parks and Horticulture Authority (PHA).

6.6.2 Surface/ Ground Water

Wastewater from industrial, commercial and residential zone of the industrial estate will contain high concentrations of Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solids (TSS) and Pathogens etc. Wastewater from other industrial and commercial sectors may contain hazardous metals and compounds.

If all this wastewater is not treated properly, it will be a continuous hazard for the aquatic system and downstream uses of canal and river. Moreover, illegal installation of tube wells by the operating industries may lead to decrease in the ground water level of the project area. The impact is considered to be temporary (in case of installation of CETP) and moderate adverse in nature.

Mitigation measures will include:

- PIEDMC should ensure the installation of tube wells as per proposed design;
- PIEDMC should ensure that no industry shall install a tube well within its own premises;
- Combined Effluent Treatment plant (CETP) shall be operated as per Standard Operating Procedures (SOPs) to follow NEQS. Special concentrations shall be paid to sludge treatment and handling;
- Implementation of bylaws of individual treatment plants at industrial level shall be ensured;
- Industries shall be bound to submit monitoring reports of their effluents regularly;
- Monitoring plans for water quality analysis of the CETP effluent and groundwater shall be prepared; and
- Best management Practices (BMPs) shall be maintained to ensure their effective function to treat nonpoint source water pollution.

6.6.3 Air Quality

The operation of industries will result in generation of large quantities of primary and secondary air pollutants including SO_x, NO_x, CO, CO_2, PM_{10}, $PM_{2.5}$, H_2S, and CH_4 etc. The gaseous emissions in form of plumes will create an air-shed of pollutants within 15 – 20 Km distance and affect the recipients in the downwind direction of the industries and may cause chronic or acute respiratory diseases like asthma and nausea and will also have effect on the faunal and floral species.

SO_x, NO_x, PM_{10} and $PM_{2.5}$ will cause breathing problems, irritation in eyes, throat and nose. CO and H_2S are foul smell poisonous gases, CO_2 and CH_4 are referred to as a greenhouse gases. Pakistan is signatory to the United Nations Framework Convention on Climate Change (UNFCCC) and adopted Kyoto protocol in 1997. Under the Kyoto

Protocol, Pakistan is committed to reduce GHG emissions into the environment to prevent interference with climate change. The continuous emissions of GHGs for the proposed project are a concern in the operational phase. This impact is high adverse and permanent in nature.

Mitigation measures will include:

- Installation of Air Pollution Control Equipment in respective industries;
- Capture CH4 and H2S that can be used commercially;
- Plan massive tree plantation along the industrial estate;
- Management should ensure Compliance of PEQS, 2016; and
- SMART Rules must be followed.

6.6.4 Soil

Disposal of hazardous waste of industries, medical facility and commercial areas is one of the major concerns during operation phase of the project. Therefore, its improper handling and disposal will pose serious threat to the physical and biological environment. This will also adversely impact the future use of the land where hazardous waste will be disposed of. This impact is high adverse permanent in nature.

Mitigation measures will include:

- Each industry shall be bound to submit the inventory of use of hazardous chemicals, their use and final disposal including measures to control special waste; and
- Signage shall be carried out to regulate the routes of especial waste disposal to avoid the risks of spillages.

6.6.5 Ecology

Movement of traffic in the area shall increase, causing noise and air pollution, which will be a permanent source of disturbance to fauna of the area and especially the birds, which shall avoid this area on account of noise and fear of being harassed or killed.

Most of the industries set up in the estate will cause toxic air emissions, resulting in deterioration of ambient air quality and ultimately affecting not only human health, but also it has negative impact on the surrounding flora and fauna. These emissions

may be carried over long distances, depending on wind speed and direction, which generally varies with seasons.

As the requisite numbers of trees to be felled are already removed, ground vegetation is already disturbed; there will be no further damage to the flora of the Project Site during operation stage. Maximum possible number of trees of suitable species should be raised during the operation stage, which shall result in a healthy impact on the flora of the area.

Both the flora and fauna are an integral part of the eco-system. In many ways fauna of a tract is dependent upon flora for its resting, nesting and roosting activities. With the plantation of 10 times more plants than the number of plants removed, the negative impact due to cutting of trees shall be mitigated to a reasonable extent, due to raising of additional plants in the area. The fauna and specially the avi-fauna shall be attracted to the area, adding to the environmental rehabilitation.

The birds which scared away due to noise and degradation of their habitat will return or start visiting the area again. So there will be a positive impact on the fauna.

Mitigation measures will include:

- Compensatory plantation of trees shall be undertaken along the boundary of the Industrial Estate, along the main and minor roads and in green areas; and
- A tree plantation program will be implemented by the Divisional Forest Officer, Bahawalpur, in and around the Industrial Estate. For this purpose, requisite funds should be placed at the disposal of D.F.O. by the proponent.

6.6.6 Solid Waste

Large quantities of municipal and hazardous waste will be generated in the operation phase of the project. Without a proper solid waste management system and engineered land filling practices, many environmental risks remain problematic for the workers and visitors. Such impacts should be minimized through following general mitigation measures:

- Solid Waste management (SWM) system should be operated as per SOPs and

improved with time to time;

- Primary collection and storage of solid waste should be performed in the closed containers;
- Secondary collection should be done in the compactor trucks;
- Only unusable trash material should be disposed of into the landfill site and all the reusable material shall be separated, processed and sold accordingly; and
- People should be educated to waste lesser.

6.6.7 Landscape

At present, the landscape of the project area is dominated by barren land. However, after the construction of proposed industrial estate, the landscape of the project area will be changed in terms of road infrastructure, grid stations, CETP, administration area, medical facility, amenities/commercial area, parks, green belts and roads etc. This will permanently change the landscape of the project area but at the same time will have a positive impact in terms of socio-economic development of the project area.

6.6.8 Increased Land value

Due to establishment of industrial estate, the land value of the project area may increase. Improved communication and infrastructure will be developed to promote new business opportunities. This impact will be permanent and major positive in nature.

6.6.9 Occupational Health and Safety

Industrial occupational safety of the workers will be of significant concern during operation phase. Industrial processes involve several hazards from minor to major injuries for the workers which need to be addressed during policy making for the operational phase.

Health risks and work safety problems may result at the workplace if the working conditions provide unsafe and/or unfavorable working environment and due to storage, handling and transport of hazardous construction material. Workers should be

provided with safe and healthy working environment taking into account risks inherent to the particular sector and specific classes of hazards in project area.

Mitigation measures will include:

- Obligatory insurance against accidents for laborers/workers;
- Providing basic medical training to specified work staff and basic medical service and supplies to workers;
- Layout plan for camp site, indicating safety measures taken by the contractor, e.g. fire-fighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents;
- Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for laborers;
- Protection devices (ear muffs) should be provided to the workers doing job in the vicinity of high noise generating machines;
- Provision of adequate sanitation, washing, cooking and dormitory facilities including light up to satisfaction;
- Proper maintenance of facilities for workers will be monitored;
- Provision of protective clothing for laborers handling hazardous materials, e.g. helmet, adequate footwear for bituminous pavement works, protective goggles, gloves etc.;
- Ensure strict use of wearing these protective clothing during work activities;
- Elaboration of a contingency planning in case of major accidents;
- Instruct foremen to strictly enforce the keeping out of non-working persons, particularly children, off work sites; and
- Adequate signage, lightning devices, barriers, yellow tape and persons with flags during construction to manage traffic at construction sites, haulage and access roads.

6.6.10 Emergency Response

Disasters such as earthquakes, flooding and other disasters such as fires may occur, and that must be considered for minimizing their impacts.

Mitigation measures will include:

- An Emergency Response Plan for earthquakes and manmade disasters will be developed;
- Emergency Response Plan will be implemented in close consultation with the Rescue 1122 Service, Fire Fighting Department, bomb disposal squad and paramedics;
- Also evacuation plan will be developed in order to tackle with any emergency; and
- In addition, training of the staff/employees regarding the emergency procedures/plans will be regularly conducted.

6.6.11 Drainage

Chocking of drainage due to improper maintenance and increased surface runoff during heavy rainfalls may accumulate on the project site and can cause problems such as foul smell and unhygienic waterlogged conditions.

Mitigation measures will include:

- PIEDMC should ensure regular maintenance of drainage system especially before the rainy season to avoid chocking and flooding.

6.6.12 Employment Opportunities

The project will provide job opportunities to a large number of people during operation phase. Proposed project will help to alleviate the economic condition of the area. Local people will get enhanced chances of dependable livelihood. Furthermore, communication system of the area will improve and new corridors for growth of local markets will open. Project will tend to attract more urban development with improved living facilities.

6.7 Potential Enhancement Measures

Specific measures will be undertaken by the PIEDMC which will help in enhancing the environmental quality of both the project and the project area. These are in the form of installation of a Combined Effluent Treatment Plant (CETP), properly design sewerage and drainage system and provision of green area comprising 10.84 acres. However, in addition to the aforementioned enhancement measures, following steps

may be adopted during the operation phase of the project.

- Installation of solar panels at the roof top may be planned to supplement the supply of electricity from the national grid which in result may reduce the electricity bills and load on electricity demand from grid station;
- Rain water harvesting may be considered through collection of water from rivers or roofs and its proper usage for irrigate green areas and domestic use with proper treatment; and
- Treated effluent from CETP may be used for irrigation purposes.

SECTION - 7
ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

7.0 General

This Section provides an overall approach for managing and monitoring the potential environmental and social impacts and describes the institutional framework and resource allocations to implement these measures. The main objectives of the Environmental Monitoring and Management Plan (EMMP) are:

- Provide the details of the Project impacts along with the proposed mitigation measures and the corresponding implementation activities;
- Define the role and responsibilities of the Project Proponent, Contractor, Supervisory Consultants and other role players and effectively communicate environmental issues among them;
- Define a monitoring mechanism, reporting frequency and identify monitoring parameters to ensure that all the mitigation measures are completely and effectively implemented; and
- Identify the resources required to implement the EMMP and outline the corresponding financing arrangements.

For effective environmental management, the Client should assign the necessary responsibilities to an Environmental Committee (EC) through Project Director PIEDMC, who will be responsible for implementation of the EMMP. The Project Director will be assisted by an Environmental Expert and a Social Expert in implementing the mitigation measures proposed in EMP.

7.1 Environmental Committee and its Responsibilities

PIEDMC will form up an Environmental Committee (EC), which will be responsible for the environmental management and supervisory affairs during the construction phase of the proposed project. EC will consist of Environmental Expert by the Contractor, Supervision Consultant (SC) and PIEDMC. The responsibilities of the EC are as follows:

- To ensure implementation of all the proposed mitigation measures proposed in EMMP during the construction of the Project;

- To organize routine monitoring of air quality, traffic, noise and vibration; etc. In case, the noise and emission levels exceed the acceptable levels; a penalty or ban must be enforced;
- To develop operational guidelines and implementation schedule;
- Receiving complaints from residents and institutions and assisting the local environmental authority including liaison with EPA Punjab; and
- To ensure that the proposed project is implemented in an environment friendly manner, causing least harm to the existing environment.

7.2 Environmental Management and Monitoring Plan (EMMP)

The EMMP provides the framework for the implementation of the mitigating measures and environmental management and monitoring during the construction and operational phases of the proposed project. **Table 7.1** portrays impacts, targets, mitigations and the responsible organizations for the implementation of the mitigation measures during the construction and the operation phases.

Table 7.1: Environmental Management Plan

Sr. No	***Project Component or Impact***	***Target***	***Mitigation***	***Responsibility***
A. PRE-CONSTRUCTION/ DESIGN PHASE				
1	Site Identification	To minimize the impact on environment	▪ Keeping in view the Sectoral Guidelines for Industrial Estates regarding the site location, effective environmental measures should be considered during the design phase of the proposed project. These measures must address the impacts of air, water, noise, waste and social parameters to make the project environmentally sustainable and socially acceptable. These measures may include but not limited to creating buffer zones (green belts) around the perimeter of the industrial estate, waste management plan, treatment of wastewater and installing air pollution control devices.	DC, PIEDMC
5	Solid waste	To minimize odour, spreading of diseases and clogging of canal and drain.	▪ Planning for disposal sites with reasonable distance from the human settlements following the siting criteria for landfill site; ▪ Disallow siting for work camps, including waste dump sites, in a distance closer than one (1) kilometer to any inhabited areas;	DC and PIEDMC

			▪ Incorporate technical design features for refuse collection containers at sites that would minimize burning impacts; ▪ Devise sustainable plans for the reuse and recycling of waste materials produced in the industrial estate by different industries; ▪ Devise plan(s) for safe handling, storage and disposal of harmful materials; and ▪ Burning of waste within and surrounding of the industrial estate should not be allowed in any case.	
	Groundwater	To minimize the effect on ground water quality	▪ Planning for protection of groundwater reserves from any source of contamination such as the construction and oily waste that will degrade its potable quality during construction phase; ▪ Planning to disallow/prohibit use of excess water during construction and operation phase; and ▪ Sustainable policy should be devised by the PIEDMC for the efficient use of groundwater.	DC and PIEDMC
	Surface Water	To avoid surface water contamination	▪ PIEDMC should ensure that the water requirement of the Industrial Estate should be met in the proposed design; ▪ Permission must be sought out from the Irrigation	DC and PIEDMC

			Department Punjab for disposal of wastewater in Canal/River; and ▪ Storm water should be treated for removal of TSS, TDS, oil and grease.	
	Wastewater	To minimize the effect on surface water and to reduce foul smell m	▪ CETP should be designed for the proposed Industrial Estate in order to avoid contamination of the receiving water body; ▪ A policy should be devised to ensure that all the industries in the industrial estate should install a wastewater treatment plant; ▪ Plan to restrict the solid waste dumping into gravity sewer and force main; ▪ Provision should be made in the design to cover the gravity sewer and force main; and ▪ Alternative options should be considered such as using treated water for agriculture purpose by meeting the standards for irrigation and prior consultation with farmers of the nearby villages to take the views regarding willingness to use this water.	DC and PIEDMC
	Flora	To minimize the impact on ecology	▪ Incorporate technical design measures to minimize removal of these trees, as far as possible; ▪ Provision for a 0.5 Km wide "greenbelt" around the	DC, PIEDMC and PHA/Forest Department

			site perimeter; ▪ A Tree Plantation Plan is formulated in compensation of trees affected by the establishment of the proposed Industrial Estate and attached as Annexure - VIII. This plan may be considered during the operation phase; ▪ A plan for transplantation of trees may be considered; ▪ Compensatory planting of ten (10) trees against each fallen tree of similar floral function should be planned; and ▪ PHA should ensure that there should be no exotic species in the plantation plan with known environmental setbacks (Eucalyptus, etc.).	
	Seismicity	To minimize the impact on structure stability	▪ The structures of the proposed project should be designed and constructed keeping in view low to moderate earthquakes. For seismic hazard analysis, updated structural and seismic evaluations should be conducted by the design engineer/consultant; ▪ Seismic Building Code of Pakistan 2007 (SBC-07) should be adopted for designing of buildings. This code specifies minimum requirements for seismic safety of buildings and has to be applied and used by engineers in conjunction with the necessary	DC and PIEDMC

			understanding of the concepts of structural, geotechnical and earthquake engineering; and ▪ The structure of the proposed project should also be studied by the proponent (PIEDMC) to evaluate its durability/strength to withstand moderate to high intensity earthquake.	
	Air Pollution, Noise and Vibration	To minimize the impact on surrounding environment	▪ A policy should be devised at the planning stage for the strict enforcement of PEQS, 2016 for industrial gaseous emissions by all the industries during the operation phase; ▪ Provision of air pollution control equipment's must be considered for respective industries; ▪ Each industry would submit its separate IEE/EIA as stated in PEPA Act, 1997. ▪ Plan for using other options of dust controlling/suppressing techniques; ▪ Scheduling of water sprinkling by the construction contractor prior to construction activities; ▪ Plan and budgeting for provision for noise barriers for the construction site, particularly for the sensitive receptors; ▪ Plan for scheduling the noisy construction work	DC and PIEDMC

			during night time; ▪ Consultations of the proponent at the pre-construction phase with the traffic police and contractor to devise a traffic management plan for smooth flow of traffic during the construction phase in order to reduce dust and noise pollution; and ▪ Selection/budgeting of air and noise emission control devices by the contractor prior to construction activities.	
	Emergency Management	To minimize health & safety risks	▪ A comprehensive Emergency Response Plan should be devised which should be implemented in close consultation with the Rescue 1122 Service, Fire Fighting Department, bomb disposal squad and paramedics; ▪ Provision of regular training of the staff/employees regarding the emergency procedures/plans; ▪ Provision of medical facility should be provided in the industrial estate; and ▪ Provision of firefighting and emergency exits should be given in the design.	DC and PIEDMC

	Transmission Lines	To minimize health & safety risks	▪ Single-pole structures placing the existing road ▪ Longer spans as far as practically possible can be used to span them. ▪ Effects of windbreak removal can be mitigated by trimming the windbreak vegetation selectively, replanting lower-growing trees and brushes beneath the line, or creating a new windbreak elsewhere. ▪ A common method to reduce EMF is to bring the lines closer together. This causes the fields created by each of the three conductors to interfere with each other and produce a reduced total magnetic field. Magnetic fields generated by double-circuit lines are less than those generated by single-circuit lines because the magnetic fields interact and produce a lower total magnetic field. In addition, double circuit poles are often taller resulting in less of a magnetic field at ground level. ▪ Provision of keeping the distance of 15m ROW of either side of the transmission lines as per National Transmission and Dispatch Company (NTDC) should be considered before finalizing the Master Plan of the industrial estate.	DC and PIEDMC

B. CONSTRUCTION STAGE				
Sr. No	***Project Component or Impact***	***Target***	***Mitigation***	***Responsibility***
1.	Soil	To minimize soil erosion and contamination.	▪ All spoils will be disposed of at designated site and the site will be restored back to its original conditions; ▪ Avoid use of heavy machinery on wet soil to prevent damage to soil structure; ▪ Non-bituminous wastes from construction activities will be dumped in approved sites, in line with the legal prescriptions for dump sites; ▪ As applicable and needed, plantation of grasses and shrubs will be done at appropriate place where required; ▪ Excavations would be kept confined to the specified foundation spots as per the approved engineering drawings. Unnecessary excavations should be avoided; ▪ Quarry Management Plan should be adhered; ▪ Site camps for the resident labor should not be setup on the land earmarked for developing green belts and lawns; ▪ Oils, lubricants, chemicals, and other listed hazardous	CC , SC, EC

			materials should be stored safely at their designated spots, enclosures or store rooms, which should be safe from rainfall and away from any potential source of fire and Hazardous Substance Rule 2003 should be followed; ▪ Septic tanks of adequate capacities should be constructed for receiving and treating wastewater from all temporary worksite toilets and at the temporary container offices, if any. The toilet wastewater should not be discharged untreated onto the adjacent lands; ▪ Vehicles should be parked and repaired at designated site containing oil collection & sumps arrangement; and ▪ All the unspent and left over materials be completely removed offsite upon completion of construction and the site be restored to original or near to original condition; and washout from washing of equipment and gadgets should be drained into either a septic tank or a sand-gravel bed for removal of the grit and contaminants.	
2.	Surface Water/Groundwater	To avoid surface and ground water contamination	▪ Protection of groundwater reserves from any source of contamination such as the construction and oily waste;	CC , SC, EC

	Quality		▪ Water required for construction may be obtained in a sustainable way that the water availability and supply to nearby communities remain unaffected; ▪ Stockpiles of cement and other construction materials should be kept covered when not being used; ▪ Avoid fuel and other chemicals being stored at numerous locations around the site; ▪ Maintenance of vehicles and plant should be carried out only on impermeable areas where any oil spillages can be contained; ▪ Oils, fuel and chemicals should be stored at fuel stores; ▪ Careful planning of the works to avoid soil excavation works during rainy seasons; ▪ All kinds of waste shall be stored in covered containers and disposed of safely as soon as possible; ▪ Temporary sanitary facilities, such as portable chemical toilets, should be employed on-site. A licensed contractor should be hired for appropriate disposal and maintenance of these facilities; and ▪ Sand/silt removal facilities such as sand traps, silt traps and sediment basins will be provided to remove the sand/silt particles from run-off. These facilities will be	

			properly and regularly maintained. These facilities will be carefully planned to ensure that they would be installed at appropriate locations to capture all surface water generated on site.	
3.	Air Quality	To minimize the impact on air quality	▪ All vehicles, machinery, equipment and generators used during construction activities should be kept in good working condition, properly tuned and maintained in order to minimize the exhaust emissions; ▪ Open burning of solid waste from the contractor's camps should be strictly banned; ▪ Use of fuel with substantially lower sulphur content; ▪ Proper maintenance and repair of power generators and construction machinery is needed to minimize the hazardous emissions; ▪ Personal Protective Equipment (PPE) like masks, goggles and gloves etc. shall be provided to workers; and ▪ NEQS applicable to gaseous emissions generated by construction vehicles, equipment and machinery should be enforced during construction works. ▪ Regular water sprinkling on the site and access roads	CC , SC, EC

			should be carried out to suppress excessive dust emission(s); ▪ Construction workers should be provided with masks for protection against the inhalation of dust; ▪ The vehicles carrying construction materials and the construction material storage areas should be covered with tarpaulin; ▪ Vehicle speed in the project area should be prescribed not more than 20 km/ hr and controlled accordingly; ▪ Tires of all the vehicles leaving the site should be washed. No earth, mud and dust shall be deposited on the public road; and ▪ Any material dropped on the paved roads will need to be cleaned up immediately to prevent dust nuisance.	
5.	Noise and vibration	To minimize the impact on workers and nearby residents	▪ Provide construction workers with suitable hearing protection like ear cap, or earmuffs and training them in their use; ▪ Preferably, restrict construction vehicles movement during night time near the residential areas and camp sites; ▪ Locate the concrete mixing, and materials shipment yards at least 2km from residential areas,	CC , SC, EC

			particularly schools and health centers; ▪ Selection of up-to-date and well maintained plant or equipment with reduced noise levels ensured by suitable in-built damping techniques or appropriate muffling devices; ▪ Heavy machinery like percussion hammers and pneumatic drills should not be used during the night. ▪ Residents should be notified earlier before commencement of excavation operations, if any; and ▪ Earth retaining walls should be constructed to contain the vibrations.	
6.	Solid Waste	To minimize the impact on soil and water	▪ The waste generated from the camp site will be disposed of at approved sites; ▪ Burning of waste shall be prohibited; ▪ Containers with covers shall be provided on site to store waste; ▪ General and hazardous waste shall be labelled and segregated; ▪ Solid Waste shall be safely stored in demarcated waste disposal sites; and ▪ The contractor shall ensure implementation of waste management plan.	CC , SC, EC

7.	Flora	To minimize the impact on plants	▪ The affected/uprooted ornamental trees should be re-planted; ▪ Flowering and fruiting shrubs should be planted along the project boundary to beautify the landscape. Plantation would however be done keeping in view the principles of landscape designing; ▪ The contractor's staff and labour should be strictly directed not to damage any vegetation such as trees or bushes. They should use the paths and tracks for movement; ▪ Construction vehicles, equipments and machinery should remain confined within their designated areas of movement; ▪ Contractor should supply gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel should not be allowed; and ▪ Camp sites and asphalt plants should be established on waste/barren land rather than on forested or agriculturally productive land. However if such type of land is not available, it should be ensured that minimum clearing of the vegetation is carried out and	CC , SC, EC

			minimum damage is caused to the trees. ▪ Establishment of Contractor's camp and warehouses for storage of equipment, material etc. shall involve clearing of grassy vegetation, mostly Dab and Kana vegetation from the area causing a negative impact; ▪ During the entire construction period dust laden polluted air will form a dust film on leaves thus blocking sunshine and stomata consequently hindering photosynthesis processes causing detrimental effect on the plant health; ▪ Exhaust of noxious gases from movement of heavy machinery will pollute air which will adversely affect health and vigor of plants; ▪ During construction activities the Contractor's workers may damage the vegetation and trees (for use as fire-wood to fulfill the camps requirements). ▪ Trees should be properly preserved and no trees should be unnecessarily removed; ▪ Trees that are suitable for and worthy of preservation are identified in the planning or feasibility stage and should be properly preserved through careful and	

			proper planning, design, implementation and post construction maintenance; ▪ Removal, i.e. transplanting or felling should be considered only if preservation is impractical; ▪ Tree transplanting should be properly planned by PHA implemented to ensure that sufficient space to accommodate the existing tree and its future growth, and adequate time for preparation of transplanting are available; ▪ For situations where retaining the trees at their existing locations are not practicable, priority should be given to transplant the affected trees to other permanent locations within the project site where appropriate, so as to increase the trees' survival rate after transplanting and minimize the loss of greenery in the local environs; and if not practicable, transplant the affected trees to a suitable permanent location ex-situ. Location of the receptor site should preferably be in proximity to the project site for retention of amenity effect in the vicinity; and ▪ A larger root ball is recommendable for more mature trees to enhance better recovery after transplanting.	

8.	Fauna	To minimize the impacts on fauna of the project area	▪ Noise control measures should be enforced during the construction phase such as provision of silencers on heavy construction vehicles. It is further recommended that activities, which are expected to generate more noise should be executed during the daytime only; ▪ Moreover, over speeding shall be prohibited and construction machinery, vehicles and equipment will remain confined within their designated areas of movement to avoid and minimize any accidental killing of Fauna; ▪ The camps will be properly fenced and gated to check the entry of wild animals in search of eatable goods. Similarly wastes of the camps will be properly disposed of to prevent the chances of its eating by wild animals, which may prove hazardous for them; and ▪ Hunting, poaching and harassing of animals and birds will be strictly prohibited and contractor shall be held responsible for any such act of his men; ▪ Hunting of the species must be restricted through existing regulations and if necessary, more stringent laws should be enacted for preservation of this	CC , SC, EC

			valuable species; ▪ Local People and construction workers should be given awareness for protection of wildlife as wildlife has also right to live and it makes the surroundings more attractive and colorful. Promotion of awareness to individuals shall accelerate the process of wildlife preservation; ▪ All construction activities must be in coherence with the behavior and habits of threatened species in the area; and ▪ Contractor should make close liaison with the Wildlife Department and Game inspectors to develop strategies for protection and conservation of Species. ▪ During construction, fencing of area is mandatory to confine and protect the species. ▪ During the hunting season, a framework should be developed in order to record the number of birds killed in a specific area. This is an essential component because it helps in generating necessary information in order to show not only the number of birds killed in each year from a specific area but the annual	

			population estimates can also support the sustainable use concept; ▪ Rats in the area must be curtailed as it is suspected that they eat eggs and chicks (Houbara Bustard); and ▪ Turtle hatcheries should be established and protection of nesting sites should be ensured. Surveys should be conducted to identify suitable places for establishing hatcheries for freshwater turtles. Protection of nesting sites of turtles is necessary for their survival. Nest protection during breeding season can be promoted;	
9.	Resource Conservation	Sustainable use of energy resources	▪ Diesel and fuels with low sulphur content will be used to operate construction machinery and equipment's. ▪ The efficient and well maintained equipment's and machinery shall be used; ▪ The equipment's and machinery shall be turned off when not in use; and ▪ Regular maintenance of machinery to avoid fuel leakages.	CC , SC, EC
11.	Health and Safety of Workers and Public	To minimize health risks	▪ Providing basic medical training to specified work staff and basic medical service and supplies to workers; ▪ Obligatory insurance against accidents for	CC , SC, EC

			labourers/workers; ▪ Layout plan for camp site, indicating safety measures taken by the contractor, e.g. firefighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents; ▪ Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for labourers; ▪ Protection devices (ear muffs) should be provided to the workers doing job in the vicinity of high noise generating machines; ▪ Provision of adequate sanitation, washing, cooking and dormitory facilities including light up to satisfaction; ▪ Provision of protective clothing for labourers handling hazardous materials, e.g. helmet, adequate footwear for bituminous pavement works, protective goggles, gloves etc; ▪ Ensure strict use of wearing these protective clothing during work activities; ▪ Elaboration of a contingency planning in case of major	

			accidents; ▪ Ensure that the site is restricted for the entry of irrelevant people particularly children; and ▪ Adequate lightning devices, barriers, yellow tape and safety signage shall be posted. ▪ There should be proper control on construction activities and Oil spillage of vehicles; ▪ The labourers with different transmittable diseases should be restricted within the construction site; ▪ Efforts will be made to create awareness about road safety among the drivers operating construction vehicles; ▪ Timely public notification on planned construction works; ▪ Close consultation with local communities to identify optimal solutions for diversions to maintain community integrity & social links; ▪ Provision of proper safety signage, particularly at sensitive/accident-prone spots; ▪ If identified, consider guard rails at accident-prone stretches and sensitive locations;	

