ENVIRONMENTAL IMPACT ASSESSMENT

(EIA REPORT)

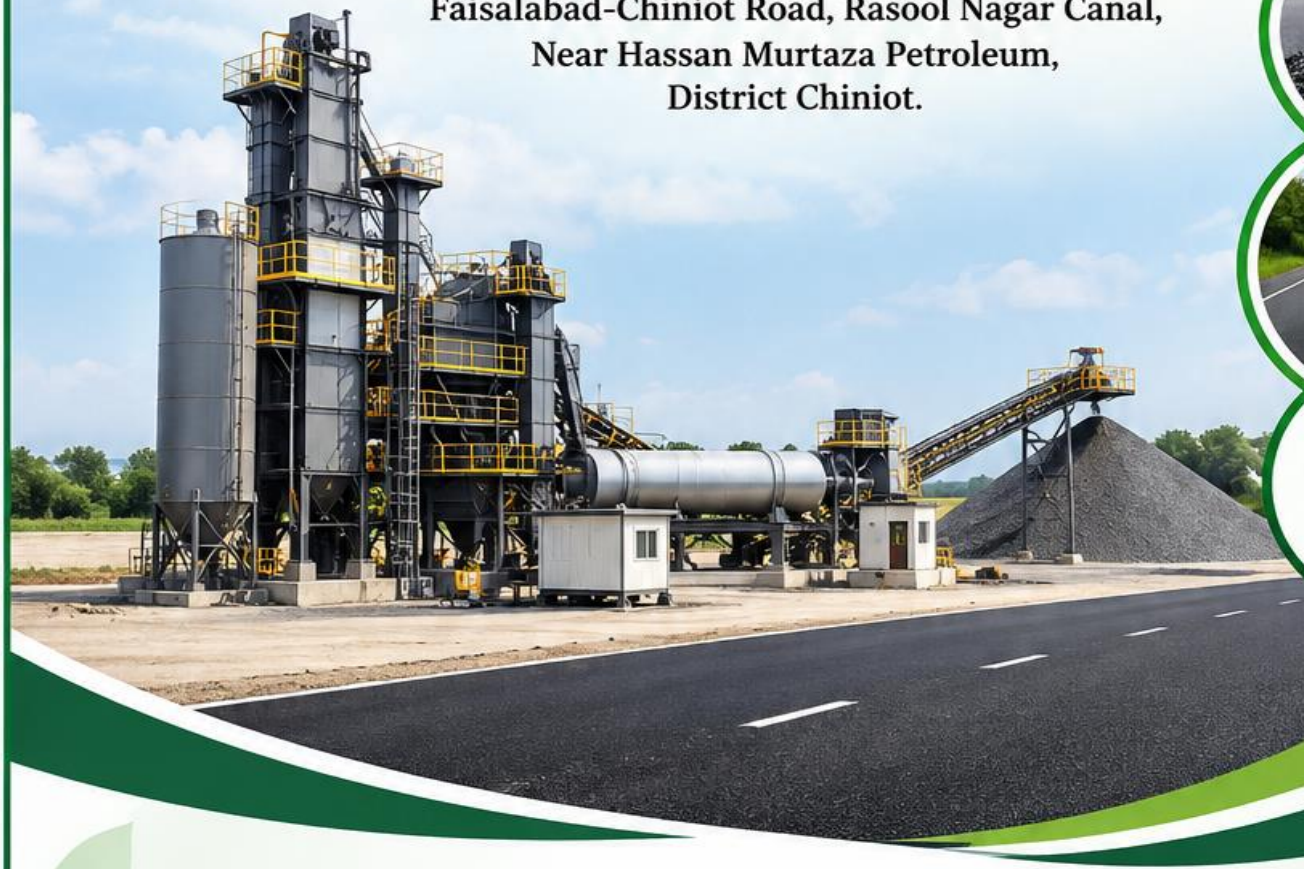
ESTABLISHMENT OF AN ASPHALT PLANT

BY

M/S MUNAWAR & BROTHERS

LOCATED AT

Faisalabad-Chiniot Road, Rasool Nagar Canal,
Near Hassan Murtaza Petroleum,
District Chiniot.





PREPARED BY

ZOOM
CONSULTANCY & SERVICES

77 UG Eden Height Gulberg Lahore

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LIST OF ABBREVIATIONS

Abbreviation	Description
AMSL	Above Mean Sea Level
CNIC	Computerised National Identity Card
CO	Carbon Monoxide
CO2	Carbon Dioxide
dB(A)	Decibel, A-weighted (unit of noise)
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
FGD	Focus Group Discussion
HSD	High Speed Diesel
HMA	Hot Mix Asphalt
HSE	Health, Safety and Environment
IEE	Initial Environmental Examination
LESCO	Lahore Electric Supply Company
NEQS	National Environmental Quality Standards
NOC	No Objection Certificate
NOx	Oxides of Nitrogen
NTN	National Tax Number
OSH	Occupational Safety and Health
PAH	Polycyclic Aromatic Hydrocarbons
PEC	Pakistan Engineering Council
PEPA 1997	Punjab Environmental Protection Act, 1997 (amended 2012)
PEQS	Punjab Environmental Quality Standards
PKR	Pakistani Rupee
PM	Particulate Matter
PPE	Personal Protective Equipment
SO2	Sulphur Dioxide
SOP	Standard Operating Procedure
TDS	Total Dissolved Solids
TMA	Tehsil Municipal Administration
TPD	Tons Per Day
TSS	Total Suspended Solids
VOC	Volatile Organic Compounds

EXECUTIVE SUMMARY

1. Project Title and Location

This Executive Summary sets out the principal findings of the Environmental Impact Assessment (EIA) carried out for the proposed establishment and operation of an asphalt hot mix plant by M/s Munawar & Brothers, Government Contractor, on a 3.5 acre site Located at Faisalabad-Chiniot Road, Rasool Nagar Canal, Near Hassan Murtaza Petroleum, District Chiniot. The plant is designed to produce 50 tons of hot bituminous mix per day for road construction, widening, resurfacing and maintenance works undertaken by the firm in Sheikhupura, Safdarabad, Faisalabad and the surrounding districts. The total capital cost of the project is PKR 15.00 million.

M/s Munawar & Brothers is an established civil works contracting firm holding a valid licence from the Pakistan Engineering Council and registered with the Federal Board of Revenue under NTN 1039967-5. The firm is proprietorship in status and is represented by its proprietor, Mr. Munawar Hussain son of Bashir Ahmad. The land for the plant has been secured through a registered lease agreement for a term of five years covering the period from 01 January 2026 to 31 December 2030.

Asphalt plants occupy a useful position in the road construction supply chain, since they allow bituminous mix to be produced close to the point of laying and delivered at the correct working temperature. At the same time, the drying and heating of aggregate, the handling of hot bitumen and the movement of heavy vehicles carry recognized environmental consequences, principally in the form of particulate emissions, combustion gases, bitumen fumes, noise and the risk of oil and bitumen spillage. Environmental regulation in Pakistan is administered under the Pakistan Environmental Protection Act, 1997 and, in this province, under the Punjab Environmental Protection Act, 1997 as amended in 2012, read with the Punjab Environmental Protection (Review of IEE and EIA) Regulations, 2022. This EIA has accordingly been prepared to record baseline conditions at and around the site, to assess the likely impacts of construction and operation, and to prescribe mitigation and monitoring arrangements that will hold the plant within the limits laid down by the Punjab Environmental Quality Standards.

Project Title: Proposed Munawar Brothers Asphalt Plant Project

Project Location: Faisalabad–Chiniot Road, near Rasool Nagar Canal and Hassan Murtaza Petroleum, District Chiniot, Punjab, Pakistan.

Total Project Area: 3.5 acres.

GPS Coordinates: The project site for Munawar Brothers Asphalt Plant is located off the Faisalabad–Chiniot Road at primary coordinates **31°39'06.7"N 73°00'41.8"E** (31.651861, 73.011611). These coordinates denote the central plant location, defining the project boundary and the primary access point from the main highway corridor.

2. Proponent Details

Proponent: Munawar Hussain.

CNIC NO: 35403-1128058-5

Address of Proponent: Chak No. 284/RB, Paniwala Post Office, Asghar Pur Kalar, Tehsil Safdarabad, District Sheikhupura

The proponent will be responsible for project implementation, compliance with applicable environmental requirements, installation and maintenance of pollution-control systems, occupational health and safety arrangements, and implementation of the Environmental Management Plan (EMP).

3. Report Preparation

Report Preparing by: Zoom Consultancy & Services Lahore

The environmental report shall be prepared by a suitably qualified environmental consultant. The consultant will conduct baseline assessment, identify environmental and social impacts, recommend mitigation measures, prepare the EMP, and support the proponent in obtaining the required environmental clearance from the Punjab Environmental Protection Agency (Punjab EPA).

Salient Features of the Project

Parameter	Detail
Project Title	Establishment and operation of an asphalt (hot mix) plant
Company	M/s Munawar & Brothers
Status of Firm	Proprietorship
Proprietor	Mr. Munawar Hussain son of Bashir Ahmad, CNIC 35403-1128058-5
National Tax Number	1039967-5, Federal Board of Revenue
PEC Licence	Licence No. 500, Category CA, valid up to 30 June 2027
Registered Office	Rizwan Colony, House No. 1251-A, Hassan Street, Faisalabad
Project Site	Located at Faisalabad-Chiniot Road, Rasool Nagar Canal, Near Hassan Murtaza Petroleum, District Chiniot.
Project Area	3.5 Acres
Production Capacity	50 tons per day of hot bituminous mix
Annual Production	Approximately 13,000 to 14,000 tons, based on 260 to 280 working days
Project Cost	PKR 15.00 million
Land Tenure	Leasehold for five years, 01.01.2026 to 31.12.2030, under registered lease agreement
Plant Type	Batch type asphalt hot mix plant with rotary dryer and pug mill mixer
Principal Raw Materials	Crushed stone aggregate, sand, stone dust filler and penetration grade bitumen
Fuel	High speed diesel or furnace oil for the dryer burner
Source of Power	LESCO grid supply, supplemented by a standby diesel generator
Source of Water	On-site bore or tube well, for dust suppression, scrubbing and domestic use
Air Emission Control	Primary cyclone separator followed by a wet scrubber, discharging through an elevated stack
Working Hours	24 hours
Manpower	Approximately 22 persons, drawn mainly from the surrounding villages
Consultant	Zoom Consultancy & Services, Lahore

4. Brief Outline of the Proposal

The proposed project involves establishment and operation of an asphalt production plant by Munawar Brothers on approximately **3.5 acres** of land at Faisalabad–Chiniot Road, near Rasool Nagar Canal, District Chiniot. The plant will manufacture hot-mix asphalt for use in road construction, repair, maintenance, and other infrastructure-development works.

The proposed facility is expected to include the following major components:

- Aggregate stockpiling and handling area.
- Cold-feed bins and conveyor arrangement for aggregate feeding.
- Aggregate drying and heating unit.
- Burner system, likely operated on an approved fuel source such as diesel, furnace oil, gas, or another suitable fuel.
- Mixing unit for combining heated aggregates, mineral filler, and bitumen.
- Bitumen storage tanks and pumping system.
- Hot-mix asphalt storage/loading area.
- Dust-control equipment, such as a bag filter/baghouse, cyclone separator, or equivalent air-pollution-control system.
- Internal access roads, vehicle parking, weighbridge, office, laboratory, workshop, generator area, and staff facilities.
- Fuel/bitumen storage and handling arrangements.
- Drainage, solid-waste collection, fire-fighting, and emergency-response facilities.

The plant should use modern, energy-efficient asphalt-mixing technology with an effective baghouse filtration system to minimize particulate emissions.

5. Major Environmental Impacts

The main environmental impacts anticipated during construction and operational phases are summarized below:

Environmental Aspect	Potential Impact
Air quality	Dust emissions from aggregate unloading, stockpiles, conveyors, internal roads, and truck movement; gaseous and particulate emissions from the dryer, burner, generator, and asphalt-mixing process.
Noise and vibration	Noise from the dryer, mixer, screens, conveyors, generator, loaders, trucks, and other machinery, potentially affecting workers and nearby receptors.
Water resources	Possible contamination of soil, surface runoff, or nearby canal environment due to accidental spills of diesel, lubricants, bitumen, and contaminated stormwater.
Soil and land	Soil contamination from improper storage or leakage of fuel, bitumen, used oil, and other hazardous materials; localized land disturbance during site development.
Solid and hazardous waste	Generation of baghouse dust, rejected asphalt mix, used oil, oil-contaminated rags, empty lubricant containers, domestic waste, and maintenance-related waste.
Traffic and road safety	Increased movement of aggregate trucks, bitumen tankers, and asphalt delivery vehicles on Faisalabad–Chiniot Road and adjoining access routes.
Occupational health and safety	Risk of burns from hot bitumen and asphalt, exposure to fumes and dust, fire hazards, vehicle collisions, slips, falls, and machinery-related injuries.
Community health and safety	Potential nuisance due to dust, emissions, noise, and traffic if the plant is not properly managed.
Ecology and drainage	Improperly managed runoff or spills may affect nearby drainage features, including Rasool Nagar Canal.

6. Recommended Mitigation Measures

The following measures are recommended for incorporation into the project design, operation, and Environmental Management Plan:

- Install and continuously maintain a properly designed **bag filter system** or equivalent dust-control equipment for the asphalt plant, dryer, and associated emission sources.
- Ensure that emissions from the stack comply with applicable Punjab EPA environmental standards and that stack height is adequate for effective dispersion of emissions.
- Use clean and approved fuel, maintain burners regularly, and avoid incomplete combustion that may increase smoke and gaseous emissions.
- Cover aggregate transfer points where practical and provide enclosures, chutes, and dust-suppression arrangements at material-handling locations.
- Sprinkle water on internal unpaved roads, stockpiles, and vehicle movement areas during dry and dusty conditions; avoid excessive water use and prevent runoff into the canal.
- Maintain aggregate stockpiles in an organized manner, preferably with windbreaks, boundary walls, or other controls to reduce windblown dust.
- Provide paved or compacted internal roads and enforce a low vehicle-speed limit within the facility.
- Install acoustic enclosures/silencers for generators and properly maintain all machinery to control noise.
- Restrict high-noise activities to daytime where feasible and provide hearing protection to workers exposed to elevated noise levels.
- Store bitumen, diesel, lubricants, and used oil within a designated, impermeable, bunded area with sufficient containment capacity.
- Establish a spill-prevention and emergency-response system, including spill kits, sand, absorbent material, drip trays, emergency contact numbers, and trained staff.
- Ensure that stormwater drainage is separated from potentially contaminated runoff. Runoff from fuel, bitumen, workshop, and washing areas should pass through oil-and-grease traps before discharge or reuse, as applicable.
- Do not discharge wastewater, wash water, oil, bitumen residues, or contaminated runoff into Rasool Nagar Canal or any nearby drain, watercourse, or open land.

- Collect used oil, oily rags, containers, and other hazardous waste separately; store them safely and hand them over to an authorized/reputable waste handler or recycler.
- Reuse collected baghouse dust and rejected asphalt material in the process where technically feasible and environmentally acceptable.
- Develop and implement a Traffic Management Plan covering designated truck routes, vehicle scheduling, signage, speed control, parking, reversing alarms, and driver awareness.
- Provide appropriate PPE, including helmets, safety shoes, gloves, high-visibility jackets, dust masks/respirators, goggles, and hearing protection.
- Install fire extinguishers, sand buckets, hydrants or water-storage arrangements, emergency exits, fire alarms, and clearly displayed emergency procedures.
- Conduct routine worker training on hot-bitumen handling, machinery safety, fire prevention, first aid, spill response, and safe driving practices.
- Develop a greenbelt/plantation strip around the site boundary using suitable native or locally adapted species, while ensuring that plantation does not obstruct traffic visibility or plant operations.
- Establish a grievance mechanism to record and respond to complaints from nearby communities regarding dust, smoke, noise, traffic, or other environmental concerns.

7. Proposed Environmental Monitoring

The proponent should implement a structured environmental monitoring program throughout construction and operation. Monitoring results should be recorded, reviewed by management, and made available to Punjab EPA when required.

Parameter	Monitoring Location	Frequency	Purpose
Stack emissions, including particulate matter and relevant gaseous pollutants	Main dryer/burner stack	At least annually, and additionally as required by Punjab EPA	Verify compliance of plant emissions with applicable standards
Ambient air quality, including particulate matter/dust	Project boundary, nearby road side, and nearest sensitive receptor	Quarterly or as required by the regulatory authority	Assess dust and air-quality impacts outside the plant
Fugitive dust	Aggregate stockpiles, conveyors, internal roads, loading/unloading points	Daily visual inspection; formal monthly record	Ensure effectiveness of water sprinkling, enclosures, and housekeeping
Noise levels	Plant boundary, machinery area, and nearest sensitive receptor	Quarterly; worker exposure assessment as needed	Confirm that noise-control measures are effective
Generator and machinery condition	Generator, burner, baghouse, conveyors, mixer, and vehicles	Daily operational checks and preventive maintenance schedule	Prevent excessive emissions, leakage, noise, and breakdowns
Water use and wastewater/runoff	Water storage, drainage channels, oil-and-grease traps, and discharge points	Monthly, with inspection after rainfall events	Prevent polluted runoff and protect Rasool Nagar Canal
Fuel, bitumen, and chemical storage	Fuel storage area, bitumen tanks, workshop, and used-oil storage area	Weekly inspection	Identify leaks, spills, inadequate bunding, and unsafe storage
Waste generation and disposal	Waste storage points and disposal records	Monthly	Verify segregation, reuse, recycling, and safe disposal
Occupational health and safety	All operational areas	Daily safety inspection; monthly HSE review	Monitor PPE use, unsafe acts, incidents, near misses, and emergency readiness
Traffic movement and road safety	Site entrance/exit and internal roads	Daily	Manage vehicle movement, congestion, speed, and accident risk
Plantation/greenbelt survival	Site boundary and landscaped areas	Quarterly	Maintain vegetation cover and replace dead plants

The project should proceed only after obtaining the applicable environmental approval from the Environmental Protection Agency.

CHAPTER 1: Introduction

1.1 Background

Rapid development of road infrastructure, urban expansion, industrial growth, and maintenance of existing highways have increased the demand for quality construction materials in Punjab. Hot-mix asphalt is one of the principal materials used for the construction, rehabilitation, resurfacing, and maintenance of roads. Its availability near project areas is important because asphalt must generally be transported and laid while it remains at a suitable temperature. Establishment of properly designed asphalt plants near major road corridors can therefore support timely road-development works, reduce transport distances, improve supply reliability, and generate direct and indirect employment.

Munawar Brothers intends to establish and operate an asphalt plant at Faisalabad–Chiniot Road, near Rasool Nagar Canal and Hassan Murtaza Petroleum, District Chiniot, Punjab. The proposed project will occupy an area of approximately 3.5 acres. The plant will produce hot-mix asphalt by heating and drying aggregates and mixing them with bitumen and, where required, mineral filler or approved additives. The finished product will be loaded onto trucks and transported to road-construction and maintenance sites.

Asphalt-plant operations have the potential to cause adverse environmental and occupational impacts if not properly designed and managed. Key concerns include stack emissions from the aggregate dryer/burner, fugitive dust from aggregate handling and vehicle movement, asphalt fumes, noise from plant equipment and generators, traffic impacts from heavy vehicles, waste generation, and risks associated with storage and handling of hot bitumen, diesel, lubricants, and used oil. The site’s proximity to Rasool Nagar Canal also makes proper drainage, spill prevention, and protection of surface-water resources a key requirement.

This Environmental Impact Assessment has therefore been prepared to identify likely environmental and social impacts of the proposed project, evaluate their significance, recommend appropriate mitigation measures, and develop an Environmental Management Plan for construction, commissioning, operation, maintenance, emergency response, and eventual closure of the plant.

1.2 Purpose of the EIA

The main purpose of this Environmental Impact Assessment is to ensure that environmental, occupational health and safety, community-health, and regulatory considerations are integrated into the planning and implementation of the proposed Munawar Brothers Asphalt Plant.