			▪ The communicable disease of most concern during construction phase, like Sexually-Transmitted Diseases (STDs) such as HIV/AIDS, should be prevented by successful initiative typically involving health awareness; education initiatives; training heath workers in disease treatment; immunization program and providing health service; ▪ Reducing the impacts of vector borne diseases on long-term health effect of workers should be accomplished through implementation of diverse interventions aimed at eliminating the factors that lead to disease, which includes: Prevention of larval and adult propagation of vectors through sanitary improvements and elimination of breeding habitat close to human settlements and by eliminating any unusable impounding of water; ▪ Fencing around the camps should be strong enough so that it can not be broken easily by local people for making passages; and ▪ Use of water should not disturb public water availability and source of water should be selected	

			carefully.	
12.	Emergency Response	To avoid the accidents	▪ Implementation of emergency response plan shall be ensured by the contractor; ▪ Training of the staff/employees regarding the emergency procedures/plans shall be regularly conducted; and ▪ Minor incidents and near misses shall be reported and preventive measures shall be formulated accordingly.	CC , SC, EC
13.	Traffic disruption	To avoid the nuisance due to traffic disruption	▪ Devising a traffic management plan in coordination with traffic police and PIEDMC.	CC , SC, EC
14.	Social Issues	To avoid socio-cultural conflicts	▪ Preparation and implementation of traffic management plan for the entire construction phase; and ▪ Public should be notified before the commencement of the project and be educated about the traffic management plan.	CC , SC, EC
15.	Borrow/ Open Pits	To minimize the issues of borrow areas	▪ Borrow areas must not be selected on agricultural land; ▪ Necessary permits must be obtained for any borrow pits from the concerned authorities; ▪ In borrow pits, the slope must not be steeper than 1:4; ▪ Soil erosion along the borrow pit shall be regularly checked to prevent / mitigate impacts on adjacent	CC , SC, EC

			lands; ▪ In case borrow pits fill with water, measures have to be taken to prevent the creation of mosquito-breeding sites; and ▪ Borrow pits may be utilized for aqua culture.	
16.	Construction Waste and Hazardous Waste	To minimize the impact on soil and water resources.	▪ Wastewater effluent from contractor's workshop and equipment washing yards would be passed through gravel/ sand beds to remove oil/ grease contaminants before discharging it into natural streams; ▪ Training of working force in the storage and handling of materials and chemicals that can potentially cause soil contamination; ▪ Solid waste generated during construction and camp sites should be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan; ▪ Proper labelling of containers, including the identification and quantity of the contents, hazard contact information etc.;	CC , SC, EC

			▪ Training employees involved in the transportation of hazardous material regarding emergency procedures; ▪ The sewage system for camps will be properly designed (pit latrines or, as required, septic tanks) to receive all sanitary wastewaters; ▪ Lined wash areas will be constructed within the camp site or at site, for the receipt of wash waters from construction machinery; ▪ Use of pesticides in nurseries should be done deemed necessary and suggested by the experts; ▪ Use of less toxic pesticide should be preferred; ▪ Those insecticides should be used which are less toxic to human health. ▪ No refuelling, storage, servicing or maintenance of equipment should take place within 150 feet of drainages or other sensitive environmental resources; ▪ Any fluids drained from the machinery during servicing will be collected in leak proof container and	

			taken to an appropriate disposal or recycling facility.	
17.	Groundwater	To avoid contamination of groundwater	▪ Protection of groundwater reserves from any source of contamination such as the construction and oily waste that will degrade its potable quality; ▪ The solid waste should be disposed of in designated landfill sites to sustain the water quality for domestic requirements; ▪ Water required for construction is obtained in such a way that the water availability and supply to nearby communities remain unaffected; ▪ Regular water quality monitoring according to determined sampling schedule; and ▪ Prohibit washing of machinery and vehicles outside washing yard, provide sealed washing basins and collect wastewater in sedimentation/retention pond.	CC , SC, EC
18.	Disposal of Mucking Material	To minimize the scars on the land in the Project Area.	▪ The excavated materials that are unsuitable for use will need to be stored, transported and disposed of appropriately at designated sites by PIEDMC.	CC , SC, EC
19.	Disturbance to People	To minimize the disturbance (hindrance in free movement) to people in the Project Area	▪ Ensurance of timely completion of the construction works according to the agreed schedule by PIEDMC and provision of alternate routes for the project site where the construction is being carried out.	CC , SC, EC

C. OPERATIONAL STAGE				
Sr. No	***Project Component or Impact***	***Target***	***Mitigation***	***Responsibility***
1	Flora	Proper maintenance of saplings planted.	▪ The saplings planted in the project area against the trees affected should be properly maintained throughout their initial growth period in terms of water requirement and necessary nutrients by Parks and Horticulture Authority (PHA).	PIEDMC
2	Surface/ Ground Water	To minimize impact on water quality of the project area	▪ PIEDMC should ensure the installation of tube wells as per proposed design; ▪ PIEDMC should ensure that no industry shall install a tube well within its own premises; ▪ Combined Effluent Treatment plant (CETP) shall be operated as per Standard Operating Procedures (SOPs) to follow NEQS. Special concentrations shall be paid to sludge treatment and handling; ▪ Implementation of bylaws of individual treatment plants at industrial level shall be ensured; ▪ Industries shall be bound to submit monitoring reports of their effluents regularly; ▪ Monitoring plans for water quality analysis of the	PIEDMC, EPA

			CETP effluent and groundwater shall be prepared; and ▪ Best management Practices (BMPs) shall be maintained to ensure their effective function to treat nonpoint source water pollution.	
3	Air Quality	To minimize ambient air pollution.	▪ Installation of Air Pollution Control Equipment in respective industries; ▪ Capture CH4 and H2S that can be used commercially; ▪ Plan massive tree plantation along the industrial estate; ▪ Management should ensure Compliance of PEQS, 2016; and ▪ SMART Rules must be followed.	PIEDMC, EPA
4	Soil	To avoid soil contamination	▪ Each industry shall be bound to submit the inventory of use of hazardous chemicals, their use and final disposal including measures to control special waste; and ▪ Signage shall be carried out to regulate the routes of especial waste disposal to avoid the risks of spillages.	PIEDMC
5	Ecology	To protect the ecology of the area	▪ Compensatory plantation of trees shall be undertaken along the boundary of the Industrial Estate, along the main and minor roads and in green areas; and ▪ A tree plantation program will be implemented by the Divisional Forest Officer, Bahawalpur, in and around the Industrial Estate. For this purpose, requisite funds	PIEDMC and Forest Department

			should be placed at the disposal of D.F.O. by the proponent.	
6	Solid Waste	Proper handling of the Solid waste to avoid the odor.	▪ Solid Waste management (SWM) system should be operated as per SOPs and improved with time to time; ▪ Primary collection and storage of solid waste should be performed in the closed containers; ▪ Secondary collection should be done in the compactor trucks; ▪ Only unusable trash material should be disposed of into the landfill site and all the reusable material shall be separated, processed and sold accordingly; and ▪ People should be educated to waste lesser.	PIEDMC and BWMC
7	Occupational Health and Safety	To avoid risks to health of consumers/workers/communities	▪ Obligatory insurance against accidents for laborers/workers; ▪ Providing basic medical training to specified work staff and basic medical service and supplies to workers; ▪ Layout plan for camp site, indicating safety measures taken by the contractor, e.g. fire-fighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of	PIEDMC

			accidents; ▪ Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for laborers; ▪ Protection devices (ear muffs) should be provided to the workers doing job in the vicinity of high noise generating machines; ▪ Provision of adequate sanitation, washing, cooking and dormitory facilities including light up to satisfaction; ▪ Proper maintenance of facilities for workers will be monitored; ▪ Provision of protective clothing for laborers handling hazardous materials, e.g. helmet, adequate footwear for bituminous pavement works, protective goggles, gloves etc.; ▪ Ensure strict use of wearing these protective clothing during work activities; ▪ Elaboration of a contingency planning in case of major accidents; ▪ Instruct foremen to strictly enforce the keeping out of non-working persons, particularly children, off work	

			sites; and ▪ Adequate signage, lightning devices, barriers, yellow tape and persons with flags during construction to manage traffic at construction sites, haulage and access roads.	
8	Emergency Response	To deal with the emergency situations	▪ An Emergency Response Plan for earthquakes and manmade disasters will be developed; ▪ Emergency Response Plan will be implemented in close consultation with the Rescue 1122 Service, Fire Fighting Department, bomb disposal squad and paramedics; ▪ Also evacuation plan will be developed in order to tackle with any emergency; and ▪ In addition, training of the staff/employees regarding the emergency procedures/plans will be regularly conducted.	PIEDMC
9	Drainage	To avoid surface runoff	▪ PIEDMC should ensure regular maintenance of drainage system especially before the rainy season to avoid chocking and flooding.	PIEDMC

KEY

DC Design Consultant CC Construction Contractor

SC	Supervision Consultant	EC	Environmental Committee
PIEDMC	Punjab Industrial Estate Development and Management Company	EPA	Environmental Protection Agency
PHA	Parks & Horticulture Authority	BWMC	Bahawalpur Waste Management Company

7.3 Environmental Monitoring

Environmental Monitoring is undertaken during both the construction and operation phases to ensure the effectiveness of the proposed mitigation measures. Certain environmental parameters are selected and quantitative analysis is carried out. The results of analysis are compared with the guidelines; standards and pre-project condition to investigate whether the EMP and its implementation are effective for the mitigation of impacts or not. Parameters to be analyzed during construction and operation of the proposed project and responsibilities for monitoring and reporting have been discussed below. A cost estimate for this measurement of parameters is given in **Table 7.2**.

7.3.1 Construction Phase

a) Air Quality

Air quality monitoring will be carried out on quarterly basis during the construction phase for the parameters CO, NO_2, SO_2 and PM_{10} and will be in accordance to Punjab Environmental Quality Standards (PEQS) for ambient air.

b) Ground Water Quality

Ground water quality monitoring will be done quarterly during the construction phase and will be in accordance to PEQS for drinking water.

c) Noise Level

The noise level monitoring will be carried out quarterly during the whole construction period for the proposed project and will be in accordance to PEQS for noise.

7.3.2 Operational Phase

a) Air Quality

Air quality monitoring will be done will be done bi-annually during the operational phase of the proposed project. The parameters will be monitored are CO, NO_2, SO_2 and PM_{10}.

b) Ground Water Quality

Ground water quality monitoring will be done bi-annually during the operational phase and will be in accordance to PEQS for drinking water.

c) Noise Level

The noise level monitoring will be carried out bi-annually during the operational phase and will be in accordance to PEQS for noise.

d) Wastewater

Wastewater quality monitoring will be done bi-annually during the operation phase and will be in accordance to PEQS for industrial waste.

7.3.3 Responsibilities for Monitoring and Reporting

The EC will be responsible for environmental monitoring and reporting throughout the construction and operation phases. During construction phase, one (1) environmental monitoring report will be prepared on quarterly basis and one (1) comprehensive report will be prepared at the end of the construction phase and will be submitted to each of the following authorities and institutions: (i) PIEDMC and (ii) EPA-Punjab. One (1) environmental monitoring report will be prepared bi-annually and one (1) comprehensive report will be prepared annually and submitted to the EPA-Punjab for first year of the project operation. Contents of the final report will include results of environmental monitoring in comparison to the standards for the various parameters, location and sampling time along with recommendations for the future projects.

Table 7.2: Budget Estimate for Environmental Monitoring During Construction and Operational Phases

Components	Parameters	Quantity (No. of samples x No. of locations x Frequency)	Frequency	Responsibility	Duration	Cost (Rs.)
Construction Phase (Estimation for 24 Months)						
Air Quality	CO, NO_2, SO_2, PM_{10} and according to PEQS for ambient air	1x4x8 = 32	Monthly @ Rs. 30,000/ sample	CC & SC	24 hours	960,000/-
Drinking Water Quality	According to PEQS for drinking water	1x2x8 = 16	Monthly @ Rs. 25,000/sample	CC & SC	---	400,000/-
Noise Level	---	1x4x8 = 32	Monthly @ Rs. 6,000/point	CC & SC	24 hours	192,000/-
					TOTAL	**1,552,000/-**
Operational Phase (Estimation for the first Year)						
Air Quality	CO, NO_2, SO_2, PM_{10} and according to PEQS for ambient air	1x4x2 = 8	Quarterly @ Rs. 30,000/ sample	PIEDMC and EPA-Punjab	24 hours	240,000/-
Drinking Water Quality	According to PEQS for drinking water	1x2x2 = 4	Quarterly @ Rs. 25,000/point	PIEDMC and EPA-Punjab	---	100,000/-
Noise Level	---	1x4x2 = 8	Quarterly @ Rs. 6,000/point	PIEDMC and EPA-Punjab	24 hours	48,000/-

Components	Parameters	Quantity (No. of samples x No. of locations x Frequency)	Frequency	Responsibility	Duration	Cost (Rs.)
Wastewater Quality	According to PEQS for wastewater	1x2x2 = 4	Quarterly @ Rs. 25,000/point	PIEDMC and EPA-Punjab	---	100,000/-
					TOTAL	**488,000/-**
					GRAND TOTAL	**643,200/-**

KEY

CC	Construction Contractor	PIEDMC	Punjab Industrial Estate Development and Management Company
SC	Supervision Consultant	EPA	Environmental Protection Agency

Note: Provision must be given in annual budget of operational phase for environmental monitoring. For this, the cost of operation phase monitoring (i.e.Rs.488,000/-) must be considered with an annual increment of 10%.

7.4 Environmental Technical Assistance and Training Plan

An environmental and social training and Technical Assistance (TA) program is to be carried out before the implementation of the project. Contractor's environmental awareness and appropriate knowledge of environmental protection is critical to the successful implementation of the EMP because without appropriate environmental awareness, knowledge and skills required for the implementation of the mitigation measures, it would be difficult for the Contractor(s) workforce to implement effective environmental protection measures.

PIEDMC will engage TA consultant to manage the environmental training program. The objective of the TA will be, to help in establishment of appropriate systems and to train senior PIEDMC staff and EC responsible for managing environment, operations, and planning, who can then impart training at a broader level within and outside the PIEDMC (i.e., the training of trainers). The TA consultant will organize training courses for PIEDMC and the contractor staff to train them in specialized areas such as air and noise pollution monitoring; develop environment operation manuals in consultation with the EPA Punjab. The details of this training program are presented in **Table 7.3**.

Table 7.3: Personnel Training Program

Provided by	Contents	Trainees	Duration
TA consultants/ organizations specializing in environmental management and monitoring	Short seminars and courses on: Environmental laws and regulations, daily monitoring and supervision	Contractor and PIEDMC	10 days
TA consultants/ organizations specializing in social management and monitoring	Short seminars and courses on: Social awareness	Contractor and PIEDMC	
TA consultants/ organizations specializing in	Short lectures relating to Occupational Safety and Health	Contractor and PIEDMC	

Provided by	Contents	Trainees	Duration
Occupational, health and safety issues			

7.5 Environmental Monitoring, Mitigation and Training Cost

The cost required to effectively implement the mitigation measures is important for the sustainability of the project both in the construction and operation phases. These costs are summarized in **Table 7.4** and the break-up for Health Safety & Environment cost is attached as **Annexure-XIII**.

Table 7.4: Environmental Mitigation, Monitoring and Training Cost

Sr. No.	Activity	Description	Cost (Rs.)	Rationale
1	Medical screening for workers	Rs. 3000 for 500 employees	3,000,000	Medical screening of the workers is proposed twice during the construction phase.
3	Material Storage, handling and use	Four (4) No. of tarpaulins of Rs. 20,000 each	80,000	Four (4) tarpaulins are proposed during the whole construction phase.
4	Handling/ transportation of hazardous material	Rs. 12,000/month for a period of 24 months will be required for transportation of material	288,000	One trip of one truck per month is proposed for transportation/disposal of empty/used oil drums from construction sites/camps.
5	Handling of solid waste	Includes the cost of collection, transportation and disposal to the designated site	7,200,000	One (1) dumper @ Rs. 100,000/- per month is proposed for 24 months to collect construction waste from all the active sites on daily basis.
6	Health & Safety of Workers	For 200 employees for the provision of dust masks, safety shoes, gloves, first aid box, ear plugs, safety helmets and safety jackets (Hi Vis) And Provision of dust bins, warning tap, safety cones and safety sign boards	8,922,000	For detail, please refer to **Annexure - XIII**

7	Environmental Monitoring Cost	Air, water, noise	643,200	For detailed schedule of environmental monitoring, please refer to Table 7.2 of Section-7 of EIA Report
8	Cost for hiring of staff (Environment Health & Safety Specialist and Social Expert)	i. Rs. 150,000/- per month for 3 months for hiring Environment Health & Safety Specialist ii. Rs. 150,000/- per month for 24 months for hiring Social Expert	7,200,000	Contractor is proposed to hire one HSE Specialist and Social Expert for the whole construction period.
9	Tree Plantation Cost	For raising 450 new saplings in lieu of cutting of 45 trees	353,050	
10	Cost of environmental training	For the whole construction period	600,000	Contractor will provide training to his staff/workers on monthly basis for ten days (2 hours/day) involving maximum participants (50/day) on HSE related issues through a hired professional @ Rs. 2500/day
		Grand Total	**28,286,250**	

The Environmental Mitigation, Monitoring and training cost will be Rs. **28,286,250** or **Rs. 28.286 million.**

SECTION-8
CONCLUSION AND RECOMMENDATIONS

8.1 General

This section presents conclusion of the EIA study of the proposed project. The overall objective of this EIA is to carry out a detailed environmental assessment to assess impacts caused by the different project activities and to address measures to mitigate adverse environmental impacts that may arise from the execution of the proposed project.

The conclusions mentioned below are based on the findings of detailed environmental assessment, which has been carried out as per requirement of Provincial EPA-Punjab.

8.2 Conclusions

The implementation of the proposed project will have many beneficial impacts on population residing in and around the project area. Major beneficial impacts of the proposed project are:

- Structural platform to set up industries with availability of developed plots and infrastructure;
- Provision of support services at one location;
- Availability of skilled manpower;
- Job opportunities for locals during construction and operation phase; and
- Economic uplift of the District.

Apart from the beneficial impacts of the project, the proposed project has some adverse environmental and social impacts. Most of the adverse impacts during construction are of temporary nature. These impacts can be avoided or mitigated by adopting suitable mitigation or remedial measures as mentioned in this EIA Report. Following conclusions are based on the findings of detailed EIA study.

Conclusion during Pre-Construction/Design Phase

- Site for the proposed Industrial Estate has already been selected by the PIEDMC, therefore no alternatives were studied for EIA study;
- Local residents may have issues of access, noise and air pollution during the construction activities of the industrial estate;
- For the proposed Industrial Estate, a separate system has been proposed for the collection of wastewater and stormwater. Keeping in view the economy and limited budget available with the client, it is proposed that storm water collection system will be designed as a part of this project, however its construction may be taken up in next phase upon colonization of the industrial area. Till that period, a part of storm water along the roads will be catered through wastewater pipes (partially combined system) and infiltration in empty industrial plots. Therefore, the wastewater collection system will work as partially combined system till construction of storm water drains;
- During planning and survey of wastewater disposal system, it has been revealed that in the nearby surrounding of acquired site of industrial estate there is no permanent water recipient body which can serve during dry and wet seasons. The nearest water recipient body is River Sutlej which exists at an aerial distance of about 10 km from the proposed industrial estate. Disposal of treated effluent into River Sutlej will be a costly proposition, but has to be selected being the only permanent solution;
- This is concluded during the design of sewerage system of the proposed Industrial Estate that the River Sutlej mostly remains dry due to diversion of its water to India according to Indus Water treaty. River can serve as final water recipient body during dry and rainy (wet) seasons. During dry season the option of discharging the treated effluent into the nearby Ahmadpur East canal and its distributaries can be taken up with Irrigation Department by PIEDMC;
- Wastewater of the proposed industrial estate is planned to be disposed of in River Sutlaj which flows in the North West side of the proposed project site at a distance of 10 km. It will significantly affect the nearby

settlements due to foul odor and may serve as breeding ground for disease vectors during the initial phase of the project;

- The gaseous emissions and fugitive dust emissions may deteriorate the air quality of project area during pre-construction (site clearing) and construction phase of the proposed project due to construction activities (operation of construction machinery, dust emissions, vehicular movement, etc.) which results in increase in both air and noise pollution along with the associated health risks to the nearby residents;
- Improper formulation of traffic management plan may result in traffic jams and can cause inconvenience to the road users.

Conclusion during Construction Phase

- Various liquids like fuel, lubricant oil and other oily products, which are used during the construction phase may contaminate groundwater;
- Construction camp location and mismanagement of construction camp activities may lead to various social and environmental impacts such as: loss of vegetation, indiscriminate generation of solid waste, discharge of sanitary effluent, water pollution and social & cultural conflicts;
- Health risks and work safety problems may result at the workplace/camps if the working conditions provide unsafe and/or unfavourable working environment due to storage, handling and transport of construction materials and malfunctioning in operation of construction machinery and equipment;
- Construction activities may pose a challenge to the traffic management in the project area such as vehicles carrying construction materials to the project site may result in traffic jams and problems to the people passing through the project area; and
- The air quality of the project area will be affected by the exhaust emissions (PM_{10}) produced from operation of construction machinery and equipment. All earthworks construction and hauling of materials will generate dust and may deteriorate the air quality.

Conclusion during Operation Phase

- Chocking of drainage and increased surface runoff during heavy rainfalls may accumulate on the project site and can cause problems such as foul smell and unhygienic waterlogged conditions;
- The ground water may be contaminated due to improper maintenance activities of pumping station, force main and gravity sewer;
- Emissions from different types of industries may affect the recipients in the downwind direction of the industries and may cause chronic or acute respiratory diseases like asthma and nausea and will also have effect on the faunal and floral species;
- Improper handling and disposal of waste from industries, medical facility and commercial areas will pose serious threat to the physical and biological environment;
- Improper implementation of EMMP may lead to incidents/ accidents which may cause serious health, safety and environmental risks.

8.3 Recommendations

Following recommendations must be taken care prior to any of the decision about the proposed project:

- The protected site i.e. Jamia Masjid Al-Sadiq which is declared as Protected Site by the Government of Punjab under Punjab Special Premises Ordinance 1985 is located at an aerial distance of 11.75 km from the proposed site. NOC will be needed from the Archaeology Department prior to execution of the proposed project;
- The proposed forcemain from the disposal station will cross the Ahmadpur East canal and its branches. In this regard, for obtaining NOC from Irrigation department the case must be taken up on priority basis. Also, it is to be mentioned that in case of dry season, the treated effluent may be discharged into the canal for which NOC will be needed for Irrigation Department. NOC for discharge of effluent into river Sutlej may be taken from the concerned department;
- Along the proposed route of outfall sewer (42” i/d), the sewer line will cross one branch and one main railway track for which obtaining NOC and

estimate from concerned authorities of Pakistan Railways may be taken up on priority basis;

- The proposed forcemain (800mm outer diameter) will also cross N5 through thrust boring method. In this regard, NOC must be taken from National Highway Authority prior to execution of the work;
- In order to fulfill the requirement of safe disposal of collected wastewater as per Punjab Environmental Protection Act (PEPA) (Amended), 2012 a Combined Effluent Treatment Plant (CETP) is proposed. The CETP shall be designed to provide at least secondary level treatment. The process design of proposed CETP shall be designed for average wastewater flow generated in the Bahawalpur Industrial Estate;
- Individual industries must install their Wastewater Treatment Plant to treat their wastewater as per Punjab Environmental Quality Standards, 2016 for Municipal and Liquid Industrial Effluents;
- In case of any constraints regarding the site location, effective environmental measures should be considered during the design phase of the proposed project. These measures must address the impacts of air, water, noise, waste and social parameters to make the project environmentally sustainable and socially acceptable. These measures may include but not limited to creating buffer zones (green belts) around the perimeter of the industrial estate, waste management plan, treatment of wastewater and installing air pollution control devices;
- The project structures should be designed to cater the requirements of Zone 2A of seismic provisions (2007) of Building Code of Pakistan after giving due consideration to the soil profile at site;
- A proper traffic diversion plan must be formulated prior to construction and conveyed to the road users;
- Health and safety plan for the workers must be followed during construction phase;
- During tree plantation, plants should be selected in accordance to their ability to absorb emissions;
- PIEDMC must formulate such a policy to ensure all the industries that will operate in the proposed Industrial Estate to register with Self-Monitoring And Reporting Tool (SMART) by Pak-EPA; and

- Proper implementation of EMMP should be ensured during all three phases of the proposed project. All personnel staff, employees and contractors/s should undertake appropriate training prior to construction to ensure they are aware of the on-site responsibilities in respect of all environmental and social issues. In addition, EMMP should be a part of contract document of Contractor/s. Moreover, the cost for environmental mitigation and monitoring has been estimated which should be included in the PC-I or overall Project Cost.

SECTION – 9
REFERENCES

9.1 REFERENCES

1. Ministry of climate change.org.pk

2. 0.4 kg/capita/day waste generation of Bahawalpur (Consultation with Manager Operations, Bahawalpur Waste Management Company)

3. District Census Report, Bahawalpur, 1998

4. Master Planning and Detailed Designing for Development of Bahawalpur Industrial Estate

5. IEE of 100 MW Solar PV Power Project in Bahawalpur Punjab – Pakistan

6. Urban Water Supply and Sewerage Reform Strategy World Bank – Government of Punjab report 2006

7. Adapted from Urban Unit‟s Bahawalpur base map

8. Punjab Cities Improvement Investment Program "Bahawalpur City Profile"

9. Pakistaniaat: A Journal of Pakistan Studies Vol. 2, No. 2 (2010)

10. Guidelines on Tree Transplanting, Greening, Landscape and Tree Management Section, Development Bureau, The Government of the Hong Kong Special Administrative Region, September 2014

ANNEXURE

Annexure-I
Study Team

Name, Qualification and Roles of EIA Team Member		
Study Team	**Roles**	**Responsibilities**
Hammad Qamar	Team Leader/ Environmental Expert	Major responsibilities involve reconnaissance survey/site visit of the project area reviewed procedures, guidelines, legal and policy framework and applicable standards, collection of baseline data identification and evaluation of potential significant impacts of the projects, developed mitigation measure both structural and non-structural and EMP preparation of EIA Report as per Pak-EPA guidelines, prepared environmental compliance report. Involve liaison/meeting with the client and other stakeholders and presenting the EIA findings as required. Over all supervision and technical guidance to team and preparation of IEE/EIA reports.
Saeed Hussain	Senior Sociologist/ Environmental Expert	The responsibilities includes conducting meetings with the client, designing of data collection tools for conducting social impact assessments survey, women situation survey etc and supervising the whole social Study team. Liaison with the concerned stakeholders and government officials. Arranging scoping sessions/meetings with the affected communities and presented the data both in qualitative and quantitative forms.
Ahsan Akhlaq	Senior Environmentalist	The responsibilities include meeting with the client, site visit, and collection of baseline data, identification of impacts, addressing mitigation of adverse impacts, preparation of environmental management plan and preparation of EIA report as per Pak-EPA guidelines.
Raheela Hakim	Environmentalist	The responsibilities are providing assistance in collection of baseline data, identification of impacts, addressing mitigation of adverse impacts, preparation of environmental management plan and help in report writing.
Nida Batool	Environmental Engineer	The responsibilities are providing assistance in collection of baseline data, identification of impacts, addressing mitigation of adverse impacts, preparation of environmental management plan and report writing.
Adeera Nasar	Junior Sociologist	The responsibilities are providing assistance in field level data collection and report writing.

Annexure-II
Pakistan Environmental Protection Agency (Review of IEE/EIA) Regulations, 2000

PAKISTAN ENVIRONMENTAL PROTECTION AGENCY (REVIEW OF IEE AND EIA) REGULATIONS, 2000

S.R.O. 339 (1)/2001. - In exercise of the powers referred by section 33 of the Pakistan Environmental Protection Act, 1997 (XXXIV of 1997), Pakistan Environmental Protection Agency, with the approval of the Federal Government is pleased to make the following Rules, namely : -

1. Short title and commencement

(1) These regulations may be called the Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2000.

(2) They shall come into force at once.

2. Definitions

(1) In these regulations, unless there is anything repugnant in the subject or context –

(a) "Act" means the Pakistan Environmental Protection Act, 1997 (XXXIV of 1997);

(b) "Director-General" means the Director-General of the Federal Agency;

(c) "EIA" means an environmental impact assessment as defined in section 2(xi);

(d) "IEE" means an initial environmental examination as defined in section 2(xxiv); and

(e) "section" means a section of the Act.

(2) All other words and expressions used in these regulations but not defined shall have the same meanings as are assigned to them in the Act.

3. Projects requiring an IEE

A proponent of a project falling in any category listed in Schedule I shall file an IEE with the Federal Agency, and the provisions of section 12 shall apply to such project.

4. Projects requiring an EIA

A proponent of a project falling in any category listed in Schedule II shall file an EIA with the Federal Agency, and the provisions of section 12 shall apply to such project.

5. Projects not requiring an IEE or EIA

(1) A proponent of a project not falling in any category listed in Schedules I and II shall not be required to file an IEE or EIA:

Provided that the proponent shall file –

(a) an EIA, if the project is likely to cause an adverse environmental effect;

(b) for projects not listed in Schedules I and II in respect of which the Federal Agency has issued guidelines for construction and operation, an application for approval accompanied by an undertaking and an affidavit that the aforesaid guidelines shall be fully complied with.

(2) Notwithstanding anything contained in sub-regulation (1), the Federal Agency may direct the proponent of a project, whether or not listed in Schedule I or II, to file an IEE or EIA, for reasons to be recorded in such direction:

Provided that no such direction shall be issued without the recommendation in writing of the Environmental Assessment Advisory Committee constituted under Regulation 23.

(3) The provisions of section 12 shall apply to a project in respect of which an IEE or EIA is filed under sub-regulation (1) or (2).

6. Preparation of IEE and EIA

(1) The Federal Agency may issue guidelines for preparation of an IEE or an EIA, including guidelines of general applicability, and sectoral guidelines indicating specific assessment requirements for planning, construction and operation of projects relating to particular sector.

(2) Where guidelines have been issued under sub-regulation (1), an IEE or EIA shall be prepared, to the extent practicable, in accordance therewith and the proponent shall justify in the IEE or EIA any departure therefrom.

7. Review Fees

The proponent shall pay, at the time of submission of an IEE or EIA, a non-refundable Review Fee to the Federal Agency, as per rates shown in Schedule III.

8. Filing of IEE and EIA

(1) Ten paper copies and two electronic copies of an IEE or EIA shall be filed with the Federal Agency.