The EIA provides a systematic assessment of the interaction between project activities and environmental receptors. It identifies potential impacts before the commencement of construction and operation so that impacts can be avoided, minimized, controlled, or compensated through appropriate site planning, technology selection, operational procedures, monitoring, and emergency-response measures.

The assessment is particularly focused on ensuring that the proposed plant is established and operated in a manner that:

- Protects ambient air quality in and around the project area.
- Controls stack emissions, fugitive dust, and asphalt fumes.
- Minimizes noise impacts on workers and nearby communities.
- Protects Rasool Nagar Canal and local drainage pathways from contaminated runoff, fuel spills, bitumen leakage, and improper waste disposal.
- Ensures safe storage and handling of diesel, bitumen, lubricants, used oil, and other potentially hazardous materials.
- Protects workers from burns, heat stress, machinery hazards, dust, fumes, fire, electrocution, and vehicle-related accidents.
- Manages heavy-vehicle movement and traffic safety on Faisalabad–Chiniot Road and at the project access point.
- Establishes a mechanism for stakeholder consultation, complaint management, and timely corrective action.
- Ensures compliance with applicable environmental laws, regulations, environmental-quality standards, and conditions of environmental approval.

Section 12 of the Pakistan Environmental Protection Act, 1997 requires a project proponent to file an Initial Environmental Examination or, where a project is likely to cause an adverse environmental effect, an Environmental Impact Assessment, and obtain approval from the relevant environmental agency before commencing construction or operation. The Punjab environmental assessment framework similarly categorizes projects for IEE or EIA review and establishes procedures for submission, review, approval, and environmental compliance.

1.3 Project Proponent

The project proponent is Munawar Hussain. The proponent will be responsible for the financing, development, construction, commissioning, operation, maintenance, environmental compliance, and occupational health and safety performance of the proposed asphalt plant.

The proponent's responsibilities will include, but will not be limited to:

- Obtaining environmental approval from the Punjab Environmental Protection Agency before commencement of project activities.
- Developing the plant in accordance with the approved site layout, environmental commitments, and conditions imposed by the regulatory authority.
- Installing and maintaining suitable pollution-control equipment, including a high-efficiency baghouse/bag-filter system or equivalent dust-control arrangement.
- Providing proper storage, handling, bunding, and secondary containment for bitumen, fuel, lubricants, used oil, and other hazardous materials.
- Ensuring that no untreated wastewater, contaminated runoff, bitumen, oil, or waste is discharged to Rasool Nagar Canal, nearby drains, open land, or any watercourse.
- Implementing the Environmental Management Plan, Occupational Health and Safety Plan, Waste Management Plan, Traffic Management Plan, and Emergency Response Plan.
- Conducting environmental monitoring, maintaining compliance records, and implementing corrective actions where monitoring indicates a potential non-compliance.
- Providing appropriate personal protective equipment, training, first-aid arrangements, fire-fighting equipment, and safety supervision for employees and contractors.

- Maintaining a community grievance mechanism to receive, record, investigate, and resolve complaints related to dust, emissions, noise, traffic, drainage, or other project-related matters.

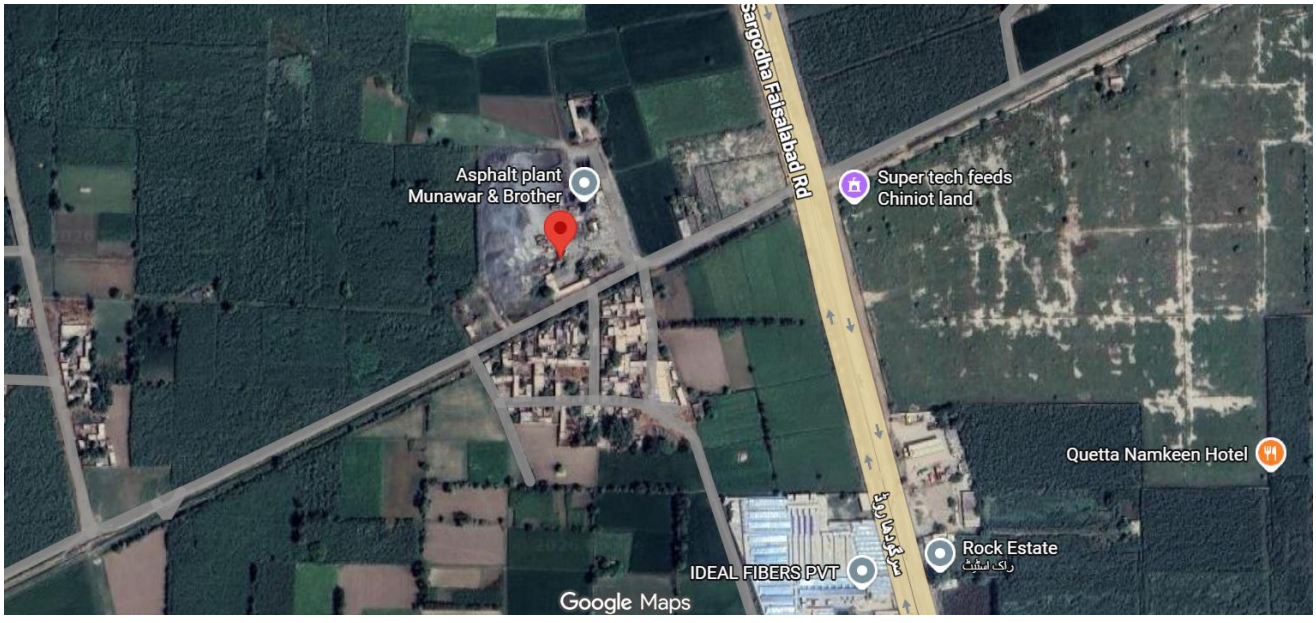
The proponent's complete address, authorized representative, telephone number, and email address should be inserted in the final EIA report.

1.4 Location and Site Setting

The proposed project site is located on Faisalabad Chiniot Road, near Rasool Nagar Canal and Hassan Murtaza Petroleum, in District Chiniot, Punjab. The project area is approximately 3.5 acres.

The location is considered operationally suitable because of its access to a major road corridor, which can facilitate the delivery of aggregates, bitumen, fuel, and other raw materials and enable efficient dispatch of finished hot-mix asphalt to road-construction sites. The site's road connectivity may reduce material-delivery time and support the supply of asphalt for local and regional infrastructure works.

However, the location also requires careful environmental planning because of the presence of Rasool Nagar Canal in the wider vicinity and the movement of heavy vehicles on Faisalabad–Chiniot Road.



The site layout should be designed to provide adequate separation between plant operations and sensitive receptors. The stack, dryer, baghouse, aggregate stockpiles, bitumen tanks, fuel-storage area, workshop, waste-storage area, truck-loading zone, drainage facilities, internal roads, parking area, office, and greenbelt should be arranged in a manner that reduces dust, emissions, noise, spill risk, and traffic conflicts.

Special attention will be given to the following site-planning requirements:

- Locating fuel, bitumen, workshop, and hazardous-waste areas away from the canal-side boundary and natural drainage pathways.
- Providing impervious flooring and secondary containment/bunding for bitumen, fuel, lubricants, and used oil.
- Separating clean stormwater from potentially contaminated runoff.
- Installing oil-and-grease interception and spill-isolation measures where required.
- Ensuring no discharge of contaminated water or waste to Rasool Nagar Canal.
- Providing safe entry and exit arrangements for trucks and other vehicles.
- Maintaining a low vehicle speed within the premises.
- Establishing boundary plantation/greenbelt where technically feasible to improve visual screening and assist in dust interception.

1.5 Brief Description of the Proposed Project

The proposed project consists of the establishment and operation of an asphalt-production facility for the manufacturing of hot-mix asphalt. The final production capacity, plant make, model, fuel type, stack height, operating hours, water demand, electricity requirement, number of workers, and quantity of raw material will be confirmed by the proponent and included in the detailed project description.

In general, the asphalt-production process will involve the following activities:

1. Aggregates of different sizes will be transported to the site and stored in designated stockpile areas.

2. Aggregates will be fed through cold-feed bins and conveyor systems into the dryer unit.

3. The dryer/burner system will remove moisture and heat aggregates to the required temperature.

4. Heated aggregates will be screened and transferred to the mixing section.

5. Bitumen will be received, stored in insulated/heated tanks, pumped in controlled quantities, and mixed with heated aggregate and mineral filler or additives, where required.

6. The finished hot-mix asphalt will be discharged into a storage/loading arrangement and loaded into covered trucks for dispatch.

7. Dust generated during drying, screening, conveying, mixing, and other plant activities will be captured through a baghouse/bag-filter or another approved pollution-control system.

The proposed facility may include aggregate stockpiles, cold-feed bins, conveyors, dryer, burner, mixer, baghouse, stack, bitumen tanks, fuel-storage area, generator, laboratory, office, workshop, parking area, internal roads, water-storage arrangement, drainage system, fire-fighting equipment, waste-storage area, and employee welfare facilities.

The plant should use modern and well-maintained technology that minimizes resource consumption and emissions. A high-efficiency baghouse is considered an essential environmental-control component because it captures particulate matter generated during asphalt production. Controlled aggregate storage, water sprinkling, road maintenance, covered transport, regular housekeeping, suitable stack design, efficient combustion, and preventive equipment maintenance will also be necessary to manage air emissions and dust.

1.6 Need and Benefits of the Project

The proposed asphalt plant is intended to support the supply of hot-mix asphalt for road construction, repair, and rehabilitation projects in District Chiniot and surrounding areas. The project is expected to provide the following benefits:

- Availability of asphalt closer to project locations, reducing delays associated with transport from distant plants.
- Support for road construction, resurfacing, rehabilitation, and maintenance activities.
- Generation of direct employment for plant operators, drivers, technicians, maintenance personnel, security staff, and administrative workers.
- Indirect employment and local economic opportunities for transporters, aggregate suppliers, fuel suppliers, workshops, equipment-maintenance providers, food vendors, and other local businesses.
- Development of technical skills among workers in asphalt production, equipment operation, safety procedures, quality control, and environmental management.

- Potential reduction in travel distance for asphalt supply, depending on the location of end-use road projects, which may reduce delivery time and associated fuel consumption.
- Contribution to local and regional infrastructure development.

These benefits can be achieved sustainably only if environmental protection, worker safety, and community-health safeguards are integrated into the project from the design stage and maintained throughout the operational life of the plant.

1.7 Objectives and Scope of the Study

The objectives of this EIA are to:

- Describe the proposed asphalt-plant project, its location, layout, components, raw materials, production process, utilities, and associated activities.
- Establish baseline environmental and social conditions within the project area and its zone of influence.
- Identify and assess potential positive and negative impacts during construction, operation, maintenance, emergency situations, and closure.
- Determine the significance of impacts based on their nature, magnitude, geographic extent, timing, duration, reversibility, likelihood, and sensitivity of affected receptors.
- Assess potential impacts on air quality, noise, soil, surface water, drainage, Rasool Nagar Canal, ecology, traffic, waste management, occupational health and safety, and nearby communities.
- Evaluate reasonable project alternatives, including the no-project option, site alternatives, design/technology alternatives, environmental alternatives, and economic alternatives.
- Recommend practical mitigation measures to avoid, minimize, control, or manage negative impacts.
- Develop an Environmental Management Plan and monitoring programme for effective implementation of mitigation measures.
- Establish institutional responsibilities, reporting arrangements, emergency-response procedures, and a grievance mechanism.
- Support the proponent in obtaining environmental approval and maintaining compliance with conditions imposed by Punjab EPA.

The assessment covers the full project life cycle. It includes the 3.5-acre site as the core assessment area; the immediate surroundings where dust, noise, traffic, and visual effects may occur; the local air-shed likely to be affected by stack emissions and prevailing wind conditions; the road corridor used by project vehicles; and the drainage area connected to or potentially influencing Rasool Nagar Canal.

1.8 Structure of the EIA Report

The EIA report has been organized to provide a clear and systematic assessment of the proposed project. The report includes the following main chapters:

- Chapter 1: Introduction, project background, purpose, location, need, objectives, and scope of the study.
- Chapter 2: Environmental screening, scoping, spatial and temporal boundaries, stakeholder concerns, significant issues, and consideration of alternatives.
- Chapter 3: Description of the project, plant process, equipment, raw materials, utilities, waste streams, workforce, and layout.
- Chapter 4: Description of the existing environmental and socio-economic conditions of the project area.
- Chapter 5: Impact assessment methodology, identification of impacts, characteristics of impacts, and evaluation of their significance.
- Chapter 6: Mitigation measures and Environmental Management Plan.
- Chapter 7: Environmental monitoring programme, institutional responsibilities, reporting arrangements, and compliance management.
- Chapter 8: Occupational health, safety, emergency preparedness, stakeholder consultation, grievance management, and conclusion.

1.9 Conclusion

The proposed Munawar Brothers Asphalt Plant is a road-material production facility planned on approximately 3.5 acres at Faisalabad–Chiniot Road, near Rasool Nagar Canal, District Chiniot. The project is expected to support road-development activities, generate employment, and provide locally available hot-mix asphalt.

At the same time, the project requires robust environmental and safety controls because asphalt manufacturing involves fuel combustion, particulate emissions, dust generation, hot-bitumen handling, heavy-vehicle movement, noise, waste generation, and potential spill/fire risks. Environmental approval must be obtained before construction or operation, and the project must be implemented in accordance with applicable environmental requirements and approval conditions.

With the installation of appropriate emission-control equipment, proper site drainage, protection of Rasool Nagar Canal, safe hazardous-material storage, effective waste management, traffic controls, worker-safety measures, emergency preparedness, and continuous environmental monitoring, the project's potential adverse impacts can be reduced to environmentally manageable levels.

CHAPTER 2: Screening, Scoping and Consideration of Alternatives

2.1 Introduction

This chapter presents the environmental screening, scoping, and analysis of alternatives for the proposed **Munawar Brothers Asphalt Plant** to be established at Faisalabad–Chiniot Road, near Rasool Nagar Canal and Hassan Murtaza Petroleum, District Chiniot, Punjab. The proposed site occupies an area of approximately **3.5 acres**.

The purpose of this chapter is to determine the applicable environmental assessment requirement; define the spatial and temporal limits of the assessment; identify the key environmental and social issues requiring detailed consideration; and evaluate feasible alternatives related to the site, design, technology, environmental management, and project economics.

2.2 Environmental Screening

2.2.1 Regulatory Requirement

Environmental screening has been undertaken with reference to the Punjab Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2020, issued under the Punjab Environmental Protection Act, 1997, as amended. The Regulations require:

- An **Initial Environmental Examination (IEE)** for projects listed in Schedule I.
- An **Environmental Impact Assessment (EIA)** for projects listed in Schedule II.
- An EIA where a project, even if not specifically listed in the schedules, is likely to cause an adverse environmental effect.
- An EIA for projects located within a notified environmentally sensitive area.
- Compliance with the environmental approval process prior to construction and operation of the project.

The Regulations also allow the Punjab Environmental Protection Agency (Punjab EPA) to direct a proponent to submit an IEE or EIA where it considers such assessment necessary, based on the nature, scale, location, or potential environmental implications of the project.

2.2.2 Screening of the Proposed Project

The proposed project is an asphalt-manufacturing facility involving the storage and handling of aggregates, bitumen, fuel, lubricants, and other materials; aggregate drying and heating; hot mixing of aggregate and bitumen; loading of finished asphalt; and movement of heavy vehicles.

The project may cause environmental impacts associated with:

- Stack emissions from the aggregate dryer and burner.
- Fugitive dust from aggregate stockpiles, internal roads, material transfer points, and truck movement.
- Asphalt fumes and odour from heating, mixing, storage, and loading operations.
- Noise emissions from the plant, generator, mixer, conveyors, loader, and trucks.
- Fire, explosion, and occupational health risks associated with hot bitumen, heated equipment, fuel, and mobile machinery.
- Soil and water contamination from accidental release of diesel, lubricants, bitumen, and contaminated stormwater.
- Potential effect on nearby drainage/water resources due to the site's proximity to Rasool Nagar Canal.
- Traffic and road-safety impacts due to movement of aggregate trucks, bitumen tankers, and hot-mix asphalt delivery vehicles along Faisalabad–Chiniot Road.

Although an asphalt plant is not expressly identified by name in Schedule I or Schedule II of the cited 2020 Regulations, it is an industrial activity with potential air-emission, hazardous-material handling, and community-health implications. Schedule II includes chemical and hazardous-substance handling, packaging, storage, and transportation, as well as any project likely to cause an adverse environmental effect.

2.2.3 Screening Conclusion

Considering the nature of asphalt production, combustion-related stack emissions, dust generation, bitumen and fuel storage, hazardous-material handling, proximity to Rasool Nagar Canal, and potential effects on nearby communities and road users, the proposed project should be treated as requiring an **Environmental Impact Assessment (EIA)** for environmental approval by Punjab EPA.

This classification is recommended under the residual provision of Schedule II for projects "likely to cause an adverse environmental effect." The final categorization remains subject to formal confirmation by Punjab EPA at the time of filing. Where Punjab EPA determines that the project falls outside Schedule II and is suitable for a lower level of assessment, the Agency may specify the applicable documentation requirement; however, preparation of an EIA is considered the more precautionary and technically appropriate approach for the proposed asphalt plant.

The proponent should submit the EIA application along with the prescribed review fee, proponent's CNIC, proof of land ownership or lease, authority letter for the consultant, project cost, layout plan, and a coloured site map indicating distances from population, water bodies, and other important receptors.

2.3 Scoping

2.3.1 Purpose of Scoping

Scoping identifies the environmental and social issues that require detailed assessment in the EIA. It enables the study to focus on potentially significant impacts, receptors, mitigation measures, monitoring needs, and stakeholder concerns associated with the construction and operation of the proposed asphalt plant.

The scoping exercise for the project has considered the project location, proposed plant operations, nearby Rasool Nagar Canal, access from Faisalabad–Chiniot Road, surrounding land uses, expected truck movement, and the potential interaction of plant emissions with workers, nearby residents, businesses, agricultural land, road users, and water resources.

Assessment Area	**Proposed Spatial Boundary**	**Key Matters to be Assessed**
Core Project Area	The full 3.5-acre project site, including the plant area, aggregate stockpiles, bitumen tanks, fuel-storage area, workshop, internal roads, drainage, office, parking, and loading/unloading areas	Land use, site drainage, occupational safety, waste generation, spill risk, noise, dust, emissions, and housekeeping
Immediate Influence Area	Area within approximately 500 m of the project boundary	Nearby houses, commercial activities, agricultural land, roadside receptors, sensitive receptors, dust and noise impacts, local drainage pathways, and visual effects

Air Quality Study Area	Area within approximately 1 km of the site, subject to confirmation based on stack height, plant capacity, fuel type, local wind direction, and terrain	Stack emissions, fugitive dust, asphalt fumes, odour, cumulative air-quality effects, and sensitive receptor exposure
Noise Study Area	Area within approximately 500 m of the site boundary and nearest sensitive receptors	Plant equipment noise, generator noise, truck noise, worker exposure, and community noise impact
Surface-Water and Drainage Area	The project drainage catchment, drainage channels, runoff pathways, and Rasool Nagar Canal or other nearby water bodies	Stormwater management, oil/bitumen contamination, wastewater discharge, erosion, and accidental-spill impacts
Traffic Influence Area	Site entrance/exit, Faisalabad–Chiniot Road, and practical access routes used by material suppliers and finished-product transporters	Traffic volume, turning movements, road safety, parking, congestion, road damage, and community safety
Labour and Community Area	Nearby settlements, roadside businesses, agricultural workers, and communities potentially affected by plant activities or traffic	Employment, community health and safety, grievance management, stakeholder concerns, and nuisance impacts

2.3.2 Spatial Boundaries of Assessment

The spatial boundaries for the environmental assessment have been established according to the likely zone of influence of the project and its associated activities.

The actual distance to residential settlements, schools, healthcare facilities, mosques, agricultural land, commercial activities, and the canal should be verified through a site survey, GPS mapping, satellite imagery, and consultation with local stakeholders. The final EIA should include an A2/A3 coloured location map showing the project boundary and distances from population centres, water bodies, and other sensitive receptors, in line with Punjab EPA submission requirements.