(2) Every IEE and EIA shall be accompanied by –

(a) an application, in the form prescribed in Schedule IV; and

(b) copy of receipt showing payment of the Review Fee.

9. Preliminary scrutiny

(1) Within 10 working days of filing of the IEE or EIA, the Federal Agency shall –

(a) confirm that the IEE or EIA is complete for purposes of initiation of the review process; or

(b) require the proponent to submit such additional information as may be specified; or

(c) return the IEE or EIA to the proponent for revision, clearly listing the points requiring further study and discussion.

(2) Nothing in sub-regulation (1) shall prohibit the Federal Agency from requiring the proponent to submit additional information at any stage during the review process.

10. Public participation

(1) In the case of an EIA, the Federal Agency shall, simultaneously with issue of confirmation of completeness under clause (a) of sub-regulation (1) of Regulation 9, cause to be published in any English or Urdu national newspaper and in a local newspaper of general circulation in the area affected by the project, a public notice mentioning the type of project, its exact location, the name and address of the proponent and the places at which the EIA of the project can, subject to the restrictions in sub-section (3) of section 12, be accessed.

(2) The notice issued under sub-regulation (1) shall fix a date, time and place for public hearing of any comments on the project or its EIA.

(3) The date fixed under sub-regulation (2) shall not be earlier than 30 days from the date of publication of the notice.

(4) The Federal Agency shall also ensure the circulation of the EIA to the concerned Government Agencies and solicit their comments thereon.

(5) All comments received by the Federal Agency from the public or any Government Agency shall be collated, tabulated and duly considered by it before decision on the EIA.

(6) The Federal Agency may issue guidelines indicating the basic techniques and measures to be adopted to ensure effective public consultation, involvement and participation in EIA assessment.

11. Review

(1) The Federal Agency shall make every effort to carry out its review of the IEE within 45 days, and of the EIA within 90 days, of issue of confirmation of completeness under Regulation 9.

(2) In reviewing the IEE or EIA, the Federal Agency shall consult such Committee of Experts as may be constituted for the purpose by the Director-General, and may also solicit views of the sectoral Advisory Committee, if any, constituted by the Federal Government under sub-section (6) of section 5.

(3) The Director-General may, where he considers it necessary, constitute a committee to inspect the site of the project and submit its report on such matters as may be specified.

(4) The review of the IEE or EIA by the Federal Agency shall be based on quantitative and qualitative assessment of the documents and data furnished by the proponent, comments from the public and Government Agencies received under Regulation 10, and views of the committees mentioned in sub-regulations (2) and (3) above.

12. Decision

On completion of the review, the decision of the Federal Agency shall be communicated to the proponent in the form prescribed in Schedule V in the case of an IEE, and in the form prescribed in Schedule VI in the case of an EIA.

13. Conditions of approval

(1) Every approval of an IEE or EIA shall, in addition to such conditions as may be imposed by the Federal Agency, be subject to the condition that the project shall be designed and constructed, and mitigatory and other measures adopted, strictly in accordance with the IEE/EIA, unless any variation thereto have been specified in the approval by the Federal Agency.

(2) Where the Federal Agency accords its approval subject to certain conditions, the proponent shall –

(a) before commencing construction of the project, acknowledge acceptance of the stipulated conditions by executing an undertaking in the form prescribed in Schedule VII;

(b) before commencing operation of the project, obtain from the Federal Agency written confirmation that the conditions of approval, and the requirements in the IEE/EIA relating to design and construction, adoption of mitigatory and other measures and other relevant matters, have been duly complied with.

14. Confirmation of compliance

(1) The request for confirmation of compliance under clause (b) of sub-regulation (2) of Regulation 13 shall be accompanied by an Environmental Management Plan indicating the measures and procedures proposed to be taken to manage or mitigate the environmental impacts for the life of the project, including provisions for monitoring, reporting and auditing.

(2) Where a request for confirmation of compliance is received from a proponent, the Federal Agency may carry out such inspection of the site and plant and machinery and seek such additional information from the proponent as it may deem fit:

Provided that every effort shall be made by the Federal Agency to provide the requisite confirmation or otherwise within 15 days of receipt of the request, with complete information, from the proponent.

(3) The Federal Agency may, while issuing the requisite confirmation of compliance, impose such other conditions as the Environmental Management Plan, and the operation, maintenance and monitoring of the project as it may deem fit, and such conditions shall be deemed to be included in the conditions to which approval of the project is subject.

15. Deemed approval

The four-month period for communication of decision stipulated in sub-section (4) of section 12 shall commence from the date of filing of an IEE or EIA in respect of which confirmation of completeness is issued by the Federal Agency under clause (a) of sub-regulation (1) of Regulation 9.

16. Extension in review period

Where the Federal Government in a particular case extends the four-month period for communication of approval prescribed in sub-section (5) of section 12, it shall, in consultation with the Federal Agency, indicate the various steps of the review process to be taken during the extended period, and the estimated time required for each step.

17. Validity period of approval

(1) The approval accorded by a Federal Agency under section 12 read with Regulation 12 shall be valid, for commencement of construction, for a period of three years from the date of issue.

(2) If construction is commenced during the initial three year validity period, the validity of the approval shall stand extended for a further period of three years from the date of issue.

(3) After issue of confirmation of compliance, the approval shall be valid for a period of three years from the date thereof.

(4) The proponent may apply to the Federal Agency for extension in the validity periods mentioned in sub-regulations (1), (2) and (3), which may be granted by the Federal Agency in its discretion for such period not exceeding three years at a time, if the conditions of the approval do not require significant change:

Provided that the Federal Agency may require the proponent to submit a fresh IEE or EIA, if in its opinion changes in location, design, construction and operation of the project so warrant.

18. Entry and inspection

(1) For purposes of verification of any matter relating to the review or to the conditions of approval of an IEE or EIA prior to, during or after commencement of construction or operation of a project, duly authorized staff of the Federal Agency shall be entitled to enter and inspect the project site, factory building and plant and equipment installed therein.

(2) The proponent shall ensure full cooperation of the project staff at site to facilitate the inspection, and shall provide such information as may be required by the Federal Agency for this purpose and pursuant thereto.

19. Monitoring

(1) After issue of approval, the proponent shall submit a report to the Federal Agency on completion of construction of the project.

(2) After issue of confirmation of compliance, the proponent shall submit an annual report summarizing operational performance of the project, with reference to the conditions of approval and maintenance and mitigatory measures adopted by the project.

(3) To enable the Federal Agency to effectively monitor compliance with the conditions of approval, the proponent shall furnish such additional information as the Federal Agency may require.

20. Cancellation of approval

(1) Notwithstanding anything contained in these Regulations, if, at any time, on the basis of information or report received or inspection carried out, the Federal Agency is of the opinion that the conditions of an approval have not been complied with, or that the information supplied by a proponent in the approved IEE or EIA is incorrect, it

shall issue notice to the proponent to show cause, within two weeks of receipt thereof, why the approval should not be cancelled.

(2) If no reply is received or if the reply is considered unsatisfactory, the Federal Agency may, after giving the proponent an opportunity of being heard:

(i) require the proponent to take such measures and to comply with such conditions within such period as it may specify, failing which the approval shall stand cancelled; or

(ii) cancel the approval.

(3) On cancellation of the approval, the proponent shall cease construction or operation of the project forthwith.

(4) Action taken under this Regulation shall be without prejudice to any other action that may be taken against the proponent under the Act or rules or regulations or any other law for the time being in force.

21. Registers of IEE and EIA projects

Separate Registers to be maintained by the Federal Agency for IEE and EIA projects under sub-section (7) of section 12 shall be in the form prescribed in Schedule VIII.

22. Environmentally sensitive areas

(1) The Federal Agency may, by notification in the official Gazette, designate an area to be an environmentally sensitive area.

(2) Notwithstanding anything contained in Regulations 3, 4 and 5, the proponent of a project situated in an environmentally sensitive area shall be required to file an EIA with the Federal Agency.

(3) The Federal Agency may from time to time issue guidelines to assist proponents and other persons involved in the environmental assessment process to plan and prepare projects located in environmentally sensitive areas.

(4) Where guidelines have been issued under sub-regulation (3), the projects shall be planned and prepared, to the extent practicable, in accordance therewith and any departure therefrom justified in the EIA pertaining to the project.

23. Environmental Assessment Advisory Committee

For purposes of rendering advice on all aspects of environmental assessment, including guidelines, procedures and categorization of projects, the Director-General shall constitute an Environmental Assessment Advisory Committee comprising –

(a) Director EIA, Federal Agency … Chairman

(b)	One representative each of the Provincial Agencies	…	Members
(c)	One representative each of the Federal Planning Commission and the Provincial Planning and Development Departments	…	Members
(d)	Representatives of industry and non-Governmental organizations, and legal and other experts	…	Members

24. Other approvals

Issue of an approval under section 12 read with Regulation 12 shall not absolve the proponent of the duty to obtain any other approval or consent that may be required under any law for the time being in force.

SCHEDULE I
(*See* Regulation 3)

List of projects requiring an IEE

A. Agriculture, Livestock and Fisheries

1. Poultry, livestock, stud and fish farms with total cost more than Rs.10 million

2. Projects involving repacking, formulation or warehousing of agricultural products

B. Energy

1. Hydroelectric power generation less than 50 MW

2. Thermal power generation less than 200 KW

3. Transmission lines less than 11 KV, and large distribution projects

4. Oil and gas transmission systems

5. Oil and gas extraction projects including exploration, production, gathering systems, separation and storage

6. Waste-to-energy generation projects

C. Manufacturing and processing

1. Ceramics and glass units with total cost more than Rs.50 million

2. Food processing industries including sugar mills, beverages, milk and dairy products, with total cost less than Rs.100 million

3. Man-made fibers and resin projects with total cost less than Rs.100 million

4. Manufacturing of apparel, including dyeing and printing, with total cost more than Rs.25 million

5. Wood products with total cost more than Rs.25 million

D. Mining and mineral processing

1. Commercial extraction of sand, gravel, limestone, clay, sulphur and other minerals not included in Schedule II with total cost less than Rs.100 million

2. Crushing, grinding and separation processes

3. Smelting plants with total cost less than Rs.50 million

E. Transport

1. Federal or Provincial highways (except maintenance, rebuilding or reconstruction of existing metalled roads) with total cost less than Rs.50 million

2. Ports and harbor development for ships less than 500 gross tons

F. Water management, dams, irrigation and flood protection

1. Dams and reservoirs with storage volume less than 50 million cubic meters of surface area less than 8 square kilometers

2. Irrigation and drainage projects serving less than 15,000 hectares

3. Small-scale irrigation systems with total cost less than Rs.50 million

G. Water supply and treatment

Water supply schemes and treatment plants with total cost less than Rs.25 million

H. Waste disposal

Waste disposal facility for domestic or industrial wastes, with annual capacity less than 10,000 cubic meters

I. Urban development and tourism

1. Housing schemes

2. Public facilities with significant off-site impacts (e.g. hospital wastes)

3. Urban development projects

J. Other projects

Any other project for which filing of an IEE is required by the Federal Agency under sub-regulation (2) of Regulation 5

SCHEDULE II

(*See* Regulation 4)

List of projects requiring an EIA

A. Energy

1. Hydroelectric power generation over 50 MW
2. Thermal power generation over 200 MW
3. Transmission lines (11 KV and above) and grid stations
4. Nuclear power plans
5. Petroleum refineries

B. Manufacturing and processing

1. Cement plants
2. Chemicals projects
3. Fertilizer plants
4. Food processing industries including sugar mills, beverages, milk and dairy products, with total cost of Rs.100 million and above
5. Industrial estates (including export processing zones)
6. Man-made fibers and resin projects with total cost of Rs.100 M and above
7. Pesticides (manufacture or formulation)
8. Petrochemicals complex
9. Synthetic resins, plastics and man-made fibers, paper and paperboard, paper pulping, plastic products, textiles (except apparel),printing and publishing, paints and dyes, oils and fats and vegetable ghee projects, with total cost more than Rs.10 million
10. Tanning and leather finishing projects

C. Mining and mineral processing

1. Mining and processing of coal, gold, copper, sulphur and precious stones
2. Mining and processing of major non-ferrous metals, iron and steel rolling
3. Smelting plants with total cost of Rs.50 million and above

D. Transport

1. Airports

2. Federal or Provincial highways or major roads (except maintenance, rebuilding or reconstruction of existing roads) with total cost of Rs.50 million and above

3. Ports and harbor development for ships of 500 gross tons and above

4. Railway works

E. Water management, dams, irrigation and flood protection

1. Dams and reservoirs with storage volume of 50 million cubic meters and above or surface area of 8 square kilometers and above

2. Irrigation and drainage projects serving 15,000 hectares and above

F. Water supply and treatment

Water supply schemes and treatment plants with total cost of Rs.25 million and above

G. Waste Disposal

1. Waste disposal and/or storage of hazardous or toxic wastes (including landfill sites, incineration of hospital toxic waste)

2. Waste disposal facilities for domestic or industrial wastes, with annual capacity more than 10,000 cubic meters

H. Urban development and tourism

1. Land use studies and urban plans (large cities)

2. Large-scale tourism development projects with total cost more than Rs.50 million

I. Environmentally Sensitive Areas

All projects situated in environmentally sensitive areas

J. Other projects

1. Any other project for which filing of an EIA is required by the Federal Agency under sub-regulation (2) of Regulation 5.

2. Any other project likely to cause an adverse environmental effect

SCHEDULE III
(See Regulation 7)

IEE/EIA Review Fees

Total Project Cost	IEE	EIA
Upto Rs.5,000,000	NIL	NIL
Rs.5,000,001 to 10,000,000	Rs.10,000	Rs.15,000
Greater than Rs.10,000,000	Rs.15,000	Rs.30,000

SCHEDULE IV

[*See* Regulation 8(2)(a)]

Application Form

1.	Name and address of proponent		Phone: Fax: Telex:	
2.	Description of project			
3.	Location of project			
4.	Objectives of project			
5.	IEE/EIA attached?	IEE/EIA :	Yes/No	
6.	Have alternative sites been considered and reported in IEE/EIA?		Yes/No	
7.	Existing land use		Land requirement	
8.	Is basic site data available, or has it been measured?	(only tick yes if the data is reported in the IEE/EIA)	<u>Available</u>	<u>Measured</u>
		Meterology (including rainfall)	Yes/No	Yes/No
		Ambient air quality	Yes/No	Yes/No
		Ambient water quality	Yes/No	Yes/No
		Ground water quality	Yes/No	Yes/No
9.	Have estimates of the following been reported?		<u>Estimated</u>	<u>Reported</u>
		Water balance	Yes/No	Yes/No
		Solid waste disposal	Yes/No	Yes/No
		Liquid waste treatment	Yes/No	Yes/No
10.	Source of power		Power requirement	
11.	Labour force (number)	Construction: Operation:		

<u>Verification.</u> I do solemnly affirm and declare that the information given above and contained in the attached IEE/EIA is true and correct to the best of my knowledge and belief.

Date _____

Signature, name and _____
designation of proponent
(with official stamp/seal)

SCHEDULE V

[*See* Regulation 12]

Decision on IEE

1. Name and address of proponent _____

   _____

2. Description of project _____

3. Location of project _____

4. Date of filing of IEE _____

5. After careful review of the IEE, the Federation Agency has decided –

   (a) to accord its approval, subject to the following conditions:

   _____
   _____

   or (b) that the proponent should submit an EIA of the project, for the following reasons –

   _____
   _____

   [Delete (a) or (b), whichever is inapplicable]

Dated _____

Tracking no.___

Director-General
Federal Agency
(with official stamp/seal)

SCHEDULE VI

[*See* Regulation 12]

Decision on EIA

1. Name and address of proponent _____

   _____

2. Description of project _____

3. Location of project _____

4. Date of filing of EIA _____

5. After careful review of the EIA, and all comments thereon, the Federation Agency has decided –

   (a) to accord its approval, subject to the following conditions:

   _____
   _____

   or (b) that the proponent should submit an EIA with the following modifications-

   _____
   _____

   or (c) to reject the project, being contrary to environmental objectives, for the following reasons:

   _____
   _____

   [Delete (a)/(b)/(c), whichever is inapplicable]

Dated _____

Tracking no.___

Director-General
Federal Agency
(with official stamp/seal)

SCHEDULE VII

[*See* Regulation 13(2)]

Undertaking

I, (full name and address) as proponent for (name, description and location of project) do hereby solemnly affirm and declare that I fully understand and accept the conditions contained in the approval accorded by the Federal Agency bearing tracking no._____ dated _____, and undertake to design, construct and operate the project strictly in accordance with the said conditions and the IEE/EIA.

Date _____

Signature, name and _____
designation of proponent
(with official stamp/seal)

Witnesses
(full names and addresses)

(1) _____

(2) _____

SCHEDULE VIII

(*See* Regulation 21)

Form of Registers for IEE and EIA projects

S. No.	Description	Relevant Provisions
1	2	3
1.	Tracking number	
2.	Category type (as per Schedules I and II)	
3.	Name of proponent	
4.	Name and designation of contact person	
5.	Name of consultant	
6.	Description of project	
7.	Location of project	
8.	Project capital cost	
9.	Date of receipt of IEE/EIA	
10.	Date of confirmation of completeness	
11.	Approval granted (Yes/No)	
12.	Date of approval granted or refused	
13.	Conditions of approval/reasons for refusal	
14.	Date of Undertaking	
15.	Date of extension of approval validity	
16.	Period of extension	
17.	Date of commencement of construction	
18.	Date of issue of confirmation of compliance	
19.	Date of commencement of operations	
20.	Dates of filing of monitoring reports	
21.	Date of cancellation, if applicable	

Annexure-III
Restoration and Rehabilitation Plan

Restoration and Rehabilitation Plan

1.0 Introduction

After the completion of construction phase of the proposed project, it is the responsibility of the Contractor to restore the site that has been disturbed due to construction activities. It is accepted that restoration may take many years to achieve. However, PIEDMC has a stewardship responsibility to ensure that the environmental value of the project area is maintained for future generations to appreciate.

2.0 General Quarry Planning and Progressive Rehabilitation

A well-considered quarry development plan prior to starting work, or when opening up new areas will greatly reduce the effort required to achieve appropriate leading practice environmental and safety outcomes for quarry rehabilitation and closure.

The selection of a site, sequencing of quarrying and rehabilitation, and final land-use should all be carefully planned prior to commencement of work at a quarry or borrow pit.

2.1 Progressive Rehabilitation

Progressive rehabilitation refers to the rehabilitation of completed parts of a quarry while extractive operations continue in other parts of the quarry. As new quarry sections are opened, worked out areas should be progressively rehabilitated to avoid increasing the total disturbed area of a quarry. Overburden and topsoil can be stripped from areas being opened up and placed directly onto worked out areas which are being rehabilitated. This will avoid double handling of materials and prevent degradation of the topsoil.

Progressive rehabilitation helps to minimize the visual impact of a quarry, control dust and erosion. It also assists in fostering good landowner and community relations.

Recommended progressive rehabilitation practices are:

- Agree on the final land form and use of a site with the relevant landowner.
- Rehabilitate in accordance with the intended final use of the land.
- Final faces of shallow borrow pits should be battered to a 1:3 (vertical: horizontal) or shallower.
- Plan and develop the quarry in stages towards terminal areas so that progressive rehabilitation works can commence as soon as possible (As shown in **Figure 1**).
- Once the final landform is established, re-vegetate areas to stabilize the landform and to give the vegetation maximum time to establish while the quarry is still in operation.

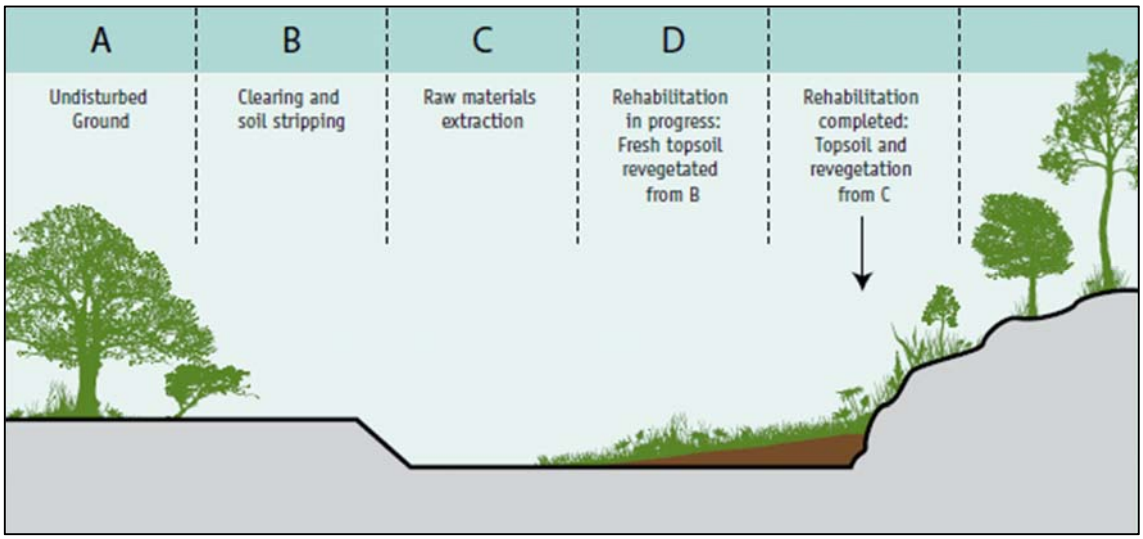


Figure 1: Progressive rehabilitation to manage potential impact on visual amenity

2.2 Re-vegetation

Establishing a self-sustaining cover of vegetation is the best way to stabilize disturbed sites in the long term. Re-vegetation also minimizes the visual impact of quarries. Generally, the vegetation type which existed before the disturbance, or a similar vegetation type will regenerate most successfully.

Prior to the commencement of a quarrying activity the type of re-vegetation should be agreed with the landowner, and should be consistent with the proposed final land-use.

Some indigenous plant species may not thrive in areas where soil conditions are substantially different after quarrying. If this is the case, and the objective is to re-establish vegetation, which fulfils the function of the original native vegetation, then some species from outside the quarry area, may have to be introduced. Care must be taken to avoid introducing a species, which could become an unacceptable fire hazard, invade surrounding areas of native vegetation or become agricultural weeds.

Where agriculture is the planned land-use then the species planted should be those commonly used for pasture or crops known to be successful on soils of similar texture, drainage status, pH and fertility. Suitable legumes should always be considered for their ability to improve soil fertility.

3.0 Rehabilitation of Affected Areas

Rehabilitation will be done in accordance with the Environmental Management and Monitoring Plan (EMMP) of the proposed project site. There are many areas affected by construction and maintenance activities that require rehabilitation such as borrow pits, stockpile sites, campsites and sidetracks.

3.1 Borrow Pits

Borrow pits are areas either in a road reserve or adjacent land holdings that have been used to extract materials such as gravels and soils. They can vary considerably in size, depending on the quantity of material taken and the borrow pits' reserve body of remaining material. The variable size, shape and nature of borrow pits preclude very specific recommendations; however the following general conditions apply:

- Before extraction commences, licenses and permits should be checked and limits of disturbance and/or clearing must be clearly marked out on the site before any ground disturbing activity takes place; and
- At the completion of extraction, the former borrow pit must be made stable and safe. This usually requires the sides of the pit to be reshaped with gentle safe grades. All disturbed areas associated with borrow pits must be retopsoiled, seeded, fertilized and mulched (if appropriate) as part of the restoration plan. Main Roads has been discouraging the conversion of borrow pits to stock watering points.

3.2 Stockpile Areas and Construction Camp Sites

Stockpile areas and construction campsites should be developed in a similar fashion to borrow pits. Limits of disturbance and/or clearing must be clearly marked out on the site using posts or flagging tape before any ground disturbing activity takes place.

Vehicle wash-down areas should be constructed as a separate area to ensure contaminants are contained and removed at the close of the site.

3.3 Sidetracks

Sidetracks may create a much greater impact than the actual construction site itself. If sidetracks are justified, limits of disturbance must be clearly marked out on the site before any ground disturbing activity takes place.

Rehabilitation of sidetracks requires removal and disposal of fill materials used for temporary approaches, abutments, crossings or embankments. All remaining areas must be reshaped to blend back in with preexisting landforms.

4.0 Monitoring

To achieve continuous improvement and ensure the activities specified in contracts are being adhered to, regular monitoring will be undertaken with emphasis placed on the continuity between site characteristics and the adjacent landscapes.

Restoration of sites disturbed by construction activities is unlikely to ever mimic the original landscape. Performance of the contractor can usually be gauged by comparing adjacent landscapes. Low continuity between these landscapes usually indicates that no attention has been given to site stability.

Annexure-IV
Monitoring Results

Ambient Air Quality Monitoring

National Engineering Services Pakistan (NESPAK)
Bahawalpur Industrial Estate
(Ambient Air Quality Data Report)

Prepared By:

PAK EPA Certified Labs

HSE SERVICES
Email: info@hse.com.pk
www.hse.com.pk

Ambient Air Monitoring Reports

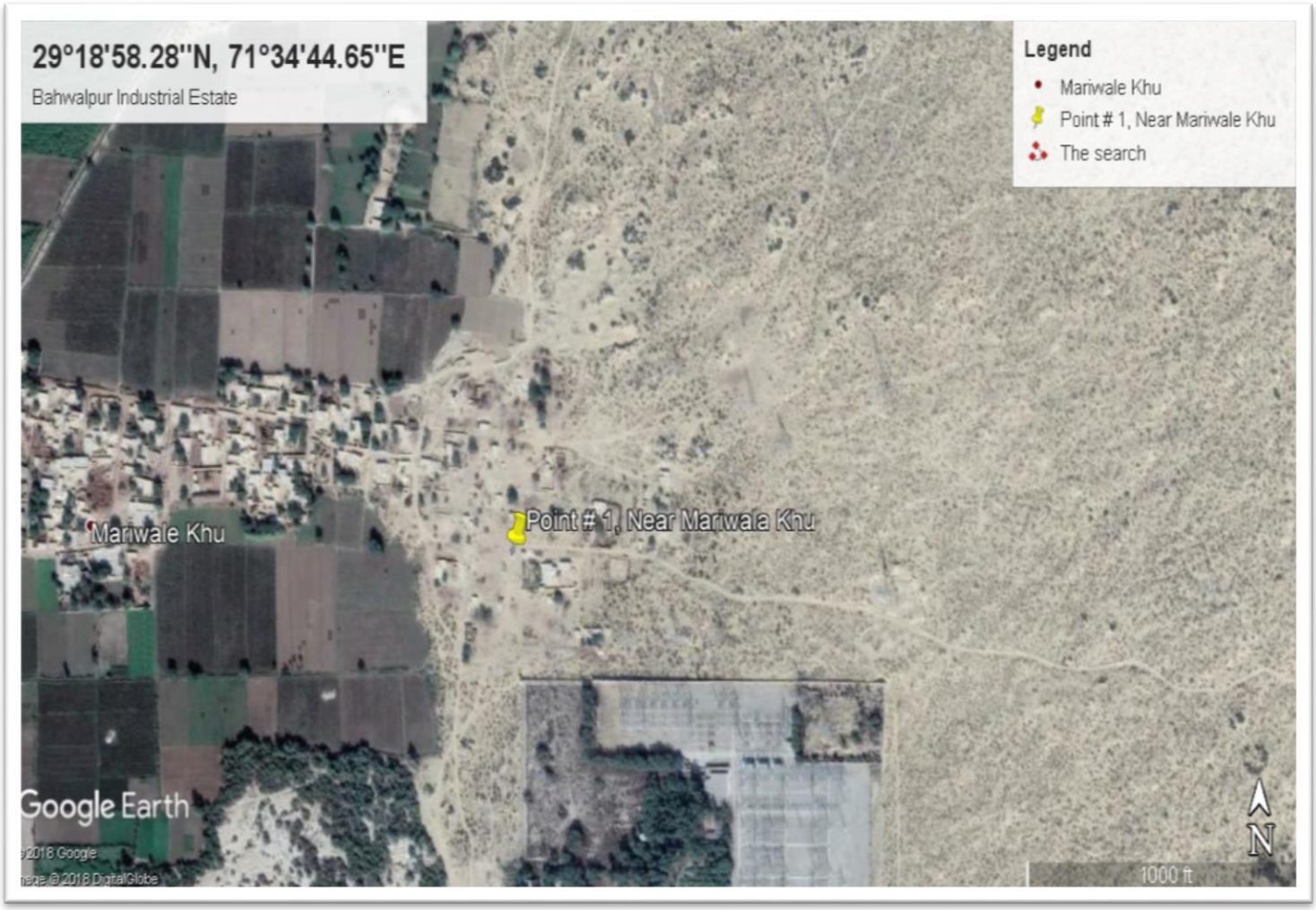
Site Map : Location

Ambient Air Monitoring Reports

AMBIENT AIR QUALITY, METEOROLOGY AND NOISE LEVEL RESULTS

Air Quality, Meteorology and Noise Monitoring Schedule

Sr. No.	Site	Start Date/Time	Completion Date/ Time	Duration	Lat.	Lon.
1.	West side near Mariwale khu	16/01/2018 11:00 Hrs.	17/01/2018 10:00 Hrs.	24h	29.31618889	71.57888889



Ambient Air Monitoring Reports

Air Quality Monitoring Assessment

Location Coordinates:

Point Number: west side near Mariwale khu

GPS Coordinates: Latitude: 29.31618889

Longitude: 71.57888889

Nearby Area: Mariwale khu

Type: Landmark

Meteorological Data at Monitoring Site: Dated: January 16, 2018

Parameters	**Units**	**Results**
Air Temperature – 24 Hours Average	°C	21
Air Humidity – 24 Hours Average	% rH	37.5

Air Pollutants and Noise Data at Monitoring Site:

Parameter	**Averaging Time**		**NEQS**	**Unit**	***Avg. Conc.**	**Methodology**
Carbon Monoxide (CO)	8 h		**5**	mg/m^3	0.47	Non-Dispersive Infrared Spectrophotometry (NDIR)
Sulfur Dioxide (SO_2)	24 h		**120**	$\mu g/m^3$	3.78	UV Fluorescent
Nitrogen Dioxide (NO_2)	24 h		**80**	$\mu g/m^3$	10.25	Chemiluminescence
Nitric Oxide (NO)	24 h		**40**	$\mu g/m^3$	3.72	Chemiluminescence
Oxides of Nitrogen (NOx)	24 h		**120**	$\mu g/m^3$	13.97	Chemiluminescence
Particulate Matter (PM_{10})	24 h		**150**	$\mu g/m^3$	20.32	Beta-Attenuation
Particulate Matter ($PM_{2.5}$)	24 h		**35**	$\mu g/m^3$	11.88	Beta-Attenuation
Suspended Particulates (SPM)	24 h		**500**	$\mu g/m^3$	198	Gravimetric Sampling
Lead	24 h		**1.5**	$\mu g/m^3$	0.02	Gravimetric Analysis
Ozone	1 h		**130**	$\mu g/m^3$	95.05	Non-Dispersive UV Absorption Method
Noise	Day-time	12h.50 m	**65**	dB (A)	44.2	Noise Logger
	Night-time	11h.10m	**55**		40.3	Noise Logger

For Detailed Monitoring Results Please see **Log Table 1.0*

Ambient Air Monitoring Reports

Log Table 1.0

WINAQMS:PC-PORT/75935250/log.009937939

Site: 1

Coordinates : Latitude: 29.31618889

Longitude: 71.57888889

Date	Time	CO	NO	NO2	NOx	SO2	O3	PM10	PM2.5
		mg/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3
16-01-18	11:00	0.53	3.13	10.07	13.20	3.77	92.31	18.54	11.54
16-01-18	12:00	0.48	3.80	10.29	14.08	3.76	93.41	18.76	12.34
16-01-18	13:00	0.56	4.23	10.42	14.65	3.76	94.02	18.88	11.65
16-01-18	14:00	0.51	4.00	10.35	14.34	3.78	95.65	18.99	11.54
16-01-18	15:00	0.47	3.76	10.27	14.02	3.75	94.21	19.23	11.64
16-01-18	16:00	0.55	4.20	10.41	14.61	3.82	95.65	19.98	11.53
16-01-18	17:00	0.50	3.96	10.33	14.29	3.78	93.45	20.14	11.78
16-01-18	18:00	0.58	4.40	10.48	14.87	3.76	96.34	20.34	11.92
16-01-18	19:00	0.53	4.16	10.39	14.55	3.78	94.21	20.45	11.96
16-01-18	20:00	0.39	3.19	10.09	13.28	3.83	92.42	20.56	11.98
16-01-18	21:00	0.57	4.36	10.46	14.82	3.76	96.98	20.89	11.94
16-01-18	22:00	0.57	4.36	10.46	14.82	3.76	96.98	20.89	11.94
16-01-18	23:00	0.51	4.12	10.38	14.49	3.82	94.32	21.14	11.92
17-01-18	00:00	0.38	3.16	10.08	13.24	3.77	96.54	21.76	11.9
17-01-18	01:00	0.57	4.33	10.45	14.78	3.76	94.32	21.98	11.84
17-01-18	02:00	0.41	3.36	10.14	13.50	3.82	98.42	20.32	11.89
17-01-18	03:00	0.37	3.12	10.07	13.19	3.76	95.02	21.23	11.92
17-01-18	04:00	0.55	4.29	10.44	14.73	3.77	97.54	21.32	11.78
17-01-18	05:00	0.42	3.33	10.14	13.47	3.79	98.11	22.54	11.87
17-01-18	06:00	0.39	3.09	10.06	13.15	3.76	92.34	20.32	12.12
17-01-18	07:00	0.44	3.53	10.20	13.73	3.77	96.21	21.54	12.22
17-01-18	08:00	0.43	3.30	10.13	13.43	3.81	94.53	20.12	12.02
17-01-18	09:00	0.46	3.72	10.26	13.98	3.75	95.05	20.01	11.99
17-01-18	10:00	0.45	3.50	10.19	13.69	3.77	95.32	19.54	11.89

Data Analysis							
Minimum Value	0.37	3.09	10.05	13.14	3.75	92.31	18.54
Maximum Value	0.58	4.39	10.47	14.87	3.83	98.42	22.54
Mode	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Variance	0.04	0.22	0.02	0.38	0.00	0.28	59.33
Quartile @ 1st 4 Hours	0.42	3.30	10.13	13.43	3.09	7.19	58.53
Quartile @ 2nd 4 Hours	0.49	3.77	10.27	14.05	3.15	7.72	66.22
Quartile @ 3rd 4 Hours	0.54	4.18	10.40	14.59	3.20	8.18	72.89
Standard Deviation	**0.06**	**0.47**	**0.14**	**0.62**	**0.06**	**0.53**	**7.70**
Mean Value	**0.48**	**3.74**	**10.26**	**14.01**	**3.78**	**95.05**	**20.32**

Ambient Air Monitoring Reports

**Standard Deviation define the deviation from the mean or average value in that specific time period, sometimes we use this data to analyzer the variation which rise and fall due to traffic concentration on nearby roads or Industrial emissions.

Ambient Air Monitoring Reports

AMBIENT AIR QUALITY, METEOROLOGY AND NOISE LEVEL RESULTS

Air Quality, Meteorology and Noise Monitoring Schedule

Sr. No.	Site	Start Date/Time	Completion Date/ Time	Duration	Lat.	Lon.
2.	South side near Mushraf khu	17/01/2018 12:00 Hrs.	18/01/2018 11:00 Hrs.	24h	29.31368889	71.59333333

Ambient Air Monitoring Reports

Air Quality Monitoring Assessment

Location Coordinates:

Point Number: South side near Mushraf khu

GPS Coordinates: Latitude: 29.31368889

Longitude: 71.59333333

Nearby Area: Mushraf khu

Type: Landmark

Meteorological Data at Monitoring Site: Dated: January 17, 2018

Parameters	**Units**	**Results**
Air Temperature – 24 Hours Average	°C	21
Air Humidity – 24 Hours Average	% rH	37.5

Air Pollutants and Noise Data at Monitoring Site:

Parameter	**Averaging Time**		**NEQS**	**Unit**	***Avg. Conc.**	**Methodology**
Carbon Monoxide (CO)	8 h		**5**	mg/m^3	0.50	Non-Dispersive Infrared Spectrophotometry (NDIR)
Sulfur Dioxide (SO_2)	24 h		**120**	$\mu g/m^3$	3.78	UV Fluorescent
Nitrogen Dioxide (NO_2)	24 h		**80**	$\mu g/m^3$	12.73	Chemiluminescence
Nitric Oxide (NO)	24 h		**40**	$\mu g/m^3$	3.72	Chemiluminescence
Oxides of Nitrogen (NOx)	24 h		**120**	$\mu g/m^3$	16.45	Chemiluminescence
Particulate Matter (PM_{10})	24 h		**150**	$\mu g/m^3$	31.32	Beta-Attenuation
Particulate Matter ($PM_{2.5}$)	24 h		**35**	$\mu g/m^3$	15.38	Beta-Attenuation
Suspended Particulates (SPM)	24 h		**500**	$\mu g/m^3$	178	Gravimetric Sampling
Lead	24 h		**1.5**	$\mu g/m^3$	0.02	Gravimetric Analysis
Ozone	1 h		**130**	$\mu g/m^3$	97.21	Non-Dispersive UV Absorption Method
Noise	Day-time	12h.50 m	**65**	dB (A)	48.5	Noise Logger
	Night-time	11h.10m	**55**		44.2	Noise Logger

For Detailed Monitoring Results Please see **Log Table 2.0*

Ambient Air Monitoring Reports

Log Table 2.0

WINAQMS:PC-PORT/75935250/log.009937939

Site: 2

Coordinates : Latitude: 29.31368889

Longitude: 71.59333333

Date	Time	CO	NO	NO2	NOx	SO2	O3	PM10	PM2.5
		mg/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3
17-01-18	12:00	0.48	3.80	11.29	15.08	3.76	96.43	30.21	13.34
17-01-18	13:00	0.56	4.23	12.42	15.65	3.76	97.54	31.32	16.65
17-01-18	14:00	0.51	4.00	13.35	16.34	3.78	97.51	31.42	15.54
17-01-18	15:00	0.47	3.76	12.27	16.02	3.75	97.24	31.23	16.64
17-01-18	16:00	0.55	4.20	12.41	16.61	3.82	95.65	32.43	15.43
17-01-18	17:00	0.5	3.96	12.33	15.29	3.78	97.21	31.21	15.45
17-01-18	18:00	0.58	4.40	12.48	16.87	3.76	98.76	33.21	15.92
17-01-18	19:00	0.53	4.16	12.39	15.55	3.78	98.87	30.23	15.96
17-01-18	20:00	0.54	3.19	12.09	15.28	3.83	99.87	31.25	14.32
17-01-18	21:00	0.57	4.36	13.46	16.82	3.76	96.98	30.54	13.94
17-01-18	22:00	0.57	4.36	13.46	16.82	3.76	96.98	30.54	13.94
17-01-18	23:00	0.51	4.12	13.38	16.49	3.82	94.53	31.52	16.92
18-01-18	00:00	0.52	3.16	13.08	17.24	3.77	98.32	33.61	14.9
18-01-18	01:00	0.57	4.33	13.45	17.78	3.76	98.21	33.33	14.32
18-01-18	02:00	0.41	3.36	14.14	17.50	3.82	97.21	32.54	15.89
18-01-18	03:00	0.54	3.12	13.07	18.19	3.76	97.31	31.32	15.32
18-01-18	04:00	0.55	4.29	13.44	17.17	3.77	97.54	31.76	16.78
18-01-18	05:00	0.42	3.33	14.14	17.47	3.79	98.11	32.77	15.87
18-01-18	06:00	0.39	3.09	13.06	16.15	3.76	96.31	31.21	14.12
18-01-18	07:00	0.44	3.53	12.20	16.73	3.77	96.21	30.23	13.43
18-01-18	08:00	0.43	3.30	12.13	16.43	3.81	96.34	30.21	15.02
18-01-18	09:00	0.46	3.72	12.26	15.98	3.75	95.05	29.11	15.99
18-01-18	10:00	0.45	3.50	12.19	16.69	3.77	97.54	30.22	15.89
18-01-18	11:00	0.5	3.27	12.32	15.39	3.79	97.26	30.32	15.87

Data Analysis							
Minimum Value	0.37	3.09	11.29	15.08	3.75	94.53	30.21
Maximum Value	0.58	4.39	14.14	18.19	3.83	99.87	33.61
Mode	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Variance	0.04	0.22	0.02	0.38	0.00	0.28	59.33
Quartile @ 1st 4 Hours	0.42	3.30	10.13	13.43	3.09	7.19	58.53
Quartile @ 2nd 4 Hours	0.49	3.77	10.27	14.05	3.15	7.72	66.22
Quartile @ 3rd 4 Hours	0.54	4.18	10.40	14.59	3.20	8.18	72.89
Standard Deviation	**0.06**	**0.47**	**0.14**	**0.62**	**0.06**	**0.53**	**7.70**
Mean Value	**0.50**	**3.74**	**12.73**	**16.45**	**3.78**	**97.21**	31.31792

Ambient Air Monitoring Reports

**Standard Deviation define the deviation from the mean or average value in that specific time period, sometimes we use this data to analyzer the variation which rise and fall due to traffic concentration on nearby roads or Industrial emissions.

Ambient Air Monitoring Reports

AMBIENT AIR QUALITY, METEOROLOGY AND NOISE LEVEL RESULTS

Air Quality, Meteorology and Noise Monitoring Schedule

Sr. No.	Site	Start Date/Time	Completion Date/ Time	Duration	Lat.	Lon.
3.	East side of Sangla Basti	18/01/2018 13:00 Hrs.	19/01/2018 12:00 Hrs.	24h	29.32125556	71.60083333

Ambient Air Monitoring Reports

Air Quality Monitoring Assessment

Location Coordinates:

Point Number: East side of Sangla Basti

GPS Coordinates: Latitude: 29.32125556

Longitude: 71.60083333

Nearby Area: Sangla Basti

Type: Landmark

Meteorological Data at Monitoring Site: Dated: January 18, 2018

Parameters	**Units**	**Results**
Air Temperature – 24 Hours Average	°C	21
Air Humidity – 24 Hours Average	% rH	37.5

Air Pollutants and Noise Data at Monitoring Site:

Parameter	**Averaging Time**		**NEQS**	**Unit**	***Avg. Conc.**	**Methodology**
Carbon Monoxide (CO)	8 h		**5**	mg/m^3	0.50	Non-Dispersive Infrared Spectrophotometry (NDIR)
Sulfur Dioxide (SO_2)	24 h		**120**	$\mu g/m^3$	3.84	UV Fluorescent
Nitrogen Dioxide (NO_2)	24 h		**80**	$\mu g/m^3$	13.53	Chemiluminescence
Nitric Oxide (NO)	24 h		**40**	$\mu g/m^3$	3.77	Chemiluminescence
Oxides of Nitrogen (NOx)	24 h		**120**	$\mu g/m^3$	17.30	Chemiluminescence
Particulate Matter (PM_{10})	24 h		**150**	$\mu g/m^3$	26.40	Beta-Attenuation
Particulate Matter ($PM_{2.5}$)	24 h		**35**	$\mu g/m^3$	12.71	Beta-Attenuation
Suspended Particulates (SPM)	24 h		**500**	$\mu g/m^3$	184	Gravimetric Sampling
Lead	24 h		**1.5**	$\mu g/m^3$	0.02	Gravimetric Analysis
Ozone	1 h		**130**	$\mu g/m^3$	96.97	Non-Dispersive UV Absorption Method
Noise	Day-time	12h.50 m	**65**	dB (A)	51.6	Noise Logger
	Night-time	11h.10m	**55**		37.8	Noise Logger

For Detailed Monitoring Results Please see **Log Table 3.0*

Ambient Air Monitoring Reports

Log Table 3.0

WINAQMS:PC-PORT/75935250/log.009937939

Site: 3

Coordinates : Latitude: 29.32125556

Longitude: 71.60083333

Date	Time	CO	NO	NO2	NOx	SO2	O3	PM10	PM2.5
		mg/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3
18-01-18	13:00	0.56	4.23	13.55	16.35	3.76	97.54	27.32	13.65
18-01-18	14:00	0.51	4.06	13.35	16.34	3.78	97.51	26.42	13.54
18-01-18	15:00	0.47	3.76	13.98	17.87	3.95	97.24	26.23	13.64
18-01-18	16:00	0.55	4.20	13.41	17.32	3.82	96.65	27.46	12.43
18-01-18	17:00	0.5	3.96	13.43	17.29	3.78	97.21	27.21	12.45
18-01-18	18:00	0.58	4.40	13.54	16.87	3.87	98.76	27.21	12.92
18-01-18	19:00	0.53	4.16	13.39	17.55	3.88	96.87	26.23	12.96
18-01-18	20:00	0.54	3.39	14.12	16.76	3.83	97.87	26.25	11.32
18-01-18	21:00	0.57	4.36	13.46	16.82	3.76	96.98	26.54	12.94
18-01-18	22:00	0.57	4.36	13.46	16.82	3.76	96.98	26.54	12.94
18-01-18	23:00	0.51	4.12	13.54	16.49	3.82	95.51	26.52	11.92
19-01-18	00:00	0.52	3.46	14.08	18.24	3.87	97.32	25.61	12.90
19-01-18	01:00	0.57	4.33	13.45	17.78	3.76	96.21	25.33	12.32
19-01-18	02:00	0.41	3.36	14.14	17.78	3.82	97.21	25.54	11.89
19-01-18	03:00	0.54	3.12	14.54	18.19	3.86	97.31	26.32	12.32
19-01-18	04:00	0.55	4.19	13.44	17.17	3.97	97.54	26.76	11.78
19-01-18	05:00	0.42	3.43	14.23	18.47	3.79	98.11	25.77	11.87
19-01-18	06:00	0.39	3.29	13.06	16.15	3.76	96.31	27.21	11.12
19-01-18	07:00	0.44	3.53	13.56	16.73	3.97	96.21	26.23	12.43
19-01-18	08:00	0.43	3.40	13.43	16.43	3.81	96.34	26.21	12.02
19-01-18	09:00	0.46	3.82	13.26	18.43	3.75	97.05	26.11	12.99
19-01-18	10:00	0.45	3.40	12.19	16.69	3.97	96.54	27.22	13.89
19-01-18	11:00	0.5	3.37	13.43	18.34	3.79	97.26	26.32	13.87
19-01-18	12:00	0.53	3.36	12.98	17.54	3.97	96.23	25.43	14.54

Data Analysis							
Minimum Value	0.39	3.12	12.19	16.15	3.75	95.51	25.43
Maximum Value	0.58	4.40	14.54	18.47	3.97	98.76	27.46
Mode	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Variance	0.04	0.22	0.02	0.38	0.00	0.28	59.33
Quartile @ 1st 4 Hours	0.42	3.30	10.13	13.43	3.09	7.19	58.53
Quartile @ 2nd 4 Hours	0.49	3.77	10.27	14.05	3.15	7.72	66.22
Quartile @ 3rd 4 Hours	0.54	4.18	10.40	14.59	3.20	8.18	72.89
Standard Deviation	**0.06**	**0.47**	**0.14**	**0.62**	**0.06**	**0.53**	**7.70**
Mean Value	**0.50**	**3.7778**	**13.53**	**17.30**	**3.837**	**96.976**	26.40

Ambient Air Monitoring Reports

**Standard Deviation define the deviation from the mean or average value in that specific time period, sometimes we use this data to analyzer the variation which rise and fall due to traffic concentration on nearby roads or Industrial emissions.

Ambient Air Monitoring Reports

AMBIENT AIR QUALITY, METEOROLOGY AND NOISE LEVEL RESULTS

Air Quality, Meteorology and Noise Monitoring Schedule

Sr. No.	Site	Start Date/Time	Completion Date/ Time	Duration	Lat.	Lon.
4.	Basti Sangla North side of the project	19/01/2018 14:00 Hrs.	20/01/2018 13:00 Hrs.	24h	29.32625278	71.58500000

Ambient Air Monitoring Reports

Air Quality Monitoring Assessment

Location Coordinates:

Point Number: Basti Sangla North side of the project

GPS Coordinates: Latitude: 29.32625278

Longitude: 71.58500000

Nearby Area: Basti Sangla

Type: Landmark

Meteorological Data at Monitoring Site: Dated: January 19, 2018

Parameters	**Units**	**Results**
Air Temperature – 24 Hours Average	°C	21
Air Humidity – 24 Hours Average	% rH	37.5

Air Pollutants and Noise Data at Monitoring Site:

Parameter	**Averaging Time**		**NEQS**	**Unit**	***Avg. Conc.**	**Methodology**
Carbon Monoxide (CO)	8 h		**5**	mg/m^3	0.50	Non-Dispersive Infrared Spectrophotometry (NDIR)
Sulfur Dioxide (SO_2)	24 h		**120**	$\mu g/m^3$	3.48	UV Fluorescent
Nitrogen Dioxide (NO_2)	24 h		**80**	$\mu g/m^3$	13.94	Chemiluminescence
Nitric Oxide (NO)	24 h		**40**	$\mu g/m^3$	03.90	Chemiluminescence
Oxides of Nitrogen (NOx)	24 h		**120**	$\mu g/m^3$	17.84	Chemiluminescence
Particulate Matter (PM_{10})	24 h		**150**	$\mu g/m^3$	27.24	Beta-Attenuation
Particulate Matter ($PM_{2.5}$)	24 h		**35**	$\mu g/m^3$	13.72	Beta-Attenuation
Suspended Particulates (SPM)	24 h		**500**	$\mu g/m^3$	184	Gravimetric Sampling
Lead	24 h		**1.5**	$\mu g/m^3$	0.02	Gravimetric Analysis
Ozone	1 h		**130**	$\mu g/m^3$	96.24	Non-Dispersive UV Absorption Method
Noise	Day-time	12h.50 m	**65**	dB (A)	45.6	Noise Logger
	Night-time	11h.10m	**55**		39.3	Noise Logger

For Detailed Monitoring Results Please see **Log Table 4.0*

Ambient Air Monitoring Reports

Log Table 4.0

WINAQMS:PC-PORT/75935250/log.009937939

Site: 4

Coordinates : Latitude: 29.32625278

Longitude: 71.58500000

Date	Time	CO	NO	NO2	NOx	SO2	O3	PM10	PM2.5
		mg/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3
19-01-18	14:00	0.51	4.06	13.35	17.34	3.78	95.51	26.42	13.54
19-01-18	15:00	0.47	3.76	14.98	18.87	3.35	96.24	27.23	13.64
19-01-18	16:00	0.55	4.20	13.41	18.86	3.52	96.65	28.46	12.43
19-01-18	17:00	0.5	3.96	13.43	18.29	3.28	97.21	28.21	14.45
19-01-18	18:00	0.58	4.40	13.54	17.65	3.37	97.77	28.21	12.92
19-01-18	19:00	0.53	4.16	14.39	17.55	3.18	96.87	26.23	12.96
19-01-18	20:00	0.54	4.39	14.12	18.53	3.53	95.87	26.25	14.32
19-01-18	21:00	0.57	3.36	13.46	17.82	3.46	95.98	26.54	13.94
19-01-18	22:00	0.57	4.36	13.46	16.82	3.26	96.98	26.54	12.94
19-01-18	23:00	0.51	3.12	14.54	18.54	3.22	95.51	26.52	13.92
20-01-18	00:00	0.52	4.46	15.08	18.24	3.87	96.32	26.61	14.90
20-01-18	01:00	0.57	3.43	13.45	17.78	3.36	96.21	27.33	13.32
20-01-18	02:00	0.41	3.56	15.14	16.78	3.52	97.21	26.54	13.89
20-01-18	03:00	0.54	3.62	14.54	18.19	3.86	96.31	26.32	12.32
20-01-18	04:00	0.55	4.17	13.54	17.17	3.37	97.54	28.76	12.78
20-01-18	05:00	0.42	3.53	14.53	17.47	3.29	95.11	27.77	14.87
20-01-18	06:00	0.39	3.69	13.36	17.45	3.56	96.31	28.21	13.12
20-01-18	07:00	0.44	4.23	13.56	17.76	3.17	95.21	28.23	14.43
20-01-18	08:00	0.43	4.40	13.23	17.43	3.71	96.34	26.21	14.02
20-01-18	09:00	0.46	3.52	13.66	17.43	3.85	95.05	27.11	12.99
20-01-18	10:00	0.45	3.40	14.19	18.87	3.47	95.54	28.22	14.89
20-01-18	11:00	0.5	3.57	13.43	17.34	3.79	96.26	27.32	13.87
20-01-18	12:00	0.53	4.66	14.98	17.54	3.37	95.23	27.43	14.54
20-01-18	13:00	0.48	3.80	13.29	18.54	3.46	96.43	27.21	14.34

Data Analysis							
Minimum Value	0.39	3.12	13.23	16.78	3.18	95.11	26.21
Maximum Value	0.58	4.66	15.08	18.87	3.87	97.77	28.76
Mode	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Variance	0.04	0.22	0.02	0.38	0.00	0.28	59.33
Quartile @ 1st 4 Hours	0.42	3.30	10.13	13.43	3.09	7.19	58.53
Quartile @ 2nd 4 Hours	0.49	3.77	10.27	14.05	3.15	7.72	66.22
Quartile @ 3rd 4 Hours	0.54	4.18	10.40	14.59	3.20	8.18	72.89
Standard Deviation	**0.06**	**0.47**	**0.14**	**0.62**	**0.06**	**0.53**	**7.70**
Mean Value	**0.50**	**3.90**	**13.94**	**17.84**	**3.48**	**96.24**	27.24

Ambient Air Monitoring Reports

**Standard Deviation define the deviation from the mean or average value in that specific time period, sometimes we use this data to analyzer the variation which rise and fall due to traffic concentration on nearby roads or Industrial emissions.

Note:

- The instruments used were dully calibrated.
- The measurements were carried out on client's request.
- The client is responsible for lawful usage of reported data in future.
- This report is not valid for Court.
- The measurement results based on the time of monitoring.

Monitoring & Prepared By:

HSE Services

Date: January 31, 2018

Ambient Air Monitoring Reports

Monitoring Station Details

i. Ambient Gas analyzers are based on 4 main instruments:

1. Serinus 10 Ozone analyser (O3), Ecotech Australia
   (U.S. EPA approved (EQOA-0809-187)
   EN approval (TUV 936/21221977/C)
   Ultraviolet photometry method EN14625
   Determination of Ozone AS3580.6.1 Australian/New Zealand Standards

2. Serinus 30 Carbon Monoxide analyser (CO), Ecotech Australia
   U.S. EPA approved (RFCA-0509-174)
   EN approval (TUV 936/21221977/D)
   Non Dispersive I.R. Spectrometry method EN1426
   Determination of carbon monoxide AS 3580.7.1.2011 Australian/New Zealand standards

3. Serinus 40 Oxides of Nitrogen analyser (NOx), Ecotech Australia
   US EPA approved (RFNA-0809-186)
   EN approval (TUV 936/21221977/A)
   Chemiluminescence method EN14211
   Determination of oxides of nitrogen AS 3580.5.1-2011 Australian/New Zealand Standards.

4. Serinus 50 Sulphur Dioxide analyser (SO2), Ecotech Australia
   U.S. EPA approved (EQSA-0809-188)
   EN approval (TUV 936/21221977/B)
   Ultraviolet fluorescence method EN 14212
   Determination of sulphur dioxide AS 3580.4.1-2008 Australian/New Zealand Standards

ii. For PM Sampling: METONE BAM
   40 CFR Parts 50,51, 52,53 and 58.
   Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere (High-Volume Method).
   Reference Method for the Determination of Particulate Matter as PM10 in the Atmosphere.

Ambient Air Monitoring Reports

iii. Weather Station: Accurite USA

iv. Sound Level Data Logger – Extech USA

v. Oxygen Level Detector – Honeywell USA

vi. GPS – Garmin USA

vii. Temperature & Humidity Data Logger Extech USA

Acknowledgements
This report has been prepared by the staff of the Environmental Monitoring and Reporting Branch of the HSE SERVICES.

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0321-4000347

HSE Services

Health Safety & Environment, Consultant & Services

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Water Analysis Test Report

Report No.	HSE/L/DW/13/18	Date	Monday, January 22, 2018
Client Name	NESPAK		
Client Adress	Fateh wah Canal		
Sample Nature	Surface Water	Quantity Of Sample	1 Liter
Sample Collected By	HSE Services	Sampling Methodology	EPA Sampling Ruels
Date of Sample Received	25-12--2017		

S.No	Measuring Parameter	Units	REFERENCES (APHA)	PEQs	Test Results	Remarks
1	pH @ 25 °C	-	4500-H+	6.0-9.0	7.4	Ok
2	Temperature	0C	APHA 9030 B	.....	12.7	Ok
3	Total Dissolved Solids	TDS (mg/L)	1030F	3500	1240	Ok
4	Chloride	mg/L	4500 CC(-) B	1000	43.4	Ok
5	TSS	mg/L	APHA 2540-D	200	198	Ok
6	BOD_5	mg/L	APHA 5210-B	80	20	Ok
7	COD	mg/L	APHA 5220-D	150	37	Ok
8	Boron	mg/L	4500 B	6	1.2	Ok
9	Oil & Grease	mg/L	4500 Gravity method	10	4	Ok
10	Cadium	mg/L	3500 Cd C	0.1	0.01	Ok
11	Mercury	mg/L	4500 Hg	0.01	BDL	Ok
12	Arsenic	As^{-3} (mg/L)	1.17927 (Merck method)	1	0.05	Ok
13	Ammonia	mg/L	4500 NH_3	40	0.14	Ok
14	Phenolic Compounds	mg/L	4500 Photometric	0.1	BDL	Ok
15	Selenium	mg/L	4500 Se	0.5	BDL	Ok
16	Chromium	$Cr6^{+}$ (mg/L)	3500 Cr B	1	1.69	
17	Copper	Cu^{2+} (mg/L)	3500 Cu	1	BDL	Ok
18	Cyanide	CN (mg/L)	4500 CN B	1	0.01	Ok
19	Fluoride	mg/L	APHA 4500 F	10	3.1	Ok
20	Lead	$Pb.^{2}$ (mg/L)	4500 Pb C	0.5	BDL	Ok
21	Manganese	$Mn.^{2}$(mg/L)	3500 Mn	1.5	0.1	Ok
22	Sulphate	mg/L	4500 SO_4 -2 E	600	121	Ok
23	Nickel	$Ni.^{2}$ (mg/L)	3500 Ni	1	BDL	Ok
24	Sulfide	mg/L	4500 S -2	1	BDL	Ok
25	Ionic detergenta as MBAs	mg/L	5540 C	20	ND	Ok
26	Zinc	$Zn.^{2}$ (mg/L)	3500 Zn	5.0	BDL	Ok
27	Pesticides	mg/L	USEPA	0.15	ND	Ok
28	Barium	mg/L	3500 Ba	1.5	ND	Ok
29	Silver	mg/L	3500 Ag	1	BDL	Ok
30	Iron	mg/L	3500 Fe	8	BDL	Ok
31	Total Toxic metals	mg/L	3110	2	BDL	Ok
32	Chorine	mg/L	APHA 4500 Cl B/C	1	BDL	Ok

Note :

ND=Not Detected.