2.3.3 Temporal Boundaries of Assessment

The temporal boundary covers the entire project life cycle, including site preparation, construction, commissioning, operation, maintenance, emergency conditions, and closure/decommissioning.

Project Phase	**Indicative Duration**	**Key Environmental Considerations**
Pre-construction phase	Land preparation, design finalization, approvals, procurement, and mobilization	Land-use compatibility, site layout, drainage design, location of storage areas, baseline environmental monitoring, community consultation, and regulatory approvals
Construction phase	From commencement of site development until installation and commissioning of the plant	Dust, noise, construction waste, traffic, occupational safety, soil disturbance, drainage management, and temporary labour facilities

Commissioning phase	Initial plant testing and trial operations	Equipment performance, stack-emission testing, baghouse performance, noise verification, leak checks, trial production, and emergency-response readiness
Operational phase	Throughout commercial operation of the asphalt plant	Continuous emissions, fugitive dust, noise, traffic, waste management, fuel and bitumen handling, worker safety, water use, stormwater quality, and community concerns
Maintenance/shutdown phase	Periodic and unplanned maintenance activities	Used oil, contaminated rags, equipment cleaning, hot-work safety, dust-control-system maintenance, and temporary emissions/noise
Emergency phase	Any accidental or unplanned incident	Fuel or bitumen spill, fire, explosion, baghouse failure, traffic accident, worker injury, and contaminated runoff reaching the canal
Decommissioning/closure phase	At the end of plant life or relocation of operations	Dismantling waste, contaminated-soil assessment, removal of fuel/bitumen residues, site restoration, disposal of hazardous materials, and rehabilitation of the site

The assessment should consider seasonal variation, particularly dry-weather dust conditions, rainfall-related runoff, prevailing wind direction, high traffic periods, and periods of maximum plant production.

2.3.4 Important Issues and Concerns Raised During Consultation

Consultation should be conducted with nearby residents, landowners, shopkeepers, road users, workers, local representatives, relevant government departments, Punjab EPA field staff, and other stakeholders identified during site reconnaissance.

As the detailed consultation record is to be completed during the EIA study, the following issues are anticipated to be of primary concern to stakeholders:

Stakeholder Group	**Likely Issues and Concerns**
Nearby residents and communities	Dust deposition on houses and crops; smoke, smell, and asphalt fumes; noise from machinery and trucks; nighttime operation; potential health effects; and availability of employment for local people
Farmers and agricultural landowners	Dust on crops; contamination of soil or irrigation water; damage to local access routes; waterlogging or changes in natural drainage; and accidental spill impacts
Road users and nearby businesses	Increased traffic; slow-moving or overloaded trucks; turning and reversing hazards; road congestion; dust on the road; damage to road surface; and access obstruction
Workers and contractors	Exposure to hot asphalt and bitumen; burns; dust and fumes; fire risk; noise exposure; vehicle movement; insufficient PPE; inadequate drinking water, sanitation, and first-aid facilities
Regulatory agencies	Compliance with environmental approval conditions; adequacy of emission-control systems; stack monitoring; protection of Rasool Nagar Canal; safe fuel and bitumen storage; waste disposal; and implementation of the EMP
Local government and emergency services	Traffic management; fire preparedness; emergency access; drainage management; community complaints; and coordination during accidents or emergencies

Consultation findings should be documented in the final EIA through meeting records, attendance sheets, photographs, stakeholder comments, and a consultation-response matrix. Concerns raised should be incorporated into the EMP, traffic-management plan, emergency-response plan, and monitoring programme.

2.3.5 Significant Impacts and Factors for Detailed Assessment

The following issues have been identified as potentially significant and require detailed assessment during the EIA.

Environmental and Social Aspect	Potential Significant Impact	Factors to be Determined During EIA
Ambient air quality	Increased particulate matter, smoke, combustion gases, and asphalt fumes affecting workers and nearby receptors	Plant capacity, fuel type, burner efficiency, stack height, emissions-control system, wind direction, distance to receptors, baseline air quality, and cumulative sources
Fugitive dust	Dust from aggregate stockpiles, loading/unloading, conveyors, unpaved roads, and vehicle movement	Quantity and type of aggregate, stockpile management, road condition, traffic intensity, water-sprinkling arrangements, wind speed, and distance to homes/crops
Stack emissions	Particulate matter and gaseous emissions from dryer/burner and generator operation	Fuel characteristics, stack dimensions, baghouse design, emission concentrations, operating temperature, maintenance system, and compliance with applicable PEQS
Noise and vibration	Noise nuisance to nearby communities and hearing risk for workers	Baseline noise levels, equipment specifications, working hours, generator capacity, distance to receptors, enclosure/silencer provision, and worker exposure duration
Water resources	Contamination of drainage and Rasool Nagar Canal through spills or polluted runoff	Exact canal distance, site drainage direction, flood/rainfall patterns, chemical-storage arrangement, bund capacity, oil-and-grease traps, and discharge/reuse arrangements
Soil and groundwater	Soil contamination from diesel, bitumen, lubricants, maintenance waste, and accidental spills	Existing soil condition, depth to groundwater if relevant, impermeable flooring, containment measures, spill history, used-oil management, and emergency response
Waste management	Improper storage or disposal of baghouse dust, waste asphalt, used oil, oily rags, containers, domestic waste, and maintenance waste	Waste quantities, reuse potential, storage locations, authorized recyclers/disposal contractors, manifests, and housekeeping arrangements
Occupational health and safety	Burns, fire, explosion, dust/fume inhalation, heat stress, hearing loss, mechanical injury, and vehicle-related accidents	Worker numbers, shift arrangements, PPE, safety training, first aid, emergency equipment, fire-fighting system, safety signage, permit-to-work arrangements, and incident reporting
Community health and safety	Exposure to dust, emissions, noise, and traffic hazards	Population density, receptor locations, vehicle routes, operating hours, community grievance mechanism, security arrangement, and emergency communication system
Traffic and transportation	Increased accident risk, congestion, dust, and road deterioration	Number of trucks per day, access route, intersection design, vehicle loading arrangements, parking space, speed limits, driver training, signage, and peak-hour traffic conditions
Ecology and vegetation	Localized impacts on roadside vegetation, agricultural productivity, and canal-side environment	Existing vegetation, agricultural activity, protected species if any, dust deposition,

		drainage pathways, and required plantation/greenbelt measures
Cumulative impacts	Combined effects of traffic, nearby commercial/industrial activities, petroleum facilities, road emissions, and other air-emission sources	Existing facilities, background pollution, nearby fuel stations, cumulative truck movement, other industrial plants, and prevailing meteorological conditions

The EIA should identify impact significance by considering the magnitude, duration, reversibility, geographic extent, likelihood, receptor sensitivity, and effectiveness of proposed mitigation measures.

2.4 Consideration of Alternatives

2.4.1 Introduction

Consideration of alternatives is an important component of the EIA process. It demonstrates that the selected project option has been evaluated against feasible alternatives and that environmental, technical, social, operational, and economic factors have been integrated into decision-making.

Alternatives considered for the proposed asphalt plant include:

- The **no-project alternative**.
- Alternative sites.
- Alternative plant design and technology options.
- Alternative environmental management measures.
- Alternative economic and operational approaches.

2.4.2 No-Project Alternative

Under the no-project alternative, the asphalt plant would not be established at the proposed site. Consequently, the environmental impacts associated with construction, emissions, dust, noise, traffic, fuel/bitumen storage, and worker safety risks would not occur at this location.

However, the no-project option would also result in the following limitations:

- Reduced availability of locally produced hot-mix asphalt for road construction and maintenance activities.
- Continued dependence on asphalt supply from more distant plants.
- Increased transportation distance, fuel consumption, delivery time, and associated vehicle emissions for projects in and around Chiniot.
- Loss of potential direct and indirect employment opportunities.
- Reduced local economic activity related to aggregate supply, transportation, maintenance, and construction support services.
- Potential delays in road development and maintenance works.

The no-project alternative is therefore not preferred, provided that the project is developed and operated in accordance with environmental approval conditions, pollution-control requirements, and the Environmental Management Plan.

2.4.3 Site Alternatives

Alternative Site Selection Criteria

The following criteria should be used to assess alternative sites for the asphalt plant:

- Sufficient land availability for the plant, stockpiles, internal roads, drainage, parking, greenbelt, fuel/bitumen storage, and safety buffer.
- Adequate separation from dense residential areas, schools, hospitals, mosques, and other sensitive receptors.
- Safe and direct access to major roads suitable for heavy vehicle movement.

- Availability of utilities, including electricity, water, communications, and emergency services.
- Avoidance of flood-prone areas, wetlands, protected areas, forests, and environmentally sensitive areas.
- Sufficient distance from canals, drains, ponds, and groundwater recharge areas.
- Compatibility with surrounding land use and local development plans.
- Minimal requirement for land acquisition, resettlement, or displacement of people.
- Ability to install an adequate drainage system, pollution-control equipment, waste-storage area, and emergency access.
- Economic feasibility in terms of land cost, infrastructure development, transport distance, and operational efficiency.

Evaluation of Site Alternatives

Site Option	Description	Selection/Rejection Criteria	Decision
Proposed Site	Site located at Faisalabad–Chiniot Road, near Rasool Nagar Canal and Hassan Murtaza Petroleum, District Chiniot; total area approximately 3.5 acres	Provides road access, adequate project area, logistical suitability for aggregate and asphalt transport, and proximity to the intended market; requires stringent dust, drainage, spill-prevention, traffic, and water-protection controls because of the nearby canal and road	Selected, subject to Punjab EPA approval and implementation of safeguards
Site Near Dense Residential Area	A site closer to settlements or commercial/residential development	Higher potential for dust, noise, odour, traffic congestion, public complaints, and community health and safety impacts	Rejected
Site Adjacent to Canal/Watercourse	A site immediately adjoining a canal, drain, pond, or other water body	Elevated risk of water contamination from stormwater, fuel spills, bitumen leakage, and maintenance waste; reduced ability to establish a safe environmental buffer	Rejected
Site with Poor Road Access	A site located away from major roads or requiring passage through narrow village streets	Increased traffic safety risk, road damage, transport cost, dust, congestion, and disruption to local communities	Rejected
Site Requiring Significant Land Acquisition	A location requiring displacement of residents, productive agricultural land, or commercial activity	Higher social impact, land-acquisition cost, project delay, and potential stakeholder opposition	Rejected
Industrial/Designated Area Site	A site within an approved industrial zone or suitably zoned industrial area, if available	May offer improved land-use compatibility and infrastructure; however, viability depends on land availability, cost, road access, distance from project demand, and utility availability	To be considered where technically and economically feasible

The proposed site is considered acceptable only if a verified site layout demonstrates adequate buffer distances from sensitive receptors and Rasool Nagar Canal; all fuel, bitumen, and waste-storage areas are located on

impervious, bunded surfaces; and no untreated runoff or wastewater is allowed to enter the canal or nearby drainage system.