PEQS= Punjab Environmental Quality standards

BDL=Below Detectable Limits.

The instruments used were duly calibrated.

The measurements were carried out on client's request.

The client is responsible for lawful usage of reported data in future.

This report is not valid for Court evidence/ Judicial Knowledge.

Company is not responsible for any query if sample is given by Client

Report is just valid for given sample.

Reviewed By _____

HSE SERVICES

Verified By _____

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HSE Services

Health Safety & Environment, Consultant & Services

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Water Analysis Test Report

Report No.	HSE/L/DW/08/18	Date	Wednesday, January 31, 2018
Client Name	NESPAK		
Client Adress	Basti Sanghla Khu Jhak Ramzan		
Sample Nature	Drinking Water	Quantity Of Sample	1 Liter
Sample Collected By	HSE Services	Sampling Methodology	EPA Sampling Ruels
Date of Sample Collection	25-01--2018	Analysis type	Chemical / Microbiology

S.No	Measuring Parameter	Units	Testing Method	PEQs	Test Results	Remarks
1	pH @ 25 °C	pH	ASTM D-1293	6.5-8.5	7.4	Ok
2	Temperature	oC	APHA 9030 B	.....	15.2	Ok
3	Total Dissolved Solids	TDS (mg/L)	APHA 2540-C	<1000	814	Ok
4	Chloride	mg/L	ASTM D-512	<250	144	Ok
5	Escherichia Coli	E.Coli(count/100ml)	APHA 9222-G	0/100ml	0	Ok
6	Feacal Coliform	F.Coli(count/100ml)	APHA 9222-G	.....	0	Ok
7	Total Coliform	TC(count/100ml)	APHA9222-B	0/100ml	0	Ok
8	Boron	mg/L	Lovibond Azomethine Method	----	1	Ok
9	Total Hardness	T.Hard (mg/L)	ASTM D-1126	<500	172	Ok
10	Cadium	mg/L	ASTM D-3577	0.01	ND	Ok
11	Mercury	mg/L	Kit Method	≤0.001	ND	Ok
12	Arsenic	As^{-3} (mg/L)	Palintest Arsenic Kit	≤0.05	ND	Ok
13	Aliminum	mg/L	ASTM D-857	≤0.2	BDL	Ok
14	Tubidity	NTU	Lovibond Attenuated Radiation Method	<5	2	Ok
15	Selenium	mg/L	APHA	0.01	BDL	Ok
16	Chromium	$Cr6^{+}$ (mg/L)	Lovibond 1,5-diphenyl-Carbohydrazide Method	.....	1.31	Ok
17	Copper	Cu^{2+} (mg/L)	Lobond Biquinoline Method	2	BDL	Ok
18	Cyanide	CN (mg/L)	APHA 4500CN	≤0.05	ND	Ok
19	Fluoride	mg/L	Lovibond Spadns Reagent Method	<1.5	0.6	Ok
20	Lead	Pb^{-2} (mg/L)	ASTM D-3559	≤0.05	BDL	Ok
21	Manganese	Mn^{-2}(mg/L)	Lovibond PAN Method	≤0.5	0.1	Ok
22	Phenolic Compound	mg/L	ASTM D-1783	....	BDL	Ok
23	Nickel	Ni^{-2} (mg/L)	Lovibond Dimethylglyoxime Method	≤0.02	BDL	Ok
24	Nitrate	$NO3^{-}$(mg/L)	Lovibond chromotropic acid	≤50	12.7	Ok
25	Nitrite	$NO2^{-}$(mg/L)	Lovibond N-(1-naphthyl)-ethylenediamine method	≤3	0.35	Ok
26	Zinc	Zn^{-2} (mg/L)	Lovibond Zincon Method	5.0	0.19	Ok
27	Pesticides	mg/L	APHA	.....	ND	Ok
28	Barium	mg/L	ASTM D-3651	0.7	ND	Ok
29	Residual Chlorine	mg/L	Lovibond DPD Glycine method	0.2-0.5	ND	Ok
30	Color	TCU	Pt-Co Method	≤15	4.0	Ok
31	Odour	odor	Sensory Evalution	Objectionable Non-objectionable	Non-objectionable	Ok
32	Taste	Taste	Sensory Evalution	Objectionable Non-objectionable	Non-objectionable	Ok

Note :

ND=Not Detected.

BDL=Below Detectable Limits.

The instruments used were duly calibrated.

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Water Analysis Test Report

Report No.	HSE/L/DW/09/18	Date	Tuesday, January 30, 2018
Client Name	NESPAK		
Client Adress	Maliwale Khu		
Sample Nature	Drinking Water	Quantity Of Sample	1 Liter
Sample Collected By	HSE Services	Sampling Methodology	EPA Sampling Ruels
Date of Sample Collection	25-01--2018	Analysis type	Chemical / Microbiology

S.No	Measuring Parameter	Units	Testing Method	PEQs	Test Results	Remarks
1	pH @ 25 °C	pH	ASTM D-1293	6.5-8.5	7.2	Ok
2	Temperature	0C	APHA 9030 B	.....	15.1	Ok
3	Total Dissolved Solids	TDS (mg/L)	APHA 2540-C	<1000	1065	
4	Chloride	mg/L	ASTM D-512	<250	120	Ok
5	Escherichia Coli	E.Coli(count/100ml)	APHA 9222-G	0/100ml	0	Ok
6	Feacal Coliform	F.Coli(count/100ml)	APHA 9222-G	.....	0	Ok
7	Total Coliform	TC(count/100ml)	APHA9222-B	0/100ml	0	Ok
8	Boron	mg/L	Lovibond Azomethine Method	----	1	Ok
9	Total Hardness	T.Hard (mg/L)	ASTM D-1126	<500	174	Ok
10	Cadium	mg/L	ASTM D-3577	0.01	ND	Ok
11	Mercury	mg/L	Kit Method	≤0.001	ND	Ok
12	Arsenic	As.^{3} (mg/L)	Palintest Arsenic Kit	≤0.05	ND	Ok
13	Aliminum	mg/L	ASTM D-857	≤0.2	BDL	Ok
14	Tubidity	NTU	Lovibond Attenuated Radiation Method	<5	2.4	Ok
15	Selenium	mg/L	APHA	0.01	BDL	Ok
16	Chromium	Cr^{6+} (mg/L)	Lovibond 1,5-diphenyl-Carbohydrazide Method	.....	1.55	Ok
17	Copper	Cu^{2+} (mg/L)	Lobond Biquinoline Method	2	BDL	Ok
18	Cyanide	CN (mg/L)	APHA 4500CN	≤0.05	ND	Ok
19	Fluoride	mg/L	Lovibond Spadns Reagent Method	<1.5	0.6	Ok
20	Lead	Pb.^{2} (mg/L)	ASTM D-3559	≤0.05	ND	Ok
21	Manganese	Mn.^{2}(mg/L)	Lovibond PAN Method	≤0.5	0.2	Ok
22	Phenolic Compound	mg/L	ASTM D-1783	....	BDL	Ok
23	Nickel	Ni.^{2} (mg/L)	Lovibond Dimethylglyoxime Method	≤0.02	BDL	Ok
24	Nitrate	$NO3^{-}$(mg/L)	Lovibond chromotropic acid	≤50	11.4	Ok
25	Nitrite	$NO2^{-}$(mg/L)	Lovibond N-(1-naphthyl)-ethylenediamine method	≤3	0.29	Ok
26	Zinc	Zn.^{2} (mg/L)	Lovibond Zincon Method	5.0	0.32	Ok
27	Pesticides	mg/L	APHA	.....	ND	Ok
28	Barium	mg/L	ASTM D-3651	0.7	ND	Ok
29	Residual Chlorine	mg/L	Lovibond DPD Glycine method	0.2-0.5	ND	Ok
30	Color	TCU	Pt-Co Method	≤15	7.0	Ok
31	Odour	odor	Sensory Evalution	Objectionable Non-objectionable	Non-objectionable	Ok
32	Taste	Taste	Sensory Evalution	Objectionable Non-objectionable	Non-objectionable	Ok

Note :

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Reviewed By _____

HSE SERVICES

Verified By _____

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HSE Services

Health Safety & Environment, Consultant & Services

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Water Analysis Test Report

Report No.	HSE/L/DW/11/18	Date	Tuesday, January 30, 2018
Client Name	NESPAK		
Client Adress	Mouza Nauabad Raqba Pervaiz Mushharaf		
Sample Nature	Drinking Water	Quantity Of Sample	1 Liter
Sample Collected By	HSE Services	Sampling Methodology	EPA Sampling Ruels
Date of Sample Collection	25-01--2018	Analysis type	Chemical / Microbiology

S.No	Measuring Parameter	Units	Testing Method	PEQs	Test Results	Remarks
1	pH @ 25 °C	pH	ASTM D-1293	6.5-8.5	7.2	Ok
2	Temperature	oC	APHA 9030 B	.....	13.4	Ok
3	Total Dissolved Solids	TDS (mg/L)	APHA 2540-C	<1000	1830	
4	Chloride	mg/L	ASTM D-512	<250	132	Ok
5	Escherichia Coli	E.Coli(count/100ml)	APHA 9222-G	0/100ml	0	Ok
6	Feacal Coliform	F.Coli(count/100ml)	APHA 9222-G	.....	0	Ok
7	Total Coliform	TC(count/100ml)	APHA9222-B	0/100ml	0	Ok
8	Boron	mg/L	Lovibond Azomethine Method	----	3	Ok
9	Total Hardness	T.Hard (mg/L)	ASTM D-1126	<500	185	Ok
10	Cadium	mg/L	ASTM D-3577	0.01	ND	Ok
11	Mercury	mg/L	Kit Method	≤0.001	ND	Ok
12	Arsenic	$As.^{3}$ (mg/L)	Palintest Arsenic Kit	≤0.05	ND	Ok
13	Aliminum	mg/L	ASTM D-857	≤0.2	BDL	Ok
14	Tubidity	NTU	Lovibond Attenuated Radiation Method	<5	3.7	Ok
15	Selenium	mg/L	APHA	0.01	BDL	Ok
16	Chromium	$Cr6^{+}$ (mg/L)	Lovibond 1,5-diphenyl-Carbohydrazide Method	.....	1.19	Ok
17	Copper	Cu^{2+} (mg/L)	Lobond Biquinoline Method	2	BDL	Ok
18	Cyanide	CN (mg/L)	APHA 4500CN	≤0.05	ND	Ok
19	Fluoride	mg/L	Lovibond Spadns Reagent Method	<1.5	0.5	Ok
20	Lead	$Pb.^{2}$ (mg/L)	ASTM D-3559	≤0.05	ND	Ok
21	Manganese	$Mn.^{2}$(mg/L)	Lovibond PAN Method	≤0.5	0.09	Ok
22	Phenolic Compound	mg/L	ASTM D-1783	....	BDL	Ok
23	Nickel	$Ni.^{2}$ (mg/L)	Lovibond Dimethylglyoxime Method	≤0.02	BDL	Ok
24	Nitrate	$NO3^{-}$(mg/L)	Lovibond chromotropic acid	≤50	2.9	Ok
25	Nitrite	$NO2^{-}$(mg/L)	Lovibond N-(1-naphthyl)-ethylenediamine method	≤3	0.01	Ok
26	Zinc	$Zn.^{2}$ (mg/L)	Lovibond Zincon Method	5.0	0.23	Ok
27	Pesticides	mg/L	APHA	.....	ND	Ok
28	Barium	mg/L	ASTM D-3651	0.7	ND	Ok
29	Residual Chlorine	mg/L	Lovibond DPD Glycine method	0.2-0.5	ND	Ok
30	Color	TCU	Pt-Co Method	≤15	6.0	Ok
31	Odour	odor	Sensory Evalution	Objectionable Non-objectionable	Non-objectionable	Ok
32	Taste	Taste	Sensory Evalution	Objectionable Non-objectionable	Non-objectionable	Ok

Note :

ND=Not Detected.

BDL=Below Detectable Limits.

The instruments used were duly calibrated.

The measurements were carried out on client's request.

The client is responsible for lawful usage of reported data in future.

This report is not valid for Court evidence/ Judicial Knowledge.

Company is not responsible for any query if sample is given by Client

Report is just valid for given sample.

Reviewed By _____ HSE SERVICES **Verified By** _____

Head Office (Lahore): 1-B, 47th Commercial Area, Cavalry Ground Lahore Cantt 54810 Pakistan
Tel: +92-42-36677 186 & 187 Fax: 36677-188 & 3577-8125-0321-4000347

Karachi: 2nd Floor, Mujahid Arcade, Plot No. 6/4, Shan Chowrangi, Korangi Industrial Area.
Tel: +92-21-35110347, Fax: 021-35110346, Cell: 0301-4000347

Islamabad: First Floor, House # 1507, Street # 79, Near Chishtyanabad, Adjacent to Kohenoor Textiles Mills, Sector I-14/3, Islamabad
Tel: 0317-4000347, 0320-3000347

Email: info@hse.com.pk Web: www.hse.com.pk http://facebook.com/hse.com.pk

HSE Services

Health Safety & Environment, Consultant & Services

ISO 9000 14000 — OHSAS 18001 CERTIFIED

EPA Certified Labs

Water Analysis Test Report

Report No.	HSE/L/DW/12/18	Date	Tuesday, January 30, 2018
Client Name	NESPAK		
Client Adress	North Side Near School		
Sample Nature	Drinking Water	Quantity Of Sample	1 Liter
Sample Collected By	HSE Services	Sampling Methodology	EPA Sampling Ruels
Date of Sample Collection	25-01--2018	Analysis type	Chemical / Microbiology

S.No	Measuring Parameter	Units	Testing Method	PEQs	Test Results	Remarks
1	pH @ 25 °C	pH	ASTM D-1293	6.5-8.5	7.3	Ok
2	Temperature	oC	APHA 9030 B	.....	13.9	Ok
3	Total Dissolved Solids	TDS (mg/L)	APHA 2540-C	<1000	757	Ok
4	Chloride	mg/L	ASTM D-512	<250	123	Ok
5	Escherichia Coli	E.Coli(count/100ml)	APHA 9222-G	0/100ml	0	Ok
6	Feacal Coliform	F.Coli(count/100ml)	APHA 9222-G	.....	0	Ok
7	Total Coliform	TC(count/100ml)	APHA9222-B	0/100ml	0	Ok
8	Boron	mg/L	Lovibond Azomethine Method	----	1	Ok
9	Total Hardness	T.Hard (mg/L)	ASTM D-1126	<500	150	Ok
10	Cadium	mg/L	ASTM D-3577	0.01	ND	Ok
11	Mercury	mg/L	Kit Method	≤0.001	ND	Ok
12	Arsenic	$As.^{3}$ (mg/L)	Palintest Arsenic Kit	≤0.05	ND	Ok
13	Aliminum	mg/L	ASTM D-857	≤0.2	BDL	Ok
14	Tubidity	NTU	Lovibond Attenuated Radiation Method	<5	2.7	Ok
15	Selenium	mg/L	APHA	0.01	BDL	Ok
16	Chromium	$Cr6^{+}$ (mg/L)	Lovibond 1,5-diphenyl-Carbohydrazide Method	.....	0.85	Ok
17	Copper	Cu^{2+} (mg/L)	Lobond Biquinoline Method	2	BDL	Ok
18	Cyanide	CN (mg/L)	APHA 4500CN	≤0.05	ND	Ok
19	Fluoride	mg/L	Lovibond Spadns Reagent Method	<1.5	0.3	Ok
20	Lead	$Pb.^{2}$ (mg/L)	ASTM D-3559	≤0.05	ND	Ok
21	Manganese	$Mn.^{2}$(mg/L)	Lovibond PAN Method	≤0.5	0.2	Ok
22	Phenolic Compound	mg/L	ASTM D-1783	....	BDL	Ok
23	Nickel	$Ni.^{2}$ (mg/L)	Lovibond Dimethylglyoxime Method	≤0.02	BDL	Ok
24	Nitrate	$NO3^{-}$(mg/L)	Lovibond chromotropic acid	≤50	BDL	Ok
25	Nitrite	$NO2^{-}$(mg/L)	Lovibond N-(1-naphthyl)-ethylenediamine method	≤3	BDL	Ok
26	Zinc	$Zn.^{2}$ (mg/L)	Lovibond Zincon Method	5.0	0.1	Ok
27	Pesticides	mg/L	APHA	.....	ND	Ok
28	Barium	mg/L	ASTM D-3651	0.7	ND	Ok
29	Residual Chlorine	mg/L	Lovibond DPD Glycine method	0.2-0.5	ND	Ok
30	Color	TCU	Pt-Co Method	≤15	7.0	Ok
31	Odour	odor	Sensory Evalution	Objectionable Non-objectionable	Non-objectionable	Ok
32	Taste	Taste	Sensory Evalution	Objectionable Non-objectionable	Non-objectionable	Ok

Note :

ND=Not Detected.

BDL=Below Detectable Limits.

The instruments used were duly calibrated.

The measurements were carried out on client's request.

The client is responsible for lawful usage of reported data in future.

This report is not valid for Court evidence/ Judicial Knowledge.

Company is not responsible for any query if sample is given by Client

Report is just valid for given sample.

Reviewed By _____ HSE SERVICES **Verified By** _____

Head Office (Lahore): 1-B, 47th Commercial Area, Cavalry Ground Lahore Cantt 54810 Pakistan
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Tel: 0317-4000347, 0320-3000347

Email: info@hse.com.pk Web: www.hse.com.pk http://facebook.com/hse.com.pk

Annexure-V
Social Survey Tool

NATIONAL ENGINEERING SERVICES PAKISTAN (Pvt.) LIMITED

EIA of Construction of Bahawalpur Industrial Estate, Bahawalpur

SOCIO-ECONOMIC SURVEY

A. IDENTIFICATION

Sr. No._____	**Date:** _____
Interviewer: _____	Name of Respondent: _____
S/o: _____	Sex: _____
Mother Tongue: _____	Town/Mohallah: _____
Union Council: _____	Tehsil/District: _____
Age: _____ years	Marital Status: _____
Religion: _____	Education: _____
Profession: _____	Caste: _____
Ancestral Occupation: _____	Family Members: _____
Road User Category: _____	

1. What is your average monthly income (Rs.)?

1. Up to 13,000 2. 13,000 to 26,000
3. 26,001-39,000 4. Above 39,000

2. How much are your average monthly expenditures (Rs.)?

1. Up to 13,000 2. 13,000 to 26,000
3. 26,001-39,000 4. Above 39,000

3. What is type of your family system?

1. Joint 2. Nuclear

4. What are your major sources of income?

1. Agriculture 2. Livestock 3. Trade /Business
4. Labor 5. Service 6. Any other

5. Which of the following facilities are available in your house?

1. Electricity 2. Water Supply 3. Gas
4. Telephone 5. Sewerage 6. Solid Waste Management

6. What are the sources of water for your domestic use?

1. Public Water Supply 2. Hand Pumps / Electric Motor
3. Filtration Plant 4. Any other

7. What are the reasons of dissatisfaction?

1. Dirty Water 2. Low Pressure

3. Bad Taste 4. Bad Smell in Water

B. HABITATION

8. What is type of ownership of your structure (house / shop)?

1. Self-Owned 2. Rented 3. Encroachers/Squatters

9. What is the nature of construction of your structure?

1. Pacca 2. Semi-pacca 3. Kaccha 4. Kiosk

Type	Pacca No.	Kaccha No.	Pacca & Kaccha	Estimated Value	Year of Construction
Living Room					
Animal Shed					
Grain Store					
Tractor Room					
Wash Room					
Kitchen					
Other					

C. AGRICULTURE AND CROPPING PATTERNS (Ask only from farmers)

10. What is your agricultural landholding?

1. Productive Land _____ (Kanals)

2. Barren Land _____ (Kanals)

CROPS

Details about crops

Sr. No.	Crops	Area Sown (Kanals)	Total Production (kg)	Quantity Sold	Price (Rs)
1.					
2.					
3.					
4.					
5.					

LIVESTOCK

Details about Livestock

Sr. No.	Category	Present Strength		Milk Production/day	Milk Sale	
		No.	Value (Rs.)		Kg/day	Rs./day
1.						
2.						
3.						

4.						
5.						

D. FARM AREA AND IRRIGATION STATUS

Details about Farm and Irrigation Status

Ownership Status	Total (Acres)	Canal (Acres)	Tube wells (Acres)	Canal + Tube wells	Any other (Acres)
Area owned					
Area Rented					

E. FACILITIES

11. Which facilities are present in or nearby the proposed project area?

Sr. No.	Facilities	Yes	No	Name	Distance from Proposed Project
1.	Education Institutions				
2.	Health Institutions				
3.	Religious Place (Mosque / Shrine / Graveyard)				
4.	Recreational Place				
5.	Historical /Archeological Monument				

F. PROJECT INFORMATION

12. Do you know about the proposed project?

1. Yes 2. No

13. Is your land or any asset being acquired due to the implementation of this proposed project?

1. Yes 2. No

If yes, please give details _____

_____

_____

14. In your opinion, should this Project be implemented here?

1. Yes 2. No

Sr. No.	If Yes, then reason	Response	If No, then reason	Response
1.	Good project		Land Acquisition	
2.	Increase in income generating activities		Dust & noise pollution	
3.	Increase in standard of living		Reduction in number of customers	
4.	Value enhancement of the project area		Movement problem / Traffic issues	
5.	Infrastructural development of the project area		Increase in cost of living	

6.	Any other (please specify)		Any other (please specify)	
7.	No response		No response	

15. In your opinion, what will be possible impacts of this project?

Sr. No.	Impacts (During Construction)	Response	Impacts (After Construction)	Response
1.	Land Acquisition		Time saving due to less traffic congestion	
2.	Dust & noise issues		Enhanced employment opportunities	
3.	Traffic issues/ Movement problems		Value enhancement of the project area	
4.	Safety hazards due to construction		Development of the area and good for people	
5.	Privacy issues		Easy access to better facilities	
6.	Any other		Any other (please specify)	
7.	No response		No response	

16. What protective measures do you suggest to safeguard your interests?

Sr. No.	Protective Measures	Response
1.	Project should complete well in time	
2.	If any private land is acquired then proper compensation should be paid	
3.	Harmful effects on local residents during construction should be minimized	
4.	Implementation of HSE plan should be ensure for a safe working environment	
5.	Proper diversion plan should be given to avoid traffic problems during construction phase	
6.	Local residents should be given priority of jobs	
7.	No response	
8.	Any other (please specify)	

17. In your opinion, what are some pressing needs of this area?

Sr. No.	Pressing Needs	Response
1.	Provision / up gradation of basic facilities (please specify)	
2.	Provision / up gradation of educational institutions	
3.	Provision / up gradation of medical facilities	
4.	Provision / up gradation of proper waste management system	
5.	Provision / up gradation of drainage system	
6.	Provision / up gradation of sewerage system	
7.	Any other (please specify)	
8.	No response	

Signature of Interviewer

Annexure-VI
Written Feedback of Socioeconomic Survey

NATIONAL ENGINEERING SERVICES PAKISTAN (Pvt.) LIMITED

EIA of Construction of Bahawalpur Industrial Estate, Bahawalpur

SOCIO-ECONOMIC SURVEY

A. IDENTIFICATION

Sr. No. 1 | Date: 13/1/18
Interviewer: Yasir | Name of Respondent: M. Fajal
S/o: M. Ramzan | Sex: Male
Mother Tongue: Saraiki | Town/Mohallah: Dera M. Ramzan
Union Council: Rama | Tehsil/District: Bahawalpur
Age: 31 years | Marital Status: Married
Religion: Islam | Education: Primary
Profession: Agri | Caste: Larah
Ancestral Occupation: | Family Members: 10
Road User Category:

1. What is your average monthly income (Rs.)?

1. Up to 13,000 ✓2. 13,000 to 26,000
3. 26,001-39,000 4. Above 39,000

2. How much are your average monthly expenditures (Rs.)?

1. Up to 13,000 ✓2. 13,000 to 26,000
3. 26,001-39,000 4. Above 39,000

3. What is type of your family system?

✓1. Joint 2. Nuclear

4. What are your major sources of income?

✓1. Agriculture 2. Livestock 3. Trade /Business
4. Labor 5. Service 6. Any other

5. Which of the following facilities are available in your house?

✓1. Electricity 2. Water Supply 3. Gas
4. Telephone 5. Sewerage 6. Solid Waste Management

6. What are the sources of water for your domestic use?

1. Public Water Supply ✓2. Hand Pumps / Electric Motor
3. Filtration Plant 4. Any other

7. What are the reasons of dissatisfaction?

1. Dirty Water 2. Low Pressure

3. Bad Taste 4. Bad Smell in Water

B. HABITATION

8. What is type of ownership of your structure (house / shop)?

1. Self-Owned 2. Rented 3. Encroachers/Squatters

9. What is the nature of construction of your structure?

1. Pacca 2. Semi-pacca 3. Kaccha 4. Kiosk

Type	Pacca No.	Kaccha No.	Pacca & Kaccha	Estimated Value	Year of Construction
Living Room		6 7			
Animal Shed					
Grain Store					
Tractor Room					
Wash Room		3			
Kitchen		1			
Other					

C. AGRICULTURE AND CROPPING PATTERNS (Ask only from farmers)

10. What is your agricultural landholding? father Owner

1. Productive Land 80 (Kanals)

2. Barren Land _____ (Kanals)

CROPS

Details about crops

Sr. No.	Crops	Area Sown (Kanals)	Total Production (kg)	Quantity Sold	Price (Rs)
1.	Wheat	80			
2.	cotton	80			
3.	Sugarcane	80			
4.					
5.					

LIVESTOCK

Details about Livestock

Sr. No.	Category	Present Strength		Milk Production/day	Milk Sale	
		No.	Value (Rs.)		Kg/day	Rs./day
1.	Cow	4				
2.	Buffalo	3				
3.	Goat	10				

4.						
5.						

D. FARM AREA AND IRRIGATION STATUS

Details about Farm and Irrigation Status

Ownership Status	Total (Acres)	Canal (Acres)	Tube wells (Acres)	Canal + Tube wells	Any other (Acres)
Area owned	80	80	80		
Area Rented					

E. FACILITIES

11. Which facilities are present in or nearby the proposed project area?

Sr. No.	Facilities	Yes	No	Name	Distance from Proposed Project
1.	Education Institutions	✓		G.P.S	0.5 Km
2.	Health Institutions	✓			0.5
3.	Religious Place (Mosque / Shrine / Graveyard)	✓		Masjid. Mohandi	near In house
4.	Recreational Place		✓		
5.	Historical /Archeological Monument		✓		

F. PROJECT INFORMATION

12. Do you know about the proposed project?

1. ✓ Yes 2. No

13. Is your land or any asset being acquired due to the implementation of this proposed project?

1. Yes 2. ✓ No

If yes, please give details _____

_____

_____

14. In your opinion, should this Project be implemented here?

1. ✓ Yes 2. No

Sr. No.	If Yes, then reason	Response	If No, then reason	Response
1.	Good project	✓	Land Acquisition	
2.	Increase in income generating activities		Dust & noise pollution	
3.	Increase in standard of living	✓	Reduction in number of customers	
4.	Value enhancement of the project area	✓	Movement problem / Traffic issues	
5.	Infrastructural development of the project area		Increase in cost of living	

6.	Any other (please specify)		Any other (please specify)	
7.	No response		No response	

15. In your opinion, what will be possible impacts of this project?

Sr. No.	Impacts (During Construction)	Response	Impacts (After Construction)	Response
1.	Land Acquisition		Time saving due to less traffic congestion	
2.	Dust & noise issues	✓	Enhanced employment opportunities	
3.	Traffic issues/ Movement problems	✓	Value enhancement of the project area	✓
4.	Safety hazards due to construction	✓	Development of the area and good for people	✓
5.	Privacy issues		Easy access to better facilities	
6.	Any other		Any other (please specify)	
7.	No response		No response	

16. What protective measures do you suggest to safeguard your interests?

Sr. No.	Protective Measures	Response
1.	Project should complete well in time	
2.	If any private land is acquired then proper compensation should be paid	
3.	Harmful effects on local residents during construction should be minimized	✓
4.	Implementation of HSE plan should be ensure for a safe working environment	✓
5.	Proper diversion plan should be given to avoid traffic problems during construction phase	✓
6.	Local residents should be given priority of jobs	✓
7.	No response	
8.	Any other (please specify)	

17. In your opinion, what are some pressing needs of this area?

Sr. No.	Pressing Needs	Response
1.	Provision / up gradation of basic facilities (please specify)	✓
2.	Provision / up gradation of educational institutions	✓
3.	Provision / up gradation of medical facilities	✓
4.	Provision / up gradation of proper waste management system	
5.	Provision / up gradation of drainage system	
6.	Provision / up gradation of sewerage system	
7.	Any other (please specify) Need way from Industry area having no	
8.	No response	

way of Boundary wall is completed here

Signature of Interviewer

NATIONAL ENGINEERING SERVICES PAKISTAN (Pvt.) LIMITED

EIA of Construction of Bahawalpur Industrial Estate, Bahawalpur

SOCIO-ECONOMIC SURVEY

A. IDENTIFICATION

Sr. No. 2 | Date: 13/1/18

Interviewer: Yasir | Name of Respondent: M. Ramzan

S/o: M. Bukhsh | Sex: Male

Mother Tongue: Saraiki | Town/Mohallah: Dera M. Ramzan

Union Council: Rawna | Tehsil/District: Bahawalpur

Age: 70 years | Marital Status: Married

Religion: Islam | Education: Illiterate

Profession: Retired | Caste: Lurah

Ancestral Occupation: | Family Members: 14

Road User Category:

1. What is your average monthly income (Rs.)?

   1. Up to 13,000 ✓2. 13,000 to 26,000
   3. 26,001-39,000 4. Above 39,000

2. How much are your average monthly expenditures (Rs.)?

   1. Up to 13,000 ✓2. 13,000 to 26,000
   3. 26,001-39,000 4. Above 39,000

3. What is type of your family system?

   ✓1. Joint 2. Nuclear

4. What are your major sources of income?

   ✓1. Agriculture 2. Livestock 3. Trade /Business
   4. Labor 5. Service 6. Any other Retired

5. Which of the following facilities are available in your house?

   ✓1. Electricity ✓2. Water Supply 3. Gas
   4. Telephone 5. Sewerage 6. Solid Waste Management

6. What are the sources of water for your domestic use?

   1. Public Water Supply ✓2. Hand Pumps / Electric Motor
   3. Filtration Plant 4. Any other

7. What are the reasons of dissatisfaction?

1. Dirty Water 2. Low Pressure

3. Bad Taste 4. Bad Smell in Water

B. HABITATION

8. What is type of ownership of your structure (house / shop)?

1. Self-Owned 2. Rented 3. Encroachers/Squatters

9. What is the nature of construction of your structure?

1. Pacca 2. Semi-pacca 3. Kaccha 4. Kiosk

Type	Pacca No.	Kaccha No.	Pacca & Kaccha	Estimated Value	Year of Construction
Living Room		7			
Animal Shed					
Grain Store					
Tractor Room					
Wash Room		2			
Kitchen		1			
Other					

C. AGRICULTURE AND CROPPING PATTERNS (Ask only from farmers)

10. What is your agricultural landholding?

1. Productive Land 80 (Kanals)

2. Barren Land _____ (Kanals)

CROPS

Details about crops

Sr. No.	Crops	Area Sown (Kanals)	Total Production (kg)	Quantity Sold	Price (Rs)
1.	Wheat	80	3200		1300 P/M
2.	cotton	80	200		3100 P/M
3.	Sugarcane	80	200		180 P/M
4.					
5.					