2.4.4 Design and Technology Alternatives

The selection of plant design and technology should minimize emissions, resource consumption, accident risks, and nuisance impacts while maintaining reliable production quality.

Technology/Design Alternative	Advantages	Limitations	Selection/Rejection Decision
Conventional plant with inadequate dust control	Lower initial capital cost	High risk of particulate emissions, dust complaints, non-compliance, worker exposure, and environmental liability	Rejected
Batch-mix asphalt plant with baghouse filtration	Better production control; effective dust capture; ability to manage variable mix designs; suitable for high-quality asphalt production	Higher capital and maintenance requirement; requires trained operators	Preferred
Drum-mix plant with appropriate emission controls	Continuous production and operational efficiency; can be suitable for certain production requirements	Requires carefully designed pollution-control system and close operational control to prevent emissions and quality issues	May be considered subject to demonstrated compliance
Wet scrubber as primary dust-control system	Can reduce some particulate emissions	Produces wastewater/sludge; requires water treatment and may create secondary pollution	Not preferred as the primary control option
Baghouse/bag filter system	High efficiency for particulate control; dry dust collection; facilitates potential reuse of collected dust where technically suitable	Requires regular inspection, cleaning, replacement of filter bags, and maintenance	Selected as the preferred air-pollution-control option
Open aggregate stockpiles without controls	Lowest initial cost	Significant windblown dust, material loss, nuisance, and potential impacts on crops and nearby receptors	Rejected
Managed stockpiles with windbreaks, water sprinkling, defined loading areas, and paved roads	Reduces fugitive dust and improves housekeeping	Requires water, routine maintenance, and operating discipline	Selected

Unbunded fuel/bitumen storage	Simple installation	High spill and fire risk; potential soil and water contamination	Rejected
Bunded bitumen/fuel storage on impervious surface	Reduces contamination risk; enables containment and recovery of spills	Requires proper design, inspection, and drainage isolation	Selected
Diesel generator without acoustic enclosure	Lower initial cost	Excessive noise and emissions	Rejected
Generator with acoustic enclosure, exhaust control, and preventive maintenance	Lower community and worker noise exposure; improved emission performance	Additional capital and maintenance cost	Selected
No dedicated drainage or oil-water separation	Low cost	High risk of contaminated runoff entering soil, drains, or canal	Rejected
Separate stormwater drainage with oil-and-grease trap and spill isolation	Protects canal and surrounding land; supports regulatory compliance	Requires periodic cleaning and monitoring	Selected

The preferred design is a modern asphalt plant equipped with a high-efficiency baghouse or equivalent dry filtration system, properly designed stack, controlled aggregate handling, paved/compacted internal roads, water-sprinkling arrangements, acoustic control for generators, bunded fuel/bitumen storage, spill-control infrastructure, separate stormwater drainage, and oil-and-grease interception where required.

2.4.5 Environmental Alternatives

Environmental alternatives refer to variations in project planning, layout, resource use, waste management, pollution control, and operating practices that can reduce environmental impacts.

Environmental Alternative	**Environmental Benefit**	**Selection/Rejection Criteria**	**Decision**
Locate fuel, bitumen, and waste-storage areas near the canal-side boundary	May reduce internal transfer distance	Higher risk of contaminating canal through spills or runoff	Rejected
Locate fuel, bitumen, workshop, and hazardous-waste areas away from the canal, with bunding and impervious flooring	Reduces spill risk to surface water and allows controlled drainage	Adequate area and drainage design must be available	Selected
Direct discharge of stormwater to nearby drains/canal	Lowest drainage cost	Unacceptable risk of oil, fuel, bitumen, sediment, and waste entering surface water	Rejected
Separate clean stormwater from potentially contaminated runoff	Reduces water pollution and allows treatment/containment of contaminated runoff	Requires site grading, drain maintenance, and oil-and-grease trap	Selected
Disposal of collected dust and rejected asphalt on open land	Simple short-term approach	Causes dust, land contamination, visual	Rejected

		impacts, and resource wastage	
Reuse of baghouse dust and reclaimed asphalt where technically feasible	Reduces waste generation and raw-material demand	Must not compromise product quality or create environmental risk	Preferred
Uncontrolled truck movement and idling	No management cost	Increased dust, noise, fuel use, congestion, road-safety risk, and emissions	Rejected
Traffic-management plan, speed control, designated routes, vehicle-covering, and no-idling policy	Reduces dust, emissions, accident risk, and community disturbance	Requires supervision and driver compliance	Selected
No greenbelt or visual buffer	Maximum usable operational area	Reduced dust interception, visual screening, and site amenity	Rejected
Boundary plantation/greenbelt using suitable local species	Improves visual quality; assists in dust interception; supports site landscaping	Must not restrict visibility, drainage, or emergency access	Selected
Reactive maintenance only	Lower short-term maintenance expenditure	Increased risk of plant breakdown, excessive emissions, dust-control failure, and spills	Rejected
Preventive maintenance programme	Better emission control, reduced accidents, longer equipment life, and lower operational risk	Requires maintenance records, spare parts, and trained staff	Selected

2.4.6 Economic Alternatives

Economic alternatives have been considered to ensure that the selected project option is financially viable while incorporating adequate environmental safeguards. Environmental protection measures should be treated as essential project costs rather than optional additions.

Economic Alternative	**Economic Consideration**	**Environmental/Social Implication**	**Decision**
Lowest-capital-cost plant without effective controls	Lower initial investment	Higher risk of regulatory non-compliance, complaints, penalties, shutdowns, worker illness, environmental damage, and future retrofit cost	Rejected
Modern plant with baghouse, bunding, drainage, acoustic control, and safety systems	Higher initial capital expenditure	Reduced risk of non-compliance, improved reliability, lower waste, reduced emissions, and lower long-term liability	Selected
Procurement of locally available aggregates where quality is acceptable	May reduce haulage cost and delivery time	Reduces truck fuel use and associated emissions; must use legally sourced material	Preferred
Procurement from distant sources only	May offer specific material quality or availability	Higher transport cost, traffic, fuel use, road wear, and emissions	Used only where required by quality or supply constraints

Excessive on-site storage of fuel/bitumen	May reduce frequency of deliveries	Greater spill, fire, and hazardous-material storage risk	Avoided; storage capacity should be based on operational need and safety standards
Adequate but controlled fuel/bitumen inventory	Balanced logistics and risk management	Supports safe operation and minimizes storage-related environmental risk	Selected
Delayed expenditure on monitoring and maintenance	Reduces immediate operating cost	May result in equipment failure, uncontrolled emissions, regulatory action, and higher corrective cost	Rejected
Planned spending on environmental monitoring and preventive maintenance	Predictable operating cost	Supports compliance, timely corrective action, equipment efficiency, and reduced long-term cost	Selected

The preferred economic approach is to invest in reliable production equipment, a baghouse filtration system, environmental infrastructure, fire and safety systems, preventive maintenance, worker training, and routine environmental monitoring. Although these measures increase initial and recurring costs, they reduce the risk of operational disruption, regulatory non-compliance, environmental damage, public complaints, penalties, and costly corrective actions.

2.5 Chapter Conclusion

The screening assessment indicates that the proposed Munawar Brothers Asphalt Plant should be assessed through an **Environmental Impact Assessment (EIA)** due to its potential adverse impacts related to air emissions, fugitive dust, bitumen and fuel handling, traffic, occupational safety, and its proximity to Rasool Nagar Canal. Under the Punjab IEE/EIA Regulations, projects with likely adverse environmental effects may require an EIA, and Punjab EPA retains authority to confirm or direct the applicable assessment category.

The EIA will assess impacts within the 3.5-acre site, surrounding community and roadside receptors, the local air-shed, traffic routes, and the canal/drainage environment. The assessment will cover all phases from site preparation to decommissioning, with particular focus on air quality, noise, water protection, waste management, traffic safety, occupational health and safety, and stakeholder concerns.

The preferred alternative is the proposed site and project configuration, subject to confirmation of land-use compatibility, verified distances from the canal and sensitive receptors, installation of a high-efficiency

baghouse, controlled drainage, bunded fuel and bitumen storage, strict spill prevention, traffic management, PPE and fire-safety arrangements, plantation, and full implementation of the Environmental Management Plan.

CHAPTER 3: DESCRIPTION OF THE PROJECT

3.1 General

This chapter describes the proposed asphalt hot mix plant in the detail needed to identify where its environmental effects originate. It covers the classification of the project, the alternatives considered, the site and its boundary, the production process step by step, the materials consumed and produced, the supporting infrastructure, the manpower required and the schedule for implementation.

3.2 Type and Category of the Project

The project is an industrial installation for the manufacture of hot bituminous mix, classified within the construction materials sector. It is a batch type plant of small capacity, rated at 50 tons per day, occupying a leased area of **3.5 acres**, with a capital cost of PKR 15.00 million. Under the Punjab Environmental Protection (Review of IEE and EIA) Regulations, 2022, plants of this description are subject to environmental assessment before commencement, and the screening exercise carried out at the outset of this study concluded that the combination of a fuel-fired thermal process, mineral dust handling, and petroleum-product storage warranted assessment at the level presented in this report.

3.3 Project Objectives

- To establish a dependable in-house source of hot bituminous mix for the road construction, widening, resurfacing, and maintenance contracts executed by the proponent.
- To reduce the haulage distance between the point of manufacture and the point of laying, so that mix reaches the paver within its correct temperature window and pavement quality is improved.
- To reduce the cost and the programme risk associated with dependence on third-party plants, particularly during peak construction seasons when external supply is uncertain.
- To create direct and indirect employment in a rural area of District Chiniot where opportunities outside agriculture are limited.
- To demonstrate that a plant of this size can be operated within the Punjab Environmental Quality Standards through proper equipment selection, layout, and housekeeping.

3.4 Background

The proponent has been engaged in civil works contracting for several decades and holds a current licence from the Pakistan Engineering Council. Its road works in Chiniot, Faisalabad, Lalian, and adjoining districts have grown in volume to the point where external purchase of bituminous mix has become a recurring constraint on both cost and quality. The firm accordingly decided to install a plant of its own, sized to its own annual consumption rather than to the open market, and selected a site at **Faisalabad–Chiniot Road, near Rasool Nagar Canal and Hassan Murtaza Petroleum, District Chiniot**, where land is available on lease and where access, power, and water can be provided without extending public utilities.

3.5 Project Alternatives

3.5.1 The No Project Alternative

Under this alternative the plant would not be built and the proponent would continue to purchase mix from distant third-party plants. This would avoid the localized dust, fume, and noise associated with the new plant, but it would not avoid the environmental cost of manufacture, which would simply be incurred at another location and very possibly at a plant with weaker emission controls. It would also mean continued long-distance haulage of hot mix, with the associated fuel consumption, vehicle emissions, road wear, and material wastage through rejection of cooled mix. Weighed against the loss of local employment and the continuing quality problems, the no-project alternative was not considered to offer a net environmental or economic advantage.

3.5.2 Site Alternatives

Two other parcels within District Chiniot and the surrounding area were considered. One lay closer to a settlement and within the prevailing downwind direction of the nearby abadi, which would have brought dust and odour into closer contact with houses and agricultural land. The other had poor road access and would have required upgrading a village track to carry loaded tippers.

The selected site was preferred because it is located at **Faisalabad–Chiniot Road, near Rasool Nagar Canal and Hassan Murtaza Petroleum**, is served by an existing metalled road, provides suitable space for the proposed 3.5-acre facility, and allows access for delivery and dispatch vehicles. The site is also free of any

identified protected area or archaeological feature and is located in a manner that permits protection of the canal, local drainage, neighbouring land, and surrounding agricultural activities through appropriate layout and mitigation measures.

3.5.3 Technology Alternatives

Both drum-mix and batch-mix configurations were examined. A batch plant was selected because it offers better control over mix proportioning for the varied job-mix formulae required by different road contracts, allows the plant to be stopped and restarted without wasting a full drum charge, and lends itself more readily to the fitting of a discrete air-pollution-control train on a single, well-defined emission point.

Within the emission-control choice, a simple cyclone alone was rejected as inadequate for fine particulate. The selected arrangement is a cyclone acting as a primary knock-out stage followed by a wet scrubber, which gives a substantially higher collection efficiency for the fine fraction that a cyclone cannot capture. The final pollution-control system will be designed and operated in accordance with the applicable environmental requirements and the plant's final engineering specifications.

3.5.4 Fuel Alternatives

The dryer burner can be fired on high-speed diesel, furnace oil, or waste oil. Waste oil was rejected outright because its combustion may release metals and chlorinated compounds and cannot be adequately controlled at a plant of this size. High-speed diesel is the preferred fuel on emission grounds, being lower in sulphur and ash, and will be used wherever it is commercially available. Where furnace oil is used, the proponent will procure the lowest-sulphur grade obtainable and will accept the corresponding obligation to monitor sulphur dioxide in the stack more closely.



Figure 1: Google Map of project site

3.6 Location and Site Boundary

The plant will be established on a parcel of approximately **3.5 acres** at **Faisalabad–Chiniot Road, near Rasool Nagar Canal and Hassan Murtaza Petroleum, District Chiniot, Punjab, Pakistan**. The parcel is held by the proponent under a lease arrangement. The boundary of the leased parcel is defined by the land records and lease documentation, a copy of which will be placed at Annexure A, and will be shown on the site plan at Annexure B together with the GPS coordinates of the boundary points.

The land surrounding the project site consists primarily of agricultural fields, roadside commercial activities, access routes, and nearby settlement areas. Rasool Nagar Canal is located near the project area and will be protected through suitable site planning, drainage control, spill prevention, and prohibition of contaminated discharge.

The project site will be arranged so that fuel, bitumen, oil, workshop, and waste-storage areas are located on impervious and bunded surfaces and away from drainage pathways where practicable. No natural watercourse

will be obstructed by the project, and no wastewater, oil, bitumen, or contaminated runoff will be discharged to Rasool Nagar Canal, adjoining fields, or any other watercourse.

The nearest residences, commercial establishments, agricultural fields, schools, healthcare facilities, religious places, graveyards, archaeological features, and other sensitive receptors will be identified and shown on the final location map and site plan.

3.7 Description of the Manufacturing Process

Hot mix asphalt is produced by drying and heating graded mineral aggregate, proportioning it with mineral filler, and blending it with hot bitumen in fixed proportions so that every particle is coated with a film of binder. The finished mix is discharged into tippers and carried to the paving site while still hot. The process at this plant will proceed in the following stages.

3.7.1 Receipt and Stockpiling of Aggregate

Crushed stone aggregate of different size fractions, together with sand and stone dust, will be brought to the site by tipper and stockpiled in separate bays within a designated stockyard. The bays will be separated by partition walls to prevent intermixing of fractions, and the stockyard floor will be firm and well drained. Stockpiles will be kept at a moderate height and sprinkled with water during dry and windy conditions to control dust and prevent its movement toward nearby agricultural land, roadside businesses, settlements, and Faisalabad–Chiniot Road.

3.7.2 Cold Feed and Proportioning

Aggregate is drawn from the stockpiles into a set of cold-feed bins, each fitted with a variable-speed feeder that delivers material onto a gathering conveyor in the proportion required by the job-mix formula. Correct setting of the cold feed is important environmentally as well as commercially, since an incorrect gradation places an unnecessary load on the dryer and increases fuel consumption and emissions.

3.7.3 Drying and Heating

The gathering conveyor discharges into a rotary dryer, a steel drum inclined slightly from the horizontal and lined internally with lifting flights. Aggregate travels down the drum against a flame produced by an oil-fired burner at the lower end. Moisture is driven off and the aggregate is raised to a temperature of about 150 to 165 degrees Celsius. This is the single largest source of emissions at the plant. The exhaust gas stream carries both the products of combustion and a heavy load of entrained mineral dust, and it is drawn off by an induced-draught fan to the pollution-control train described in Section 3.15.

3.7.4 Screening and Hot Storage

The dried and heated aggregate is lifted by a hot elevator to a vibrating screen, which separates it into size fractions that are stored in hot bins immediately below. The screen deck and the hot elevator are enclosed to contain the dust released at this stage and are vented into the same extraction system serving the dryer.

3.7.5 Bitumen Storage and Supply

Penetration-grade bitumen will be received in bulk or in drums and stored in an insulated tank fitted with a heating coil and a thermostatic controller. Bitumen must be brought to a working temperature in the region of 150 to 165 degrees Celsius to be pumpable and to coat the aggregate properly. Holding it above that range, or holding it hot for long periods, causes it to oxidize and release a heavier load of hydrocarbon fume. The thermostat and a clearly displayed temperature log are therefore treated in this report as environmental-control measures and not merely as process instruments. Bitumen is drawn from the tank by a jacketed pump through heated lines to the weigh bucket.

3.7.6 Weighing and Mixing

Measured quantities of hot aggregate from each hot bin, together with mineral filler, are drawn into a weigh hopper and discharged into a twin-shaft pug-mill mixer. Hot bitumen is then sprayed into the pug mill in the weighed quantity and the batch is mixed for the prescribed time until every particle is uniformly coated. The pug mill will be hooded and the hood vented to the extraction system so that the fume released at the moment of bitumen injection is captured rather than allowed to escape into the working area.

3.7.7 Discharge and Dispatch

The finished batch is discharged from the pug mill directly into a tipper positioned beneath the mixer, or into a small holding hopper. Loaded tippers are sheeted with insulated covers before leaving the site, which serves both to retain heat and to prevent fume and material loss in transit. A weighbridge or calibrated load record will be maintained for dispatch.

3.8 Raw Materials and Consumption

The indicative daily consumption of materials and utilities at full rated output of 50 tons per day is set out below. Actual figures will vary with the job-mix formula specified for each contract.

Input	Indicative Daily Quantity	Remarks
Coarse and fine aggregate	44 to 45 tons	Crushed stone and sand, procured from licensed crushing plants
Mineral filler / stone dust	2 to 3 tons	Stored under cover to prevent wind loss
Bitumen, penetration grade	2.0 to 2.5 tons	Approximately 4 to 5 percent by weight of mix
Fuel for dryer burner	350 to 450 litres	High-speed diesel preferred; low-sulphur furnace oil as alternative
Diesel for generator and loader	60 to 90 litres	Subject to duration of grid outage
Water	3,000 to 4,000 litres	Dust suppression, wet-scrubber make-up, and domestic use
Electricity	Approximately 250 to 350 units	Motors, lighting, and office load

Table 3.1: Indicative Daily Material and Utility Consumption

3.9 Product and Market

The product is hot bituminous mix conforming to the specification laid down in the relevant contract, typically an asphaltic base course or wearing course to the specifications adopted by the provincial highway and communications departments. The entire output is intended for consumption in the proponent's own road contracts in District Chiniot, Faisalabad, Lalian, and adjoining areas. No storage of finished product will take place on site beyond the short period between discharge and dispatch, since hot mix must be laid on the same day it is produced.