LIVESTOCK

Details about Livestock

Sr. No.	Category	Present Strength		Milk Production/day	Milk Sale	
		No.	Value (Rs.)		Kg/day	Rs./day
1.	Cow	4				
2.	Buffalo	3				
3.	Goat	00				

4.						
5.						

D. FARM AREA AND IRRIGATION STATUS

Details about Farm and Irrigation Status

Ownership Status	Total (Acres)	Canal (Acres)	Tube wells (Acres)	Canal + Tube wells	Any other (Acres)
Area owned		80	80		
Area Rented					

E. FACILITIES

11. Which facilities are present in or nearby the proposed project area?

Sr. No.	Facilities	Yes	No	Name	Distance from Proposed Project
1.	Education Institutions	✓		G.P.S	0.5
2.	Health Institutions	✓		Govt Hospital	0.5
3.	Religious Place (Mosque / Shrine / Graveyard)	✓		Mohammadi Masjid Near home	
4.	Recreational Place		✓		
5.	Historical /Archeological Monument		✓		

F. PROJECT INFORMATION

12. Do you know about the proposed project?

✓ 1. Yes 2. No

13. Is your land or any asset being acquired due to the implementation of this proposed project?

1. Yes ✓ 2. No

If yes, please give details _____

_____

_____

14. In your opinion, should this Project be implemented here?

✓ 1. Yes 2. No

Sr. No.	If Yes, then reason	Response	If No, then reason	Response
1.	Good project	✓	Land Acquisition	
2.	Increase in income generating activities		Dust & noise pollution	
3.	Increase in standard of living	✓	Reduction in number of customers	
4.	Value enhancement of the project area	✓	Movement problem / Traffic issues	
5.	Infrastructural development of the project area		Increase in cost of living	

6.	Any other (please specify)		Any other (please specify)	
7.	No response		No response	

15. In your opinion, what will be possible impacts of this project?

Sr. No.	Impacts (During Construction)	Response	Impacts (After Construction)	Response
1.	Land Acquisition		Time saving due to less traffic congestion	
2.	Dust & noise issues	✓	Enhanced employment opportunities	✓
3.	Traffic issues/ Movement problems	✓	Value enhancement of the project area	✓
4.	Safety hazards due to construction		Development of the area and good for people	✓
5.	Privacy issues	✓	Easy access to better facilities	✓
6.	Any other		Any other (please specify)	
7.	No response		No response	

16. What protective measures do you suggest to safeguard your interests?

Sr. No.	Protective Measures	Response
1.	Project should complete well in time	✓
2.	If any private land is acquired then proper compensation should be paid	
3.	Harmful effects on local residents during construction should be minimized	
4.	Implementation of HSE plan should be ensure for a safe working environment	✓
5.	Proper diversion plan should be given to avoid traffic problems during construction phase	
6.	Local residents should be given priority of jobs	✓
7.	No response	
8.	Any other (please specify)	

17. In your opinion, what are some pressing needs of this area?

Sr. No.	Pressing Needs	Response
1.	Provision / up gradation of basic facilities (please specify)	✓
2.	Provision / up gradation of educational institutions	✓
3.	Provision / up gradation of medical facilities	✓
4.	Provision / up gradation of proper waste management system	✓
5.	Provision / up gradation of drainage system	✓
6.	Provision / up gradation of sewerage system	✓
7.	Any other (please specify) Need way to alternate route for sly	
8.	No response	

Signature of Interviewer

NATIONAL ENGINEERING SERVICES PAKISTAN (Pvt.) LIMITED

EIA of Construction of Bahawalpur Industrial Estate, Bahawalpur

SOCIO-ECONOMIC SURVEY

A. IDENTIFICATION

Sr. No. (3)
Interviewer: Yasir
S/o: M. Bukhsh
Mother Tongue: Saraiki
Union Council: Bomba
Age: 55 years
Religion: Islam
Profession: Farmer
Ancestral Occupation:
Road User Category:

Date: 13/1/08
Name of Respondent: Jam Munir
Sex: Male
Town/Mohallah: Dera M. Ramzan
Tehsil/District: Bahawalpur
Marital Status: Married
Education: ~~Illiterate~~ Primary
Caste: Lashari
Family Members: 09

1. What is your average monthly income (Rs.)?

1. Up to 13,000 ✓2. 13,000 to 26,000
3. 26,001-39,000 4. Above 39,000

2. How much are your average monthly expenditures (Rs.)?

1. Up to 13,000 ✓2. 13,000 to 26,000
3. 26,001-39,000 4. Above 39,000

3. What is type of your family system?

✓1. Joint 2. Nuclear

4. What are your major sources of income?

✓1. Agriculture 2. Livestock 3. Trade /Business
4. Labor 5. Service 6. Any other

5. Which of the following facilities are available in your house?

✓1. Electricity 2. Water Supply 3. Gas
4. Telephone 5. Sewerage 6. Solid Waste Management

6. What are the sources of water for your domestic use?

1. Public Water Supply ✓2. Hand Pumps / Electric Motor
3. Filtration Plant 4. Any other

7. What are the reasons of dissatisfaction?

1. Dirty Water 2. Low Pressure

3. Bad Taste 4. Bad Smell in Water

B. HABITATION

8. What is type of ownership of your structure (house / shop)?

1. Self-Owned 2. Rented 3. Encroachers/Squatters

9. What is the nature of construction of your structure?

1. Pacca 2. Semi-pacca 3. Kaccha 4. Kiosk

Type	Pacca No.	Kaccha No.	Pacca & Kaccha	Estimated Value	Year of Construction
Living Room		3			
Animal Shed					
Grain Store					
Tractor Room					
Wash Room					
Kitchen					
Other					

C. AGRICULTURE AND CROPPING PATTERNS (Ask only from farmers)

10. What is your agricultural landholding?

1. Productive Land 80 (Kanals)

2. Barren Land _____ (Kanals)

CROPS

Details about crops

Sr. No.	Crops	Area Sown (Kanals)	Total Production (kg)	Quantity Sold	Price (Rs)
1.	Wheat				
2.	Sugarcane				
3.	Cotton				
4.					
5.					

LIVESTOCK

Details about Livestock

Sr. No.	Category	Present Strength		Milk Production/day	Milk Sale	
		No.	Value (Rs.)		Kg/day	Rs./day
1.	Cow	3				
2.	Buffalo	2				
3.						

4.						
5.						

D. FARM AREA AND IRRIGATION STATUS

Details about Farm and Irrigation Status

Ownership Status	Total (Acres)	Canal (Acres)	Tube wells (Acres)	Canal + Tube wells	Any other (Acres)
Area owned		80	80		
Area Rented					

E. FACILITIES

11. Which facilities are present in or nearby the proposed project area?

Sr. No.	Facilities	Yes	No	Name	Distance from Proposed Project
1.	Education Institutions	✓		G.P.S	0.5 Km
2.	Health Institutions	✓			0.5 Km
3.	Religious Place (Mosque / Shrine / Graveyard)	✓		Dhamaki	Near home
4.	Recreational Place				
5.	Historical /Archeological Monument				

F. PROJECT INFORMATION

12. Do you know about the proposed project?

~~1.~~ ✓ Yes 2. No

13. Is your land or any asset being acquired due to the implementation of this proposed project?

1. Yes ~~2.~~ ✓ No

If yes, please give details _____

_____

_____

14. In your opinion, should this Project be implemented here?

1. ~~Yes~~ ✓ 2. No

Sr. No.	If Yes, then reason	Response	If No, then reason	Response
1.	Good project	✓	Land Acquisition	
2.	Increase in income generating activities		Dust & noise pollution	
3.	Increase in standard of living		Reduction in number of customers	
4.	Value enhancement of the project area	✓	Movement problem / Traffic issues	
5.	Infrastructural development of the project area		Increase in cost of living	

6.	Any other (please specify)		Any other (please specify)	
7.	No response		No response	

15. In your opinion, what will be possible impacts of this project?

Sr. No.	Impacts (During Construction)	Response	Impacts (After Construction)	Response
1.	Land Acquisition		Time saving due to less traffic congestion	
2.	Dust & noise issues	✓	Enhanced employment opportunities	
3.	Traffic issues/ Movement problems	✓	Value enhancement of the project area	✓
4.	Safety hazards due to construction		Development of the area and good for people	✓
5.	Privacy issues		Easy access to better facilities	
6.	Any other		Any other (please specify)	
7.	No response		No response	

16. What protective measures do you suggest to safeguard your interests?

Sr. No.	Protective Measures	Response
1.	Project should complete well in time	
2.	If any private land is acquired then proper compensation should be paid	
3.	Harmful effects on local residents during construction should be minimized	
4.	Implementation of HSE plan should be ensure for a safe working environment	
5.	Proper diversion plan should be given to avoid traffic problems during construction phase	
6.	Local residents should be given priority of jobs	✓
7.	No response	
8.	Any other (please specify)	

17. In your opinion, what are some pressing needs of this area?

Sr. No.	Pressing Needs	Response
1.	Provision / up gradation of basic facilities (please specify)	✓
2.	Provision / up gradation of educational institutions	✓
3.	Provision / up gradation of medical facilities	
4.	Provision / up gradation of proper waste management system	
5.	Provision / up gradation of drainage system	
6.	Provision / up gradation of sewerage system	
7.	Any other (please specify) Need Way from Industry this area	
8.	No response	

Signature of Interviewer

NATIONAL ENGINEERING SERVICES PAKISTAN (Pvt.) LIMITED

EIA of Construction of Bahawalpur Industrial Estate, Bahawalpur

SOCIO-ECONOMIC SURVEY

A. IDENTIFICATION

Sr. No. (4)
Interviewer: Yasir
S/o: M. Bukhsh
Mother Tongue: Shraiki
Union Council: Rama
Age: 65 years
Religion: Isla
Profession: Agri
Ancestral Occupation:
Road User Category:

Date: 13/1/18
Name of Respondent: Haji Gul Mohammad
Sex: Male
Town/Mohallah: Dera M. Ranjan
Tehsil/District: Bahawalpur
Marital Status: Married
Education: Illiterate
Caste: Lashari
Family Members: 07

1. What is your average monthly income (Rs.)?

1. Up to 13,000 2. 13,000 to 26,000
3. 26,001-39,000 4. Above 39,000

2. How much are your average monthly expenditures (Rs.)?

1. Up to 13,000 2. 13,000 to 26,000
3. 26,001-39,000 4. Above 39,000

3. What is type of your family system?

1. Joint 2. Nuclear

4. What are your major sources of income?

1. Agriculture 2. Livestock 3. Trade /Business
4. Labor 5. Service 6. Any other

5. Which of the following facilities are available in your house?

1. Electricity 2. Water Supply 3. Gas
4. Telephone 5. Sewerage 6. Solid Waste Management

6. What are the sources of water for your domestic use?

1. Public Water Supply 2. Hand Pumps / Electric Motor
3. Filtration Plant 4. Any other

7. What are the reasons of dissatisfaction?

1. Dirty Water 2. Low Pressure

3. Bad Taste 4. Bad Smell in Water

B. HABITATION

8. What is type of ownership of your structure (house / shop)?

1. Self-Owned 2. Rented 3. Encroachers/Squatters

9. What is the nature of construction of your structure?

1. Pacca 2. Semi-pacca 3. Kaccha 4. Kiosk

Type	Pacca No.	Kaccha No.	Pacca & Kaccha	Estimated Value	Year of Construction
Living Room		04	04		
Animal Shed					
Grain Store					
Tractor Room					
Wash Room					
Kitchen					
Other					

C. AGRICULTURE AND CROPPING PATTERNS (Ask only from farmers)

10. What is your agricultural landholding?

1. Productive Land 14 (Kanals)

2. Barren Land _____ (Kanals)

CROPS

Details about crops

Sr. No.	Crops	Area Sown (Kanals)	Total Production (kg)	Quantity Sold	Price (Rs)
1.	Wheat				
2.	Sugarcane				
3.	Cotton				
4.					
5.					

LIVESTOCK

Details about Livestock

Sr. No.	Category	Present Strength		Milk Production/day	Milk Sale	
		No.	Value (Rs.)		Kg/day	Rs./day
1.	Cow	3				
2.	Goat	6				
3.						

4.						
5.						

D. FARM AREA AND IRRIGATION STATUS

Details about Farm and Irrigation Status

Ownership Status	Total (Acres)	Canal (Acres)	Tube wells (Acres)	Canal + Tube wells	Any other (Acres)
Area owned		14	14		
Area Rented					

E. FACILITIES

11. Which facilities are present in or nearby the proposed project area?

Sr. No.	Facilities	Yes	No	Name	Distance from Proposed Project
1.	Education Institutions	✓		G.P.S school	0.5 Km
2.	Health Institutions	✓		G. Hospital	0.5 Km
3.	Religious Place (Mosque / Shrine / Graveyard)	✓		Mohammdi	Near
4.	Recreational Place				
5.	Historical /Archeological Monument				

F. PROJECT INFORMATION

12. Do you know about the proposed project?

1. ✓ Yes 2. No

13. Is your land or any asset being acquired due to the implementation of this proposed project?

1. Yes 2. ✓ No

If yes, please give details _____

_____

_____

14. In your opinion, should this Project be implemented here?

1. ✓ Yes 2. No

Sr. No.	If Yes, then reason	Response	If No, then reason	Response
1.	Good project	✓	Land Acquisition	
2.	Increase in income generating activities	✓	Dust & noise pollution	
3.	Increase in standard of living		Reduction in number of customers	
4.	Value enhancement of the project area	✓	Movement problem / Traffic issues	
5.	Infrastructural development of the project area		Increase in cost of living	

6.	Any other (please specify)		Any other (please specify)	
7.	No response		No response	

15. In your opinion, what will be possible impacts of this project?

Sr. No.	Impacts (During Construction)	Response	Impacts (After Construction)	Response
1.	Land Acquisition		Time saving due to less traffic congestion	
2.	Dust & noise issues	✓	Enhanced employment opportunities	
3.	Traffic issues/ Movement problems	✓	Value enhancement of the project area	
4.	Safety hazards due to construction	✓	Development of the area and good for people	✓
5.	Privacy issues	✓	Easy access to better facilities	
6.	Any other		Any other (please specify)	
7.	No response		No response	

16. What protective measures do you suggest to safeguard your interests?

Sr. No.	Protective Measures	Response
1.	Project should complete well in time	
2.	If any private land is acquired then proper compensation should be paid	✓
3.	Harmful effects on local residents during construction should be minimized	✓
4.	Implementation of HSE plan should be ensure for a safe working environment	
5.	Proper diversion plan should be given to avoid traffic problems during construction phase	✓
6.	Local residents should be given priority of jobs	✓
7.	No response	
8.	Any other (please specify)	

17. In your opinion, what are some pressing needs of this area?

Sr. No.	Pressing Needs	Response
1.	Provision / up gradation of basic facilities (please specify)	✓
2.	Provision / up gradation of educational institutions	
3.	Provision / up gradation of medical facilities	✓
4.	Provision / up gradation of proper waste management system	✓
5.	Provision / up gradation of drainage system	
6.	Provision / up gradation of sewerage system	
7.	Any other (please specify) Need Way from Industry	✓
8.	No response	

Signature of Interviewer

NATIONAL ENGINEERING SERVICES PAKISTAN (Pvt.) LIMITED

EIA of Construction of Bahawalpur Industrial Estate, Bahawalpur

SOCIO-ECONOMIC SURVEY

A. IDENTIFICATION

Sr. No. (5)
Interviewer: Yasir
S/o: M. Munir
Mother Tongue: Saraiki
Union Council: Rama
Age: 24 years
Religion: Islam
Profession: Agri
Ancestral Occupation:
Road User Category:

Date: 13/1/18
Name of Respondent: M. Naseer
Sex: Male
Town/Mohallah: Dera M. Rangan
Tehsil/District: Bahawalpur
Marital Status: Un Married
Education: Primary
Caste: Lashi
Family Members: 09

1. What is your average monthly income (Rs.)?

1. Up to 13,000 ✓2. 13,000 to 26,000
3. 26,001-39,000 4. Above 39,000

2. How much are your average monthly expenditures (Rs.)?

1. Up to 13,000 ✓2. 13,000 to 26,000
3. 26,001-39,000 4. Above 39,000

3. What is type of your family system?

✓1. Joint 2. Nuclear

4. What are your major sources of income?

✓1. Agriculture 2. Livestock 3. Trade /Business
4. Labor 5. Service 6. Any other

5. Which of the following facilities are available in your house?

✓1. Electricity 2. Water Supply 3. Gas
4. Telephone 5. Sewerage 6. Solid Waste Management

6. What are the sources of water for your domestic use?

1. Public Water Supply ✓2. Hand Pumps / Electric Motor
3. Filtration Plant 4. Any other

7. What are the reasons of dissatisfaction?

1. Dirty Water 2. Low Pressure

3. Bad Taste 4. Bad Smell in Water

B. HABITATION

8. What is type of ownership of your structure (house / shop)?

1. Self-Owned 2. Rented 3. Encroachers/Squatters

9. What is the nature of construction of your structure?

1. Pacca 2. Semi-pacca 3. Kaccha 4. Kiosk

Type	Pacca No.	Kaccha No.	Pacca & Kaccha	Estimated Value	Year of Construction
Living Room			04		
Animal Shed					
Grain Store					
Tractor Room					
Wash Room					
Kitchen					
Other					

C. AGRICULTURE AND CROPPING PATTERNS (Ask only from farmers)

10. What is your agricultural landholding?

1. Productive Land 16 (Kanals)

2. Barren Land _____ (Kanals)

CROPS

Details about crops

Sr. No.	Crops	Area Sown (Kanals)	Total Production (kg)	Quantity Sold	Price (Rs)
1.	Wheat				
2.	sugarcane				
3.	cotton				
4.					
5.					

LIVESTOCK

Details about Livestock

Sr. No.	Category	Present Strength		Milk Production/day	Milk Sale	
		No.	Value (Rs.)		Kg/day	Rs./day
1.						
2.						
3.						

4.						
5.						

D. FARM AREA AND IRRIGATION STATUS

Details about Farm and Irrigation Status

Ownership Status	Total (Acres)	Canal (Acres)	Tube wells (Acres)	Canal + Tube wells	Any other (Acres)
Area owned		16	16		
Area Rented					

E. FACILITIES

11. Which facilities are present in or nearby the proposed project area?

Sr. No.	Facilities	Yes	No	Name	Distance from Proposed Project
1.	Education Institutions	✓		G.P. School	1 km
2.	Health Institutions	✓			1 km
3.	Religious Place (Mosque / Shrine / Graveyard)	✓		Mohammadi	Near
4.	Recreational Place				
5.	Historical /Archeological Monument				

F. PROJECT INFORMATION

12. Do you know about the proposed project?

1. ✓ Yes 2. No

13. Is your land or any asset being acquired due to the implementation of this proposed project?

1. Yes 2. ✓ No

If yes, please give details _____

_____

_____

14. In your opinion, should this Project be implemented here?

1. ✓ Yes 2. No

Sr. No.	If Yes, then reason	Response	If No, then reason	Response
1.	Good project	✓	Land Acquisition	
2.	Increase in income generating activities		Dust & noise pollution	
3.	Increase in standard of living	✓	Reduction in number of customers	
4.	Value enhancement of the project area	✓	Movement problem / Traffic issues	
5.	Infrastructural development of the project area		Increase in cost of living	

6.	Any other (please specify)		Any other (please specify)	
7.	No response		No response	

15. In your opinion, what will be possible impacts of this project?

Sr. No.	Impacts (During Construction)	Response	Impacts (After Construction)	Response
1.	Land Acquisition		Time saving due to less traffic congestion	
2.	Dust & noise issues	✓	Enhanced employment opportunities	
3.	Traffic issues/ Movement problems		Value enhancement of the project area	✓
4.	Safety hazards due to construction	✓	Development of the area and good for people	✓
5.	Privacy issues		Easy access to better facilities	
6.	Any other		Any other (please specify)	
7.	No response		No response	

16. What protective measures do you suggest to safeguard your interests?

Sr. No.	Protective Measures	Response
1.	Project should complete well in time	
2.	If any private land is acquired then proper compensation should be paid	
3.	Harmful effects on local residents during construction should be minimized	
4.	Implementation of HSE plan should be ensure for a safe working environment	
5.	Proper diversion plan should be given to avoid traffic problems during construction phase	
6.	Local residents should be given priority of jobs	✓
7.	No response	
8.	Any other (please specify)	

17. In your opinion, what are some pressing needs of this area?

Sr. No.	Pressing Needs	Response
1.	Provision / up gradation of basic facilities (please specify)	✓
2.	Provision / up gradation of educational institutions	✓
3.	Provision / up gradation of medical facilities	✓
4.	Provision / up gradation of proper waste management system	
5.	Provision / up gradation of drainage system	
6.	Provision / up gradation of sewerage system	
7.	Any other (please specify) Need Way from Gadaytoy	
8.	No response	

Signature of Interviewer

NATIONAL ENGINEERING SERVICES PAKISTAN (Pvt.) LIMITED

EIA of Construction of Bahawalpur Industrial Estate, Bahawalpur

SOCIO-ECONOMIC SURVEY

A. IDENTIFICATION

Sr. No. 6 | Date: 13/1/18

Interviewer: Yasir | Name of Respondent: M. Nazeer

S/o: Faheer Buksh | Sex: Male

Mother Tongue: Saraiki | Town/Mohallah: Dera. M. Kamran

Union Council: Kamran | Tehsil/District: Bahawalpur

Age: 55 years | Marital Status: Married

Religion: Islam | Education: Matriculate

Profession: Agri | Caste: Lasri

Ancestral Occupation: | Family Members: 06

Road User Category:

1. What is your average monthly income (Rs.)?

   1. Up to 13,000 ✓ 2. 13,000 to 26,000
   3. 26,001-39,000 4. Above 39,000

2. How much are your average monthly expenditures (Rs.)?

   1. Up to 13,000 ✓ 2. 13,000 to 26,000
   3. 26,001-39,000 4. Above 39,000

3. What is type of your family system?

   ✓ 1. Joint 2. Nuclear

4. What are your major sources of income?

   ✓ 1. Agriculture 2. Livestock 3. Trade /Business
   4. Labor 5. Service 6. Any other

5. Which of the following facilities are available in your house?

   ✓ 1. Electricity 2. Water Supply 3. Gas
   4. Telephone 5. Sewerage 6. Solid Waste Management

6. What are the sources of water for your domestic use?

   1. Public Water Supply ✓ 2. Hand Pumps / Electric Motor
   3. Filtration Plant 4. Any other

7. What are the reasons of dissatisfaction?

1. Dirty Water 2. Low Pressure

3. Bad Taste 4. Bad Smell in Water

B. HABITATION

8. What is type of ownership of your structure (house / shop)?

1. Self-Owned 2. Rented 3. Encroachers/Squatters

9. What is the nature of construction of your structure?

1. Pacca 2. Semi-pacca 3. Kaccha 4. Kiosk

Type	Pacca No.	Kaccha No.	Pacca & Kaccha	Estimated Value	Year of Construction
Living Room		05	05		
Animal Shed					
Grain Store					
Tractor Room					
Wash Room					
Kitchen					
Other					

C. AGRICULTURE AND CROPPING PATTERNS (Ask only from farmers)

10. What is your agricultural landholding?

1. Productive Land 20 (Kanals)

2. Barren Land _____ (Kanals)

CROPS

Details about crops

Sr. No.	Crops	Area Sown (Kanals)	Total Production (kg)	Quantity Sold	Price (Rs)
1.	Wheat				
2.	Sugarcane				
3.	Cotton				
4.					
5.					

LIVESTOCK

Details about Livestock

Sr. No.	Category	Present Strength		Milk Production/day	Milk Sale	
		No.	Value (Rs.)		Kg/day	Rs./day
1.						
2.						
3.						

4.						
5.						

D. FARM AREA AND IRRIGATION STATUS

Details about Farm and Irrigation Status

Ownership Status	Total (Acres)	Canal (Acres)	Tube wells (Acres)	Canal + Tube wells	Any other (Acres)
Area owned		20	20		
Area Rented					

E. FACILITIES

11. Which facilities are present in or nearby the proposed project area?

Sr. No.	Facilities	Yes	No	Name	Distance from Proposed Project
1.	Education Institutions	✓		G. P.S	0.5 Km
2.	Health Institutions	✓		G. Hospital	1 Km
3.	Religious Place (Mosque / Shrine / Graveyard)	✓		Mohammadi	1 Km
4.	Recreational Place				
5.	Historical /Archeological Monument				

F. PROJECT INFORMATION

12. Do you know about the proposed project?

1. ✓ Yes 2. No

13. Is your land or any asset being acquired due to the implementation of this proposed project?

1. Yes 2. ✓ No

If yes, please give details _____

_____

_____

14. In your opinion, should this Project be implemented here?

1. Yes 2. No

Sr. No.	If Yes, then reason	Response	If No, then reason	Response
1.	Good project	✓	Land Acquisition	
2.	Increase in income generating activities		Dust & noise pollution	
3.	Increase in standard of living		Reduction in number of customers	
4.	Value enhancement of the project area		Movement problem / Traffic issues	
5.	Infrastructural development of the project area		Increase in cost of living	

6.	Any other (please specify)		Any other (please specify)	
7.	No response		No response	

15. In your opinion, what will be possible impacts of this project?

Sr. No.	Impacts (During Construction)	Response	Impacts (After Construction)	Response
1.	Land Acquisition		Time saving due to less traffic congestion	
2.	Dust & noise issues	✓	Enhanced employment opportunities	✓
3.	Traffic issues/ Movement problems		Value enhancement of the project area	
4.	Safety hazards due to construction		Development of the area and good for people	
5.	Privacy issues		Easy access to better facilities	
6.	Any other		Any other (please specify)	
7.	No response		No response	

16. What protective measures do you suggest to safeguard your interests?

Sr. No.	Protective Measures	Response
1.	Project should complete well in time	
2.	If any private land is acquired then proper compensation should be paid	
3.	Harmful effects on local residents during construction should be minimized	✓
4.	Implementation of HSE plan should be ensure for a safe working environment	
5.	Proper diversion plan should be given to avoid traffic problems during construction phase	
6.	Local residents should be given priority of jobs	✓
7.	No response	
8.	Any other (please specify)	

17. In your opinion, what are some pressing needs of this area?

Sr. No.	Pressing Needs	Response
1.	Provision / up gradation of basic facilities (please specify)	✓
2.	Provision / up gradation of educational institutions	✓
3.	Provision / up gradation of medical facilities	✓
4.	Provision / up gradation of proper waste management system	
5.	Provision / up gradation of drainage system	
6.	Provision / up gradation of sewerage system	
7.	Any other (please specify) Need way from underpass	
8.	No response	

Signature of Interviewer

NATIONAL ENGINEERING SERVICES PAKISTAN (Pvt.) LIMITED

EIA of Construction of Bahawalpur Industrial Estate, Bahawalpur

SOCIO-ECONOMIC SURVEY

A. **IDENTIFICATION**

Sr. No. (7)	Date: 13/1/18
Interviewer: Yasir	Name of Respondent: M. Iqbal
S/o: M. Ramzan	Sex: Male
Mother Tongue: Saraiki	Town/Mohallah: Dera M. Ramzan
Union Council: ~~[illegible]~~ Kama	Tehsil/District: Bahawalpur
Age: 27 years	Marital Status: Married
Religion: Islam	Education: Illiterate
Profession: Agri	Caste: Lasah
Ancestral Occupation:	Family Members: 05
Road User Category:	

1. What is your average monthly income (Rs.)?

   1. Up to 13,000 ✓2. 13,000 to 26,000
   3. 26,001-39,000 4. Above 39,000

2. How much are your average monthly expenditures (Rs.)?

   1. Up to 13,000 ✓2. 13,000 to 26,000
   3. 26,001-39,000 4. Above 39,000

3. What is type of your family system?

   ✓1. Joint 2. Nuclear

4. What are your major sources of income?

   ✓1. Agriculture 2. Livestock 3. Trade /Business
   4. Labor 5. Service 6. Any other

5. Which of the following facilities are available in your house?

   ✓1. Electricity 2. Water Supply 3. Gas
   4. Telephone 5. Sewerage 6. Solid Waste Management

6. What are the sources of water for your domestic use?

   1. Public Water Supply ✓2. Hand Pumps / Electric Motor
   3. Filtration Plant 4. Any other

7. What are the reasons of dissatisfaction?

1. Dirty Water 2. Low Pressure

3. Bad Taste 4. Bad Smell in Water

B. HABITATION

8. What is type of ownership of your structure (house / shop)?

1. Self-Owned 2. Rented 3. Encroachers/Squatters

9. What is the nature of construction of your structure?

1. Pacca 2. Semi-pacca 3. Kaccha 4. Kiosk

Type	Pacca No.	Kaccha No.	Pacca & Kaccha	Estimated Value	Year of Construction
Living Room		03			
Animal Shed					
Grain Store					
Tractor Room					
Wash Room		1			
Kitchen		1			
Other					

C. AGRICULTURE AND CROPPING PATTERNS (Ask only from farmers)

10. What is your agricultural landholding?

1. Productive Land 15 (Kanals)

2. Barren Land _____ (Kanals)

CROPS

Details about crops

Sr. No.	Crops	Area Sown (Kanals)	Total Production (kg)	Quantity Sold	Price (Rs)
1.	Wheat				
2.	Cotton				
3.	Sugarcane				
4.					
5.					

LIVESTOCK

Details about Livestock

Sr. No.	Category	Present Strength		Milk Production/day	Milk Sale	
		No.	Value (Rs.)		Kg/day	Rs./day
1.	Cow	2				
2.	Goat	5				
3.						

4.						
5.						

D. FARM AREA AND IRRIGATION STATUS

Details about Farm and Irrigation Status

Ownership Status	Total (Acres)	Canal (Acres)	Tube wells (Acres)	Canal + Tube wells	Any other (Acres)
Area owned			15		
Area Rented					

E. FACILITIES

11. Which facilities are present in or nearby the proposed project area?

Sr. No.	Facilities	Yes	No	Name	Distance from Proposed Project
1.	Education Institutions	✓		G.P.S	1 Km
2.	Health Institutions	—		G. Hospital	6 Km
3.	Religious Place (Mosque / Shrine / Graveyard)	/		Mohammadi	
4.	Recreational Place				
5.	Historical /Archeological Monument				

F. PROJECT INFORMATION

12. Do you know about the proposed project?

1. ✓ Yes 2. No

13. Is your land or any asset being acquired due to the implementation of this proposed project?

1. Yes 2. ✓ No

If yes, please give details _____

_____

_____

14. In your opinion, should this Project be implemented here?

1. ✓ Yes 2. No

Sr. No.	If Yes, then reason	Response	If No, then reason	Response
1.	Good project	✓	Land Acquisition	
2.	Increase in income generating activities		Dust & noise pollution	
3.	Increase in standard of living	✓	Reduction in number of customers	
4.	Value enhancement of the project area		Movement problem / Traffic issues	
5.	Infrastructural development of the project area		Increase in cost of living	

6.	Any other (please specify)		Any other (please specify)	
7.	No response		No response	

15. In your opinion, what will be possible impacts of this project?

Sr. No.	Impacts (During Construction)	Response	Impacts (After Construction)	Response
1.	Land Acquisition		Time saving due to less traffic congestion	
2.	Dust & noise issues	✓	Enhanced employment opportunities	
3.	Traffic issues/ Movement problems	✓	Value enhancement of the project area	—
4.	Safety hazards due to construction		Development of the area and good for people	✓
5.	Privacy issues		Easy access to better facilities	
6.	Any other		Any other (please specify)	
7.	No response		No response	

16. What protective measures do you suggest to safeguard your interests?

Sr. No.	Protective Measures	Response
1.	Project should complete well in time	—
2.	If any private land is acquired then proper compensation should be paid	
3.	Harmful effects on local residents during construction should be minimized	—
4.	Implementation of HSE plan should be ensure for a safe working environment	—
5.	Proper diversion plan should be given to avoid traffic problems during construction phase	—
6.	Local residents should be given priority of jobs	—
7.	No response	
8.	Any other (please specify)	

17. In your opinion, what are some pressing needs of this area?

Sr. No.	Pressing Needs	Response
1.	Provision / up gradation of basic facilities (please specify)	—
2.	Provision / up gradation of educational institutions	—
3.	Provision / up gradation of medical facilities	—
4.	Provision / up gradation of proper waste management system	—
5.	Provision / up gradation of drainage system	
6.	Provision / up gradation of sewerage system	
7.	Any other (please specify) Need jobs from Industries area	
8.	No response	

Signature of Interviewer

NATIONAL ENGINEERING SERVICES PAKISTAN (Pvt.) LIMITED

EIA of Construction of Bahawalpur Industrial Estate, Bahawalpur

SOCIO-ECONOMIC SURVEY

A. IDENTIFICATION

Sr. No. 8
Interviewer: Yasir
S/o: M. Naseer
Mother Tongue: Saraiki
Union Council: Rama
Age: 28 years
Religion: Islam
Profession: Agri
Ancestral Occupation:
Road User Category:

Date: 13/1/18
Name of Respondent: M. Naseer
Sex: Male
Town/Mohallah: Dera M. Ranjha
Tehsil/District: Bahawalpur
Marital Status: Married
Education: Primary
Caste: Lashari
Family Members: 06

1. What is your average monthly income (Rs.)?

1. Up to 13,000 ✓2. 13,000 to 26,000
3. 26,001-39,000 4. Above 39,000

2. How much are your average monthly expenditures (Rs.)?

1. Up to 13,000 ✓2. 13,000 to 26,000
3. 26,001-39,000 4. Above 39,000

3. What is type of your family system?

✓1. Joint 2. Nuclear

4. What are your major sources of income?

✓1. Agriculture 2. Livestock 3. Trade /Business
4. Labor 5. Service 6. Any other

5. Which of the following facilities are available in your house?

✓1. Electricity 2. Water Supply 3. Gas
4. Telephone 5. Sewerage 6. Solid Waste Management

6. What are the sources of water for your domestic use?

1. Public Water Supply ✓2. Hand Pumps / Electric Motor
3. Filtration Plant 4. Any other

7. What are the reasons of dissatisfaction?

1. Dirty Water 2. Low Pressure

3. Bad Taste 4. Bad Smell in Water

B. HABITATION

8. What is type of ownership of your structure (house / shop)?

1. Self-Owned 2. Rented 3. Encroachers/Squatters

9. What is the nature of construction of your structure?

1. Pacca 2. Semi-pacca 3. Kaccha 4. Kiosk

Type	Pacca No.	Kaccha No.	Pacca & Kaccha	Estimated Value	Year of Construction
Living Room		04			
Animal Shed					
Grain Store					
Tractor Room					
Wash Room		1			
Kitchen		1			
Other					

C. AGRICULTURE AND CROPPING PATTERNS (Ask only from farmers)

10. What is your agricultural landholding?

1. Productive Land 5 (Kanals)

2. Barren Land _____ (Kanals)

CROPS

Details about crops

Sr. No.	Crops	Area Sown (Kanals)	Total Production (kg)	Quantity Sold	Price (Rs)
1.	Wheat				
2.	cotton				
3.	Sugarcane				
4.					
5.					

LIVESTOCK

Details about Livestock

Sr. No.	Category	Present Strength		Milk Production/day	Milk Sale	
		No.	Value (Rs.)		Kg/day	Rs./day
1.	Cow	2				
2.	Buffalo	1				
3.						

4.						
5.						

D. FARM AREA AND IRRIGATION STATUS

Details about Farm and Irrigation Status

Ownership Status	Total (Acres)	Canal (Acres)	Tube wells (Acres)	Canal + Tube wells	Any other (Acres)
Area owned		5			
Area Rented					

E. FACILITIES

11. Which facilities are present in or nearby the proposed project area?

Sr. No.	Facilities	Yes	No	Name	Distance from Proposed Project
1.	Education Institutions	✓		G.B.S.	1 km
2.	Health Institutions	✓		G. Hospital Mohammadi	1 km Near
3.	Religious Place (Mosque / Shrine / Graveyard)	✓			
4.	Recreational Place				
5.	Historical /Archeological Monument				

F. PROJECT INFORMATION

12. Do you know about the proposed project?

1. ✓ Yes 2. No

13. Is your land or any asset being acquired due to the implementation of this proposed project?

1. Yes 2. ✓ No

If yes, please give details _____

_____

_____

14. In your opinion, should this Project be implemented here?

1. ✓ Yes 2. No

Sr. No.	If Yes, then reason	Response	If No, then reason	Response
1.	Good project	✓	Land Acquisition	
2.	Increase in income generating activities		Dust & noise pollution	
3.	Increase in standard of living		Reduction in number of customers	
4.	Value enhancement of the project area	✓	Movement problem / Traffic issues	
5.	Infrastructural development of the project area		Increase in cost of living	

6.	Any other (please specify)		Any other (please specify)	
7.	No response		No response	

15. In your opinion, what will be possible impacts of this project?

Sr. No.	Impacts (During Construction)	Response	Impacts (After Construction)	Response
1.	Land Acquisition		Time saving due to less traffic congestion	
2.	Dust & noise issues	✓	Enhanced employment opportunities	
3.	Traffic issues/ Movement problems	✓	Value enhancement of the project area	✓
4.	Safety hazards due to construction		Development of the area and good for people	✓
5.	Privacy issues	✓	Easy access to better facilities	
6.	Any other		Any other (please specify)	
7.	No response		No response	

16. What protective measures do you suggest to safeguard your interests?

Sr. No.	Protective Measures	Response
1.	Project should complete well in time	
2.	If any private land is acquired then proper compensation should be paid	
3.	Harmful effects on local residents during construction should be minimized	✓
4.	Implementation of HSE plan should be ensure for a safe working environment	✓
5.	Proper diversion plan should be given to avoid traffic problems during construction phase	✓
6.	Local residents should be given priority of jobs	
7.	No response	
8.	Any other (please specify)	

17. In your opinion, what are some pressing needs of this area?

Sr. No.	Pressing Needs	Response
1.	Provision / up gradation of basic facilities (please specify)	✓
2.	Provision / up gradation of educational institutions	✓
3.	Provision / up gradation of medical facilities	✓
4.	Provision / up gradation of proper waste management system	
5.	Provision / up gradation of drainage system	
6.	Provision / up gradation of sewerage system	✓
7.	Any other (please specify) Need ways from Industrial area	
8.	No response	

Signature of Interviewer

NATIONAL ENGINEERING SERVICES PAKISTAN (Pvt.) LIMITED

EIA of Construction of Bahawalpur Industrial Estate, Bahawalpur

SOCIO-ECONOMIC SURVEY

A. IDENTIFICATION

Sr. No. 9 | Date: 13/1/18

Interviewer: Yasir | Name of Respondent: M. Sadiq Nasheer

S/o: M. Nuneer | Sex: Male

Mother Tongue: Saraiki | Town/Mohallah: Dera M. Ramzan

Union Council: Rahmen | Tehsil/District: Bahawalpur

Age: 19 years | Marital Status: Unmarried

Religion: Islam | Education: Matric

Profession: No | Caste: Lashari

Ancestral Occupation: _____ | Family Members: 06

Road User Category: _____

1. What is your average monthly income (Rs.)?

   1. Up to 13,000 ✓ 2. 13,000 to 26,000
   3. 26,001-39,000 4. Above 39,000

2. How much are your average monthly expenditures (Rs.)?

   1. Up to 13,000 ✓ 2. 13,000 to 26,000
   3. 26,001-39,000 4. Above 39,000

3. What is type of your family system?

   1. ✓ Joint 2. Nuclear

4. What are your major sources of income?

   1. ✓ Agriculture 2. Livestock 3. Trade /Business
   4. Labor 5. Service 6. Any other No

5. Which of the following facilities are available in your house?

   1. ✓ Electricity 2. ✓ Water Supply 3. Gas
   4. Telephone 5. Sewerage 6. Solid Waste Management

6. What are the sources of water for your domestic use?

   1. Public Water Supply 2. ✓ Hand Pumps / Electric Motor
   3. Filtration Plant 4. Any other

7. What are the reasons of dissatisfaction?

1. Dirty Water 2. Low Pressure

3. Bad Taste 4. Bad Smell in Water

B. HABITATION

8. What is type of ownership of your structure (house / shop)?

1. Self-Owned 2. Rented 3. Encroachers/Squatters

9. What is the nature of construction of your structure?

1. Pacca 2. Semi-pacca 3. Kaccha 4. Kiosk

Type	Pacca No.	Kaccha No.	Pacca & Kaccha	Estimated Value	Year of Construction
Living Room		03			
Animal Shed					
Grain Store					
Tractor Room					
Wash Room					
Kitchen					
Other					

C. AGRICULTURE AND CROPPING PATTERNS (Ask only from farmers)

10. What is your agricultural landholding?

1. Productive Land _____ (Kanals)

2. Barren Land _____ (Kanals)

CROPS

Details about crops

Sr. No.	Crops	Area Sown (Kanals)	Total Production (kg)	Quantity Sold	Price (Rs)
1.					
2.					
3.					
4.					
5.					

LIVESTOCK

Details about Livestock

Sr. No.	Category	Present Strength		Milk Production/day	Milk Sale	
		No.	Value (Rs.)		Kg/day	Rs./day
1.						
2.						
3.						

4.						
5.						

D. FARM AREA AND IRRIGATION STATUS

Details about Farm and Irrigation Status

Ownership Status	Total (Acres)	Canal (Acres)	Tube wells (Acres)	Canal + Tube wells	Any other (Acres)
Area owned	✓		✓		
Area Rented					

E. FACILITIES

11. Which facilities are present in or nearby the proposed project area?

Sr. No.	Facilities	Yes	No	Name	Distance from Proposed Project
1.	Education Institutions	✓		G. School	0.5
2.	Health Institutions	✓		G. Hospital	1 Km
3.	Religious Place (Mosque / Shrine / Graveyard)	✓		Muhammadi	Near home
4.	Recreational Place		✓		
5.	Historical /Archeological Monument		✓		

F. PROJECT INFORMATION

12. Do you know about the proposed project?

✓ 1. Yes 2. No

13. Is your land or any asset being acquired due to the implementation of this proposed project?

1. Yes ✓ 2. No

If yes, please give details _____

_____

_____

14. In your opinion, should this Project be implemented here?

✓ 1. Yes 2. No

Sr. No.	If Yes, then reason	Response	If No, then reason	Response
1.	Good project	✓	Land Acquisition	
2.	Increase in income generating activities		Dust & noise pollution	
3.	Increase in standard of living	✓	Reduction in number of customers	
4.	Value enhancement of the project area	✓	Movement problem / Traffic issues	
5.	Infrastructural development of the project area		Increase in cost of living	

6.	Any other (please specify)		Any other (please specify)	
7.	No response		No response	

15. In your opinion, what will be possible impacts of this project?

Sr. No.	Impacts (During Construction)	Response	Impacts (After Construction)	Response
1.	Land Acquisition	✓	Time saving due to less traffic congestion	
2.	Dust & noise issues	✓	Enhanced employment opportunities	✓
3.	Traffic issues/ Movement problems	✓	Value enhancement of the project area	✓
4.	Safety hazards due to construction		Development of the area and good for people	✓
5.	Privacy issues		Easy access to better facilities	
6.	Any other		Any other (please specify)	
7.	No response		No response	

16. What protective measures do you suggest to safeguard your interests?

Sr. No.	Protective Measures	Response
1.	Project should complete well in time	
2.	If any private land is acquired then proper compensation should be paid	
3.	Harmful effects on local residents during construction should be minimized	
4.	Implementation of HSE plan should be ensure for a safe working environment	✓
5.	Proper diversion plan should be given to avoid traffic problems during construction phase	✓
6.	Local residents should be given priority of jobs	✓
7.	No response	
8.	Any other (please specify)	

17. In your opinion, what are some pressing needs of this area?

Sr. No.	Pressing Needs	Response
1.	Provision / up gradation of basic facilities (please specify)	✓
2.	Provision / up gradation of educational institutions	✓
3.	Provision / up gradation of medical facilities	✓
4.	Provision / up gradation of proper waste management system	✓
5.	Provision / up gradation of drainage system	
6.	Provision / up gradation of sewerage system	
7.	Any other (please specify)	Need was between Drainage for us because other was was wrong
8.	No response	

Signature of Interviewer

NATIONAL ENGINEERING SERVICES PAKISTAN (Pvt.) LIMITED

EIA of Construction of Bahawalpur Industrial Estate, Bahawalpur

SOCIO-ECONOMIC SURVEY

A. IDENTIFICATION

Sr. No. 10	**Date:** 17/11/18
Interviewer: Yasir	Name of Respondent: Dilawar
S/o: Haji Naseer Khan	Sex: Male
Mother Tongue: Saraiki	Town/Mohallah: Agha pur Dera M. ...
Union Council: Rama	Tehsil/District: Bahawalpur
Age: 40 years	Marital Status: Married
Religion: Islam	Education: Illiterate
Profession: Live Stock	Caste: Lashari
Ancestral Occupation:	Family Members: 06
Road User Category:	

1. What is your average monthly income (Rs.)?
   - 1. Up to 13,000
   - 2. 13,000 to 26,000 ✓
   - 3. 26,001-39,000
   - 4. Above 39,000

2. How much are your average monthly expenditures (Rs.)?
   - 1. Up to 13,000
   - 2. 13,000 to 26,000 ✓
   - 3. 26,001-39,000
   - 4. Above 39,000

3. What is type of your family system?
   - 1. Joint ✓
   - 2. Nuclear

4. What are your major sources of income?
   - 1. Agriculture
   - 2. Livestock ✓
   - 3. Trade /Business
   - 4. Labor
   - 5. Service
   - 6. Any other

5. Which of the following facilities are available in your house?
   - 1. Electricity ✓
   - 2. Water Supply
   - 3. Gas
   - 4. Telephone
   - 5. Sewerage
   - 6. Solid Waste Management

6. What are the sources of water for your domestic use?
   - 1. Public Water Supply
   - 2. Hand Pumps / Electric Motor ✓
   - 3. Filtration Plant
   - 4. Any other

7. What are the reasons of dissatisfaction?

1. Dirty Water 2. Low Pressure

3. Bad Taste 4. Bad Smell in Water

B. HABITATION

8. What is type of ownership of your structure (house / shop)?

1. Self-Owned 2. Rented 3. Encroachers/Squatters

9. What is the nature of construction of your structure?

1. Pacca 2. Semi-pacca 3. Kaccha 4. Kiosk

Type	Pacca No.	Kaccha No.	Pacca & Kaccha	Estimated Value	Year of Construction
Living Room		10			
Animal Shed		2			
Grain Store					
Tractor Room					
Wash Room		1			
Kitchen		1			
Other					

C. AGRICULTURE AND CROPPING PATTERNS (Ask only from farmers)

10. What is your agricultural landholding?

1. Productive Land _____ (Kanals)

2. Barren Land _____ (Kanals)

CROPS

Details about crops

Sr. No.	Crops	Area Sown (Kanals)	Total Production (kg)	Quantity Sold	Price (Rs)
1.					
2.					
3.					
4.					
5.					

LIVESTOCK

Details about Livestock

Sr. No.	Category	Present Strength		Milk Production/day	Milk Sale	
		No.	Value (Rs.)		Kg/day	Rs./day
1.	Goat	15				
2.						
3.						

4.						
5.						

D. FARM AREA AND IRRIGATION STATUS

Details about Farm and Irrigation Status

Ownership Status	Total (Acres)	Canal (Acres)	Tube wells (Acres)	Canal + Tube wells	Any other (Acres)
Area owned					
Area Rented					

E. FACILITIES

11. Which facilities are present in or nearby the proposed project area?

Sr. No.	Facilities	Yes	No	Name	Distance from Proposed Project
1.	Education Institutions	✓		G. School	1 Km
2.	Health Institutions	✓		G. Hospital	1 Km
3.	Religious Place (Mosque / Shrine / Graveyard)	✓		Masjid Nabvendi	1 Km
4.	Recreational Place		✓		
5.	Historical /Archeological Monument		✓		

F. PROJECT INFORMATION

12. Do you know about the proposed project?

1. Yes 2. No

13. Is your land or any asset being acquired due to the implementation of this proposed project?

1. Yes 2. No

If yes, please give details _____

_____

_____

14. In your opinion, should this Project be implemented here?

1. Yes 2. No

Sr. No.	If Yes, then reason	Response	If No, then reason	Response
1.	Good project		Land Acquisition	
2.	Increase in income generating activities		Dust & noise pollution	
3.	Increase in standard of living	✓	Reduction in number of customers	
4.	Value enhancement of the project area	✓	Movement problem / Traffic issues	
5.	Infrastructural development of the project area	✓	Increase in cost of living	

6.	Any other (please specify)		Any other (please specify)	
7.	No response		No response	

15. In your opinion, what will be possible impacts of this project?

Sr. No.	Impacts (During Construction)	Response	Impacts (After Construction)	Response
1.	Land Acquisition		Time saving due to less traffic congestion	
2.	Dust & noise issues	✓	Enhanced employment opportunities	
3.	Traffic issues/ Movement problems	✓	Value enhancement of the project area	✓
4.	Safety hazards due to construction	✓	Development of the area and good for people	✓
5.	Privacy issues		Easy access to better facilities	
6.	Any other		Any other (please specify)	
7.	No response		No response	

16. What protective measures do you suggest to safeguard your interests?

Sr. No.	Protective Measures	Response
1.	Project should complete well in time	
2.	If any private land is acquired then proper compensation should be paid	
3.	Harmful effects on local residents during construction should be minimized	✓
4.	Implementation of HSE plan should be ensure for a safe working environment	✓
5.	Proper diversion plan should be given to avoid traffic problems during construction phase	✓
6.	Local residents should be given priority of jobs	
7.	No response	
8.	Any other (please specify)	

17. In your opinion, what are some pressing needs of this area?

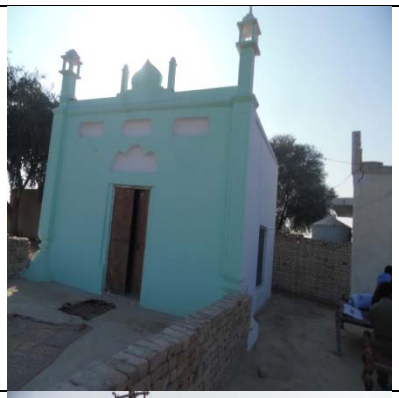
Sr. No.	Pressing Needs	Response
1.	Provision / up gradation of basic facilities (please specify)	✓
2.	Provision / up gradation of educational institutions	✓
3.	Provision / up gradation of medical facilities	✓
4.	Provision / up gradation of proper waste management system	✓
5.	Provision / up gradation of drainage system	
6.	Provision / up gradation of sewerage system	
7.	Any other (please specify) Need Way for an Highway	
8.	No response	

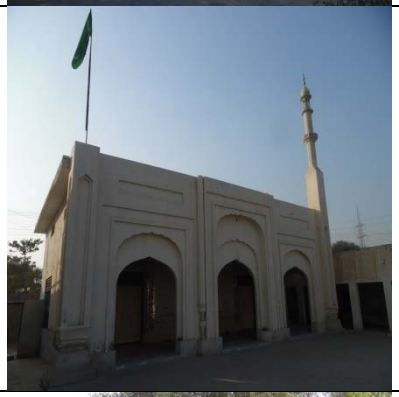
Signature of Interviewer

Annexure-VII
List of Sensitive Receptors

SENSITIVE RECEPTORS OF CONSTRUCTION OF BAHAWALPUR INDUSTRIAL ESTATE, PUNJAB

Sr. No.	Location	Co-ordinates	Pictorial View
1.	Graveyard Agha Pur	N 29°18’44.7” E 071°34’36.6”	
2.	Ahmad Pur Branch		
3.	BHU Mari Sheikh Shujra	N 29°18’58.1” E 071°34’21.4”	

4.	Muhammadia Mosque (Dera Ramazan)	N 29°19’16.6” E 071°36’03.3”	
5.	Fateh Wah Canal	N 29°18’58.1” E 071°34’21.4”	
6.	Grid Station		
7.	Govt. Girls Primary School (Mari Sheikh Shujra)	N 29°18’58.5” E 071°34’27.3”	

8.	Noor Masjid (Mari Sheikh Shujra)	N 29°19’02.1” E 071°34’35.8”		
9.	Sangle Wali Pull Village	N 29°19’32.3” E 071°35’29.6”		
10.	Mauza Agha Pur (School Located Inside the Project Site)	N 29°19’22.8” E 071°35’33.2”		

Annexure-VIII
Tree Plantation Plan

Tree Plantation Plan

As forty five (45) trees are to be removed on account of construction of proposed project, therefore in lieu of these 45 trees, ten (10) times trees i.e. four hundred and fifty (450) will be raised in vacant places and around the perimeter of the industrial estate. Plants are to be grown, keeping the distance from plant to plant as 4 meters and also 4 meters between 2 rows of plants.

It is recommended that 4 to 5 years old plants, grown in the nursery, should be procured for this purpose.

Factors to be considered for tree plantation

Following factors should be considered for tree plantation;

a) Planning

The first three to five years are critical to the success of any plantation. Primary reasons for tree mortality include: a species-site mismatch, poor site preparation, competing vegetation, animal damage, and low seedling quality. Good planning also improves the chances of meeting landowner objectives by making subsequent treatments easier to accomplish. Therefore, planning should commence at least twelve (12) months before the start of planting.

b) Site Inspection

Apart from climate and topography, soil properties (e.g., depth, texture, drainage, and nutrition) are the most important site characteristics to consider. Collectively, these factors dictate the tree species that a given site will support. It is advisable to examine the site for any pre-existing features that could be problematic. These may include plow pans; surface erosion; and changes in hydrologic conditions, such as a water table that is altered after the removal of previous cover, the presence of drainage tiles, blockage of natural drainage, or susceptibility to flooding.

During this site inspection, determine how many pre-planting tasks will be required. For example, it may be necessary to remove any existing vegetation through cultivation or herbicide treatment, or both. Other potential site-specific problems could include: insects and diseases, access control, usage of adjacent land (e.g., complaints of pesticide drift), and herbicide carryover from the last crop that might

injure or kill the trees. Poor site preparation is one of the key reasons for plantation failure.

c) Plantation Plan

The planting plan should include details of all treatments, from initial site preparation to at least three to five years after planting. Following the inspection, the next decision is what trees to plant, a single species or a mixture. Once the species composition is decided, the planting layout must be considered. Depending on how intensively managed the plantation will be, there may be a need for repeated re-entry (for weed control, pruning, pest management, or pre-commercial thinning). If trees are planted in straight rows, the alleys must be wide enough to accommodate equipment for these various silvicultural treatments. If the site is going to be fenced, sufficient room should be left at the ends of the planting rows for equipment to turn around. If trees are spaced randomly, roads or trails may be necessary. Planting density and, therefore, average spacing, will not only affect maneuverability, but will also influence tree quality.

The success of any planting operation depends on the quality of planting stock used. It is essential to locate a nursery that can supply seedlings of a suitable species, seed source, age, size, nutritional status, and Shoot: Root ratio (S: R). It is also important to verify the nursery's storage capabilities, their method of shipping, if seedlings can be delivered on the date(s) specified, and the deadline for placing orders. It might also be useful to determine the possibility for substituting a species or postponing a shipment if there is an unforeseen need to alter or delay implementation of one's planting plan. Planting time is a critical consideration; it is crucial to have sufficient moisture in the soil to ensure seedling survival and rapid early growth.

Types of trees proposed for plantation are given in the Table-1 below:

Sr. No.	Common Name	Scientific Name
1	Alstonia	*Alstonia scholaris*
2	Eucalyptus	*Eucalyptus camaldulensis*
3	Jaman	*Syzygium cumini*
4	Shisham	*Dalbergia sissoo*
5	Sirris	*Albizzia lebbek*
6	Bakain	*Melia azedarach*
7	Pipal (Sacred Fig)	*Ficus religiosa*

Sr. No.	Common Name	Scientific Name
8	Banyan	*Ficus bengalensis*
9	Toot (Mulbery)	*Morus alba*
10	Arjan	*Terminalia arjuna*
11	Moulsary	*Mimusops elengi*
12	Bottle Palm	*Cocos species*
13	Bottle Brush	*Callistemon lanceolatus*
14	Palm	*Cocos species*
15	Ashoka	*Saraca asoca*
16	Conocarpus	*Conocarpus erectus*

Plantation Cost

The cost of raising 450 plants has been estimated as Rs. 353,050/- including price of plants, earthwork, procurement of manures, continued supply of water to young plants throughout the year and its maintenance for five (5) years.

Break-up of expenditure per 1 km length or 280 plants @ Rs. 500/- per diem are given in Table-2 to Table-7 below:

Table 2: Estimated Cost of Plantation for First Year

Sr. No.	Particulars of Work	Quantity	Rate (Rupees)	Amount (Rs.)
1.	Layout	---	2 MD	1000.00
2.	Digging of Pits 2.5 ft. each 2.5x500 =1500 cft.	1500 cft.	10 MD	5000.00
3.	Cost of Plants	450 No.	Rs.100/- plant	45,000.00
4.	Cost of planting of plants	450 No.	Rs. 50/- plant	22,500.00
5.	Carriage of plants from private nursery to site including loading/unloading	450 No.	Rs. 30/- plant	13,500.00
6.	Cost of Manure and Bhall (silt) including carriage	450 plants	Lump-sum	3,000.00
7.	H/watering 50 times 450x50 with water bowser, one driver and one coolie	22,500 no.	5 MD/per 1000	31,500.00
8.	Weeding twice 450x2	900no.	5 MD	2,250.00

Sr. No.	Particulars of Work	Quantity	Rate (Rupees)	Amount (Rs.)
9.	Reopening of Pits twice (450x2)/cft/pit	900 cft.	5 MD	2,250.00
10.	Unforeseen			5000.00
Total				**131,000.00**

Table 3: Estimated Cost of Restocking and Maintenance for 2nd Year

Sr. No.	Particulars of Work	Quantity	Rate (Rupees)	Amount (Rs.)
1.	Cost of Plants 20% Restocking	90 No.	Rs.100/- plant	9,000.00
2.	Cost of planting	90 No.	Rs. 50/- plant	4,500.00
3.	Carriage of plants	90 No.	Rs. 30/- plant	2,700.00
4.	H/watering 50 times with water bowser, one driver and one coolie	22,500 no.	5 MD/per %	31,500.00
5.	Reopening of Pits twice (450x2)	900 cft.	5 MD	2,250.00
6.	Weeding twice 450x2	900 no.	5 MD	2,250.00
7.	Unforeseen			5,000.00
Total				**57,200.00**

Table 4: Estimated Cost of Restocking and Maintenance for 3rd Year

Sr. No.	Item	Quantity	Rate (Rupees)	Amount (Rs.)
1.	Cost of Plants 10% Restocking	45 No.	Rs.100/- plant	4,500.00
2.	Cost of planting	45 No.	Rs. 50/- plant	2,250.00
3.	Carriage of plants	45 No.	Rs. 30/- plant	1,350.00
4.	H/watering 40 times	18,000 no.	5 MD/1000	45,000.00
5.	Reopening of Pits twice (450x2)	900	5 MD	2,250.00

Sr. No.	Item	Quantity	Rate (Rupees)	Amount (Rs.)
6.	Unforeseen			5,000.00
Total				**60,350.00**

Table 5: Estimated Cost of Maintenance for 4th Year

Sr. No.	Particulars of Work	Quantity	Rate (Rupees)	Amount (Rs.)
1.	H/watering 40 times	18,000 no.	5 MD/1000	45,000.00
2.	Pruning and cleaning of plants	450 no.	5 MD	2,250.00
3.	Unforeseen			5,000.00
Total				**52,250.00**

Table 6: Estimated Cost of Maintenance for 5th Year

Sr. No.	Item	Quantity	Rate	Amount (Rs.)
1.	H/watering 40 times	18,000 no.	5 MD/1000	45,000.00
2.	Pruning and cleaning of plants	450 no.	5 MD	2,250.00
3.	Unforeseen			5,000.00
Total				**52,250.00**

Table 7: Total Plantation Cost (From Table 2 to 6)

Sr. No.	Item	Cost (Rs.)
1.	Total cost for raising 450 plants and Maintenance for 5 years	353,050.00

Cost of raising one plant with five years maintenance: **Rs. 784**/-.

Annexure-IX
Emergency Response Plan

Emergency Response Plan

1. Introduction

Emergency management can be defined as the organization, coordination and implementation of a range of measures to prevent, mitigate, respond to, overcome and recover from the consequences of emergency events affecting the community, its assets and the environment.

2. Purpose of Plan

This plan intends to provide a framework for safety and security to infrastructure, people and vehicles. It assigns responsibility to organizations and individuals for carrying out specific actions at projected times and places in an emergency situation that exceeds the capability or routine responsibility of any one agency.

The emergency response plan provides guidance to:

- Prevent any potential sources causing hazard to the resources during all stages of the project;
- Coordinate between various organizations to take actions in case of emergencies;
- Protect people and property in emergencies and disasters;
- Develop procedures to respond to the emergencies efficiently;
- Identify and ensure availability of personnel, equipment, facilities, supplies, and other resources for use in order to provide timely and efficient response and recovery operations; and
- Confirm that measures taken in an incident are adequate to recover the affected resources or further improvements are needed.

3. Planning

Emergency Response Team

A group/team shall be dedicated to identify and control potential emergencies during the construction and operation of the project. The roles and responsibilities of the group members shall be clearly defined.

The primary responsibilities of the group are described below:

- Identify the potential hazard or risk sources that can lead to emergency situations; Ensure availability of adequate resources, procedures and communication system to deal with the identified emergency situations;
- Ensure awareness and training of the staff to facilitate implementation of the emergency response plan;
- Maintaining the records of any previous incidents; and
- Post-event analysis to bridge the gaps of the existing risk prevention procedures.
- The emergency response team shall include but not limited to the following;
    1. Team Leader
    2. Safety Engineer

3. Reporting officer/Inspector

Team Leader

- Approve/ modify devised measures to prevent or mitigate the risks associated with the identified risk sources
- Arrange resources for dealing with potential emergencies including, financial, equipment's and personnel required to deal with emergencies.
- Assure that the Emergency Response plan is adequate, effective and can be implemented practically.

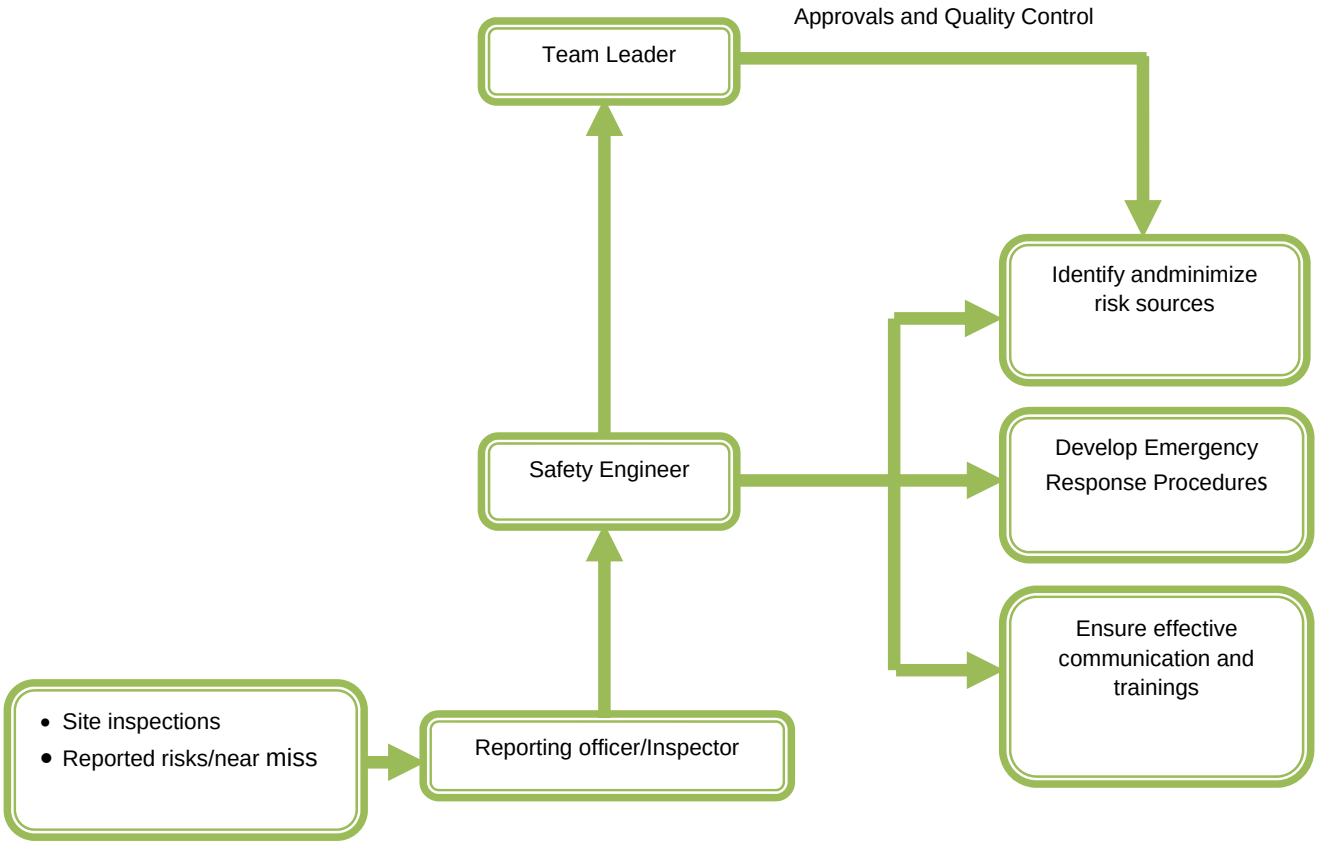
Safety Engineer

- Analyze the Identified risk sources and devise measures to prevent or mitigate the risks in close consultation with the Team Leader;
- Develop and implement the Emergency Response Procedures, in case of the possible emergencies arise;
- Ensure effective internal and external communication; and
- Provide regular trainings and arrange drills to make people aware of dealing with emergencies.

Reporting officer/Inspector

- Regular inspections of the site, to identify potential risks associated with equipment's, materials and work practices;
- Anybody from the site can notify the reporting officer about potential risk and/or near misses on the site;
- Record any identified risks and mitigation measures to control the identified risk; and
- Notify the issue and control measures taken thereby to the safety engineer.

The designation, roles and responsibilities of each member shall be clearly defined and communicated to the employees. An outline of the framework of responsibilities is presented in the following organizational chart:



i. <u>Hazard Identification</u>

A comprehensive identification and evaluation of the hazards/risks likely to cause an emergency shall be done by Emergency Response Team (ERT). Major potential emergencies identified in road projects are as follows:

- Structural failure
- Disruption of Utility (Power, Water, Telecommunications, Gas, etc)
- Accidents
- Vehicle accident
- Land slide
- Smoke
- Power/equipment failure or Vandalism
- Fire
- Earthquake
- Terrorism including bombing
- Disease Outbreak

ii. Prevention and Mitigation

The ERT shall work to eliminate or reduce the impact of identified emergencies and increasing the resilience of an affected community to recover from the consequences of such events. These activities include:

- Design considerations to control flooding, earthquakes and adequate lightening for fog etc.;
- Regular inspection and maintenance of construction machinery and the structural integrity;
- Review of work schedules based on weather updates; and
- Security controls based on political situations.

4. Emergency Preparedness

The ERT shall be prepared with all necessary resources and the personnel's shall be trained regularly.

i. Resources

Finance and administration

The financial resources shall be reserved for dealing with any emergencies arising on site during construction and operation. Responsibilities of the person managing the resources in case of emergencies shall be clearly defined and the required resources shall be adequate and updated regularly.

Equipment's

All the necessary equipment's needed in an event of emergencies shall be made available, as a minimum, the equipment's needed include;

- Personal Protective Equipment's
- Alarms/ Warnings
- Fire extinguishers
- Crowd control, flashlights, signs, barricades
- First Aid Facility
- Detection instruments, e.g.; personal alarm kits; smoke detection instruments
- Tools to fix minor vandalism

Communication

All external and internal communication systems shall be made available. Local emergency numbers shall be clearly posted and communicated to the personnel involved in construction and during operation.

The local emergency numbers are given below, which shall be regularly updated.

Emergency Numbers

Sr. No	Service	Bahawalpur (062)
1	Edhi Center	115
2	Emergency Police	15
3	Bomb Disposal	9255199
4	Rescue	1122
5	Fire Brigade Center	116, 9239027
6	Hospital Civil(casualties)/BVH	0300682866-062-9250411

Trainings

Personnel shall be made aware of the importance of safety, potential emergencies and how to respond in case of emergencies. One day training and mock exercise shall be done to prepare, the personnel to deal with emergencies.

5. Emergency Response

Response includes actions taken to reduce the impacts of an emergency event, and to limit the threat to life, property and the environment.

The emergencies can be dealt with:

- On-Site Management of the situation;
- Off-site coordination to arrange necessary resources to support the on-site management; and
- Providing advice and reports of the situation to stakeholders.

i. Emergency Response Procedure:

Any person can report about an emergency, an on-site worker, an outside agency, or the public. Circumstances change during the course of an emergency in different events, thus, the procedure will vary as per the specific situation on ground. However, a basic action plan to be followed in an emergency is discussed below. This order of response is applicable to almost any emergency and should be followed in sequence.

Assess the situation:

The most important thing to do in case of emergency is to stay calm and avoid panic. Assess the situation, the cause and most immediate requirement to control, limit and/or manage the immediate, ongoing, or further damage.

Immediate control:

The most senior person on the scene should take control and contact, or delegate someone to contact emergency services as posted and communicated by ERT and inform the reporting officer of ERT and explain the situation. The area of emergency shall be restricted by barricades, tapes and adequate signage, if and as required.

Protection from further losses:

i. Once the site is restricted, to provide protection and reduce further losses, the source causing the emergency shall be controlled including equipment's, materials, environment and accident scene from continuing damage or further hazards to the area and people

.e.g.: suppress fire, prevent objects from falling, shut down equipment or utilities, and take other necessary measures as required depending upon the type of emergency;

ii. Provide first aid if required or in doing so;

iii. Designate people to emergency duties. e.g.: assign personnel to guide emergency services on arrival;

iv. Headcount People/personnel to identify any missing persons;

v. People/ personnel shall be directed to safe location;

vi. Arrange diversions for the traffic to reduce disturbance to the flow of traffic, if and as far as possible; and

vii. Preserve the accident scene until experts mark it safe; only disturb what is essential to maintain life or relieve human suffering and prevent immediate or further losses.

ii. Communication:

Emergency service providers:

The emergency service providers 'need to be kept informed of the situation. On site, personnel from the emergency services shall be guided towards the emergency scene, brief about the event, ongoing and potential hazards and cause(s), if known.

Emergency Response Team and Management:

Members of ERT shall be immediately informed and the management shall also be kept informed.

Public:

Timely notifications to public shall be disseminated through electronic and print media depending upon the requirement and urgency of the emergency so that they can adopt alternate routes and avoid the hazards associated with the emergency encountered.

Utilities:

In case of disruption of utilities, the utility control authorities shall be immediately contacted to control the situation.

6. Recovery

Emergency affected individuals, communities and infrastructure shall be restored in terms of emotional, economic, and physical wellbeing including the following as a minimum:

- A detailed analysis and assessment of causes of emergency, extent of damage and gaps if any, in managing the emergency;
- Recovery/replacement of the assets and infrastructure;
- Reinstatement of disrupted services;
- Road and bridge repairs; and
- Updation of safety arrangements and Emergency response procedures to ensure better safety and security in any other arising emergencies.

Annexure-X
Chance Find Procedure

CHANCE FIND PROCEDURES

Project may involve deep excavation. Therefore the possibility of chance find is not ignorable. In case of any chance find, the contractor will immediately report through Supervision Consultant to Directorate General (DG) of Archeological Department, Government of Pakistan to take further suitable action to preserve those antique or sensitive remains. Representative of the DG will visit the site and observed the significance of the antique, artifact and Cultural (religious) properties and significance of the project. The report will be prepared by representative and will be given to the DG. The documentation will be completed and if required suitable action will be taken to preserve those antiques and sensitive remains.

In case any artifact, antiques and sensitive remains are discovered, chance find procedures should be adopted by contractor workers as follows:

- Stop the construction activities in the areas of chance find;
- Delineate the discovered site or area;
- Consult with the local community and provincial Archeological Department
- The suggestion of the local communities and the concerned authorities will be suitably incorporated during taking the preventive measures to conserve the antique, artifact and cultural (religious) properties
- Secure the site to prevent any damage or loss of removable objects. In case of removable antiquities or sensitive remain, a night guard shall be arranged until the responsible local authorities take over;
- After stopping work, the contractor must immediately report the discovery to the Supervision Engineer.

The contact Address of Archeology Department is given below:

Archeology Department;
Bahawalpur

Annexure-XI
Quarry Management Plan

Quarry Management Plan

1.0 Introduction

After the completion of construction phase of the proposed project, it is the responsibility of the contractor to restore the site that has been disturbed due to construction activities. Punjab Industrial Estates Development and Management Company (PIEDMC has a stewardship responsibility to ensure that the environmental value of the project area is maintained for future generations to appreciate.

2.0 General Quarry Planning and Progressive Rehabilitation

A well-considered quarry development plan prior to starting work, or when opening up new areas will greatly reduce the effort required to achieve appropriate leading practice environmental and safety outcomes for quarry rehabilitation and closure.

The selection of a site, sequencing of quarrying and rehabilitation and final land-use should all be carefully planned prior to commencement of work at a quarry or borrow pit.

2.1 Progressive Rehabilitation

Progressive rehabilitation refers to the rehabilitation of completed parts of a quarry while extractive operations continue in other parts of the quarry. As new quarry sections are opened, worked out areas should be progressively rehabilitated to avoid increasing the total disturbed area of a quarry. Overburden and topsoil can be stripped from areas being opened up and placed directly onto worked out areas which are being rehabilitated. This will avoid double handling of materials and prevent degradation of the topsoil.

Progressive rehabilitation helps to minimize the visual impact of a quarry, control dust and erosion. It also assists in fostering good landowner and community relations.

Recommended progressive rehabilitation practices are:

- Agree on the final land form and use of a site with the relevant landowner.
- Rehabilitate in accordance with the intended final use of the land.

- Plan and develop the quarry in stages towards terminal areas so that progressive rehabilitation works can commence as soon as possible (As shown in **Figure 1**).
- Once the final landform is established, re-vegetate areas to stabilize the landform and to give the vegetation maximum time to establish while the quarry is still in operation.

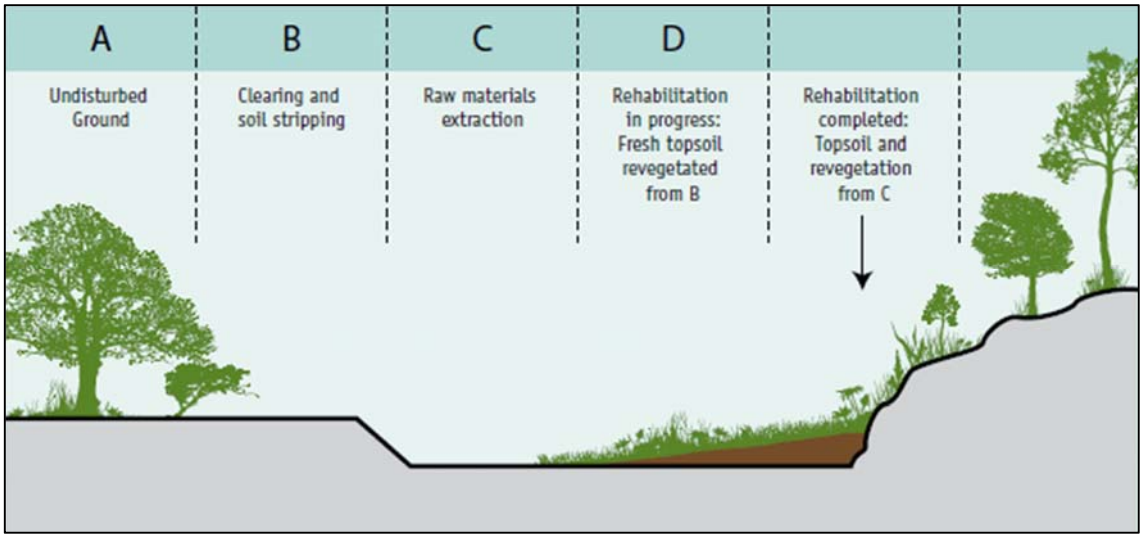


Figure 1: Progressive rehabilitation to manage potential impact on visual amenity

2.2 Re-vegetation

Establishing a self-sustaining cover of vegetation is the best way to stabilize disturbed sites in the long term. Re-vegetation also minimizes the visual impact of quarries. Generally, the vegetation type which existed before the disturbance, or a similar vegetation type will regenerate most successfully.

Prior to the commencement of a quarrying activity the type of re-vegetation should be agreed with the landowner, and should be consistent with the proposed final land-use.

Some indigenous plant species may not thrive in areas where soil conditions are substantially different after quarrying. If this is the case, and the objective is to re-establish vegetation, which fulfils the function of the original native vegetation, then some species from outside the quarry area, may have to be introduced. Care must be taken to avoid introducing a species, which could become an unacceptable fire hazard, invade surrounding areas of native vegetation or become agricultural weeds.

Where agriculture is the planned land-use then the species planted should be those commonly used for pasture or crops known to be successful on soils of similar texture, drainage status, pH and fertility. Suitable legumes should always be considered for their ability to improve soil fertility.

3.0 Rehabilitation of Borrow Pits

Borrow pits are areas either in a road reserve or adjacent land holdings that have been used to extract materials such as gravels and soils. They can vary considerably in size, depending on the quantity of material taken and the borrow pits' reserve body of remaining material. The variable size, shape and nature of borrow pits preclude very specific recommendations; however the following general conditions apply:

- Before extraction commences, licenses and permits should be checked and limits of disturbance and/or clearing must be clearly marked out on the site before any ground disturbing activity takes place; and
- At the completion of extraction, the former borrow pit must be made stable and safe. This usually requires the sides of the pit to be reshaped with gentle safe grades. All disturbed areas associated with borrow pits must be retopsoiled, seeded, fertilized and mulched (if appropriate) as part of the restoration plan. Main Roads has been discouraging the conversion of borrow pits to stock watering points.

Annexure-XII
Construction Waste Management Plan

CONSTRUCTION WASTE MANAGEMENT PLAN

Construction waste material consists mainly of concrete, masonry, limestone, sandstone, metal, and wood, depending on the construction type.

Origins and causes of construction waste:

Origins of Waste	Causes of Waste
Contractual	▪ Errors in contract documents ▪ Contract documents incomplete at commencement of construction
Design	▪ Design changes ▪ Design and detailing complexity ▪ Design and construction detail errors ▪ Unclear/unsuitable specification ▪ Poor coordination and communication (late information, last minute client requirements, slow drawing revision and distribution)
Procurement	▪ Ordering errors (i.e., ordering items not in compliance with specification) ▪ Over allowances (i.e., difficulties to order small quantities) ▪ Supplier errors
Transportation	▪ Damage during transportation ▪ Difficulties for delivery vehicles accessing construction sites ▪ Insufficient protection during unloading ▪ Inefficient methods of unloading
On-site Management and Planning	▪ Lack of on-site waste management plans ▪ Improper planning for required quantities ▪ Delays in passing information on types and sizes of materials and components to be used ▪ Lack of on-site material control ▪ Lack of supervision
Material storage	▪ Inappropriate site storage space leading to damage or deterioration ▪ Improper storing methods ▪ Materials stored far away from point of application
Material handling	▪ Materials supplied in loose form ▪ On-site transportation methods from storage to the point of application ▪ Inadequate material handling
Site operation	▪ Accidents due to negligence ▪ Unused materials and products ▪ Equipment malfunction ▪ Poor craftsmanship ▪ Use of wrong materials resulting in their disposal

Origins of Waste	Causes of Waste
	▪ Time pressure ▪ Poor work ethics
Residual	▪ Waste from application processes (i.e., over preparation of mortar) ▪ Off-cuts from cutting materials to length ▪ Waste from cutting uneconomical shapes ▪ Packaging
Other	▪ Weather ▪ Vandalism ▪ Theft

Construction Waste Management Plan

1) Waste Management Goals:

The Builder has established an opinion that this project shall generate at least 50% less waste into landfills and that processes shall be employed to ensure that this goal is met. These shall include prevention of damage to materials to be incorporated into the work due to mishandling, improper storage, contamination, inadequate protection or other factors as well as minimizing poor quantity estimating, as well as through road design.

2) Responsibility:

a) The Project Manager shall be responsible for the implementation of the administrative portions of this program, including the notification of subcontractor management, the training of the site supervisor and the onsite posting of this plan.

b) The site supervisor will be responsible for the implementation of the onsite portions of this program including the training of subcontractor personnel.

3) Waste Prevention Planning:

a) In addition to other requirements specified herein it is a requirement for the work of this project that the contractor comply with the applicable city waste disposal requirements.

b) Of the inevitable waste that is generated, the waste materials designated in this specification shall be salvaged for reuse and or recycling where practical and possible.

Waste disposal in landfills or incinerators shall be minimized where practical and possible.

c) Project Construction Documents: The General Contractor will contractually require all subcontractors to comply with these recycling guidelines. A copy of this "Construction Waste Management Plan" will accompany all subcontractor agreements and require subcontractor participation.

d) The "Construction Waste Management Plan" shall be implemented and executed as follows and as on the chart:

   i) Salvageable materials will be diverted from disposal where feasible.

   ii) There will be a designated area on the construction site reserved for materials that can be recycled.

   iii) Areas shall be marked to designate what recycle materials are to be stored there.

   iv) Hazardous waste will be managed by a licensed hazardous waste vendor.

4) Communication & Education Plan:

a) This Waste Management Plan will be posted onsite.

b) Each subcontractor will be made aware of the intent of this project with respect to reduction of waste and recycling. Onsite recycling containers and/or areas will be plainly marked.

c) The subcontractor will be expected to make sure all their crews comply with the Waste Management Plan.

d) All recycling containers/areas will be clearly marked.

e) Lists of acceptable/unacceptable materials will be posted at the site.

f) All subcontractors will be informed in writing of the importance of non-contamination with other materials or trash.

5) Motivation Plan:

a) The General Contractor will conduct a pre-award meeting for subcontractors. Subcontractors under consideration will be required to attend the meeting to review project goals and requirements with the project team. Attendance will be a prerequisite

for award of subcontracts. This document will be an attachment to every subcontract. Copies of the attachment will be posted prominently at the job site.

6) Expected Project Waste, Disposal, and Handling:

The following chart identifies waste materials expected on this project, their expected disposal methods and handling procedures. New items may be added as needed.

Material	Quantity	Disposal Method	Handling Procedure
Land clearing debris		Keep separate for reuse and or wood sale. Suitable materials may be delivered to a composting site. Separate topsoil and rock for future landscaping use.	Keep separated in designated areas onsite.
Clean dimensional wood and palette wood		Keep separate for reuse by on-site construction or by site employees for either heating stoves or reuse in home projects. May be offered to public.	Keep separated in designated areas onsite.
Plywood, OSB, particle board		Reuse onsite when possible, landfill or recycle off site.	Keep separated in designated areas onsite. Place in "Trash" container.
Painted or treated wood		Reuse, off site recycle, landfill.	Keep separated in designated areas onsite. Place in "Trash" container.
Concrete		Recycle when possible.	
Concrete Masonry Units		Keep separate for re-use by on-site construction or by site employees	Keep separated in designated areas onsite
Metals		Recycle off site when possible. Separate copper	Keep separated in designated areas onsite. Place in "Metals"

Material	Quantity	Disposal Method	Handling Procedure
		wire when possible.	container.
Gypsum drywall (unpainted)		Recycle with supplier when possible.	Keep scraps separate for recycling – stack on pallets in provided onsite. All scrap drywall should be taken back by contractor to drywall supplier
Paint		Reuse onsite; donate to Habitat for Humanity Restore.	Keep separated in designated areas onsite
Carpet and pad		Reuse or recycle with carpet. manufacturer	
Glass		Glass Bottles: recycle locally.	Keep separated in designated areas onsite.
Plastics		Plastic Bottles: recycle locally; be aware of plastics that are acceptable to recycle facility.	Keep separated in designated areas onsite.
Beverage		Recycle locally	Keep separated in designated areas onsite.
Cardboard		Recycle locally	Keep separated in designated areas onsite.
Paper and newsprint		Recycle locally	Keep separated in designated areas onsite.

7) Waste Disposal Company:

To be determined

a) Contact:

8) Recycle Hauler:

To be determined

a) Contact:

b) Some or all recycle may be hauled by the builder.

9) Possible recycle locations and acceptable materials:

a) Coordinate with companies in Lahore which are registered with LDA that accept materials for recycle; and

b) Using the above as a resource, a list will be kept indicating local opportunities for recycle of expected materials. New locations should be added as needed.

Annexure-XIII
Break-up of Health and Safety & Environmental Cost

Items	Quantity	Cost / Item (Rs.)	Total Cost (Rs.)	Rationale
(A) Personal Protective Equipments PPEs				
Dust masks	48000	20	960,000	1 dust mask to be used in a week by each labourer for 24 months and for 96 weeks the quantity will be 48000 dust masks.
Safety Shoes	1000	2000	2,000,000	2 safety shoes are supposed to be used for 24 months by each labourer and for 500 labourers for 24 months construction period it is estimated to be 1000.
Gloves	4000	200	800,000	8 pairs of gloves is to be used by each labourer for 24 months and 4000 gloves are estimated to be used by 500 labourers.
First Aid Box	20	3000	60,000	1 first aid box is proposed for 25 labourers and for 500 labourers 20 first aid boxes are estimated.
Ear Plugs	48000	30	1,440,000	1 set of ear plug to be used for a week by each labourer and for 96 weeks (24 months) it is estimated to be 48000 for 500 labourers.
Safety Helmets	2000	1000	2,000,000	4 safety helmets are to be used by each labourer for 24 months and for 500 labourers 2000 safety helmets are estimated.
Safety Jackets (Hi Vis)	2000	800	1,600,000	4 safety Jacket (Hi Vis) to be used by each labourer for 24 months and 2000 safety helmets are estimated to be used by 500 labourers.
Sub-Total (A)			**8,860,000**	
(B) Others				
Provision of Dust Bins	4	500	2,000	Four (4) dust bins are proposed to be placed at construction site for the whole construction period.
Warning Tape	30	500	15,000	---
Safety Cones	30	1000	30,000	30 safety cones are estimated to be placed at active construction sites.
Safety Sign Boards	10	1500	15,000	10 safety sign boards are proposed to be placed at active construction sites.
Sub-Total (B)			**62,000**	
Total (A) + (B)			**8,922,000**	

Time required for Construction = 24 months
No. of labour required during construction = 500