3.10 Plant and Machinery

Item	Indicative Specification
Asphalt batch mix plant	Rated at approximately 8 to 10 tons per hour, operated to deliver 50 tons per day
Cold feed bins with feeders	Three to four compartment unit with variable-speed belt feeders
Rotary dryer with burner	Oil-fired burner with air and fuel-ratio control and flame safeguard
Cyclone separator	Primary dust knock-out stage on the dryer exhaust
Wet scrubber with settling tank	Secondary control stage for fine particulate, with water recirculation
Induced-draught fan and stack	Stack of not less than 15 metres height with a sampling port and access platform
Hot elevator, vibrating screen, and hot bins	Enclosed and vented to the extraction system
Twin-shaft pug-mill mixer	Hooded and vented, batch capacity matched to plant rating
Bitumen storage tank	Insulated, with heating coil, thermostat, and temperature indicator
Bitumen pump and heated lines	Jacketed pump with drip tray beneath all flanged joints
Diesel generator	Standby unit housed in an acoustic enclosure with exhaust stack
Wheel loader and tippers	For stockyard handling and dispatch
Water bowser and sprinkler system	For internal roads, stockpiles, and unpaved surfaces
Firefighting equipment	Dry chemical and foam extinguishers, sand buckets, and a water reserve

Table 3.2: Indicative Plant and Machinery

3.11 Basic Infrastructure and Facilities

The site will be developed with a boundary wall or fence and a controlled gate, a paved internal road and hardstanding for the plant, the stockyard and the loading area, an office and site laboratory for job-mix design and quality control, a workshop and store, a bunded fuel and bitumen storage area, a bore or tube well with an overhead tank, drinking-water points, washrooms and a septic tank with soakage arrangement, a rest and changing area for workers, a first-aid post, and a perimeter greenbelt.

The approach from Faisalabad–Chiniot Road will be surfaced for a sufficient length to prevent tracking of mud and dust onto the public road. Adequate turning space, signage, speed control, traffic-management arrangements, drainage, fire-fighting access, and spill-control facilities will be provided within the project boundary.

3.12 Energy

Electrical power for motors, lighting, and the office will be drawn from the relevant electricity distribution network. A standby diesel generator will be installed to cover outages, since an interruption during a batch cycle leaves hot material in the pug mill and dryer. The generator will be housed in an acoustic enclosure, will exhaust through a stack carried above the enclosure roof, and will be operated only when grid supply fails. Thermal energy for the dryer and the bitumen tank will come from the combustion of high-speed diesel or furnace oil as described earlier.

3.13 Availability of Water

Water will be drawn from a bore or tube well on the site, subject to applicable permissions and sustainable abstraction requirements. The daily requirement is modest, in the range of three to four thousand litres, and is made up of dust suppression on internal roads and stockpiles, make-up water for the wet scrubber, washing of plant and vehicles, and domestic use by the workforce.

Scrubber water will be recirculated from the settling tank so that fresh water is required only to replace evaporation and the volume removed with settled sludge. No process water is consumed in the manufacture of the mix itself. Water abstraction will be limited to actual project requirements, and leakage from tanks, pipes, and taps will be repaired promptly.

3.14 Wastewater Management

The plant generates no process effluent. The three streams requiring management are scrubber blowdown, vehicle and plant washing water, and domestic sewage. Scrubber water will be circulated through a settling tank in which collected fines are allowed to settle and are periodically removed as sludge for use as filler or for disposal at a designated contained location.

Washing water will be routed through an oil-and-grease interceptor before it reaches any soakage point. Domestic sewage will go to a properly constructed septic tank with a soakage pit, sized for the workforce and located away from the tube well, Rasool Nagar Canal, drainage pathways, and neighbouring fields. No effluent of any kind will be discharged to a natural drain, watercourse, Rasool Nagar Canal, or adjoining field.

3.15 Air Emissions and Control

The plant has one principal point source and several diffuse sources. The point source is the rotary dryer exhaust, which carries combustion gases together with entrained mineral dust. The diffuse sources are the aggregate stockpiles, cold-feed and transfer points, screening deck, pug-mill discharge, internal haul roads, truck movement, and the bitumen-tank vent.

The dryer exhaust will be treated in two stages. A cyclone separator acting as a primary knock-out will remove the coarse fraction, which will be returned to the process as filler where its gradation permits. The gas stream will then pass to a wet scrubber, in which fine particulate is captured by intimate contact with a water spray, before being discharged by an induced-draught fan through a stack of not less than fifteen metres in height, subject to final engineering design and regulatory requirements.

The stack will be provided with a sampling port and a safe means of access so that representative sampling can be carried out without improvisation. Diffuse sources will be controlled by enclosing conveyors and transfer points, hooding the screen and the pug mill and venting them into the same extraction system, sprinkling water on roads and stockpiles, paving the internal circulation area, limiting vehicle speed within the site, keeping the drop height at transfer points as low as practicable, and planting a dense perimeter greenbelt.

The greenbelt will help intercept airborne dust at the boundary and will be particularly dense along the side facing nearby agricultural land, settlements, roadside businesses, and receptors along Faisalabad–Chiniot Road.

3.16 Noise

The significant noise sources are the dryer burner and its combustion-air blower, the induced-draught fan, the vibrating screen, the bucket elevators, the wheel loader, the standby generator, pumps, and tippers entering and leaving the site.

All rotating equipment will be mounted on properly designed foundations with vibration isolation where specified by the manufacturer, kept in good repair, and lubricated on schedule, since worn bearings and loose fittings are a common and avoidable cause of elevated noise. The generator will be enclosed acoustically. Operations will be confined to daylight hours so that night-time noise levels in the surrounding area, including nearby settlements and commercial establishments, are not unnecessarily affected.

3.17 Solid and Hazardous Waste

The solid-waste stream is expected to be small. It will consist of collected dust and scrubber sludge, rejected or cooled mix, empty bitumen drums, used oil filters and rags, spent lubricating oil, packaging material, scrap, and domestic refuse from the office and rest area.

Collected dust and scrubber sludge will be returned to the process as filler where the gradation allows, and otherwise used within the site as fill in a contained location or transferred for suitable disposal. Rejected mix will be reused in the surfacing of internal roads and hardstanding.

Empty drums will be returned to the supplier or sold to authorized reconditioners and will not be used for the storage of drinking water, food, livestock feed, or household materials. Spent oil, oily rags, and filters are hazardous waste and will be stored in closed, labelled containers on an impervious plinth and handed over only to collectors authorized to receive them, against a documented record.

Domestic refuse will be collected in covered bins and disposed of through the arrangement approved by the relevant local authority. Open burning of any waste on the site is prohibited without exception. Waste will not be dumped near Rasool Nagar Canal, Faisalabad–Chiniot Road, adjoining agricultural fields, or open drainage.

3.18 Firefighting and Emergency Plans

Hot bitumen, diesel, and furnace oil together make fire one of the most serious credible emergencies at the plant. Dry-chemical and foam extinguishers of appropriate rating will be mounted at the bitumen tank, burner and fuel-storage area, generator room, workshop, office, and other identified risk points. Equipment will be inspected and recharged on schedule.

Sand buckets will be kept at the bitumen and fuel-storage points. A water reserve with a hose connection will be maintained. Fuel and bitumen storage will be bunded to contain the largest vessel within the bund and will be separated from the burner and other sources of ignition by a suitable safe distance.

Smoking will be prohibited throughout the process area, and signage to that effect will be displayed in Urdu and English. A written Emergency Response Plan covering fire, bitumen-burn injury, spill, electrical incident, and vehicle accident will be prepared before commissioning. Emergency drills will be held at least twice a year, with attendance and corrective actions recorded.

The plan will include arrangements for protecting Rasool Nagar Canal and nearby drainage pathways in the event of a spill, fire-water runoff, or other incident with potential environmental consequences.

3.19 Operational Arrangements

The plant will operate in a single shift of eight hours during daylight, on approximately 260 to 280 days in the year. Production is seasonal, falling away during the monsoon and in the coldest part of winter when bituminous laying is restricted or not permitted under applicable specifications.

Batching will be carried out according to the job-mix formula approved for the contract in hand, with routine testing of gradation, binder content, and mix temperature in the site laboratory. A daily log will record production, fuel consumption, bitumen temperature, water use, waste generation, environmental inspections, and any abnormal event such as a burner trip, scrubber stoppage, excessive dust, spill, fire, or traffic incident.

3.20 Land Ownership

The land is private agricultural land held by the proponent under a lease arrangement for the proposed project. No government land, shamilat, common grazing land, or forest land is involved, and no acquisition under the Land Acquisition Act has been required.

No person is being displaced from a residence or from possession of land as a consequence of this project. The final land records and lease documentation will confirm the legal status, boundaries, and occupancy condition of the project parcel. The project will remain strictly within the approved and leased boundary.

3.21 Land Use on Site

Component	**Indicative Area**	**Share of Site**
Plant, control cabin, and pollution-control equipment	0.60 acre	17.14 percent
Aggregate and filler stockyard	0.875 acre	25.00 percent
Bitumen and fuel storage, bunded	0.2625 acre	7.50 percent
Internal roads, hardstanding, and loading area	0.7875 acre	22.50 percent
Office, laboratory, workshop, store, and welfare facilities	0.35 acre	10.00 percent
Greenbelt, boundary setback, and open space	0.625 acre	17.86 percent
Total	**3.50 acres**	**100 percent**

Table 3.3: Indicative Land Use on Site

3.22 Manpower

The plant will employ approximately twenty-two persons in regular operation, with a slightly larger workforce during the installation phase. Preference in recruitment for unskilled and semi-skilled positions will be given to residents of nearby settlements and surrounding areas of District Chiniot.

Category	**Number**
Plant in-charge / site engineer	1
Plant operator and control cabin attendant	2
Environmental and Safety Officer	1
Laboratory technician	1
Wheel loader operator	1
Burner and bitumen attendant	2
Mechanic and electrician	2
Drivers	4
General labour and helpers	6
Security and support staff	2
Total	**22**

Table 3.4: Indicative Manpower Requirement

3.23 Vegetation Feature of the Project Site

The parcel is presently under ordinary agricultural use, with field crops and scattered trees along field boundaries, nearby agricultural tracks, and the approach from Faisalabad–Chiniot Road. There is no natural forest, no plantation of any protected species, and no tree of exceptional age or size identified on the parcel.

Where removal of a boundary tree is unavoidable for the layout, the proponent will obtain any permission required and will plant replacement stock at a ratio of not less than five saplings for each tree removed, in addition to the greenbelt described in Chapter 7. The greenbelt will use suitable indigenous or locally adapted species and will be maintained throughout the operational life of the plant.

3.24 Project Cost

The total capital cost of the project is PKR 15.00 million. The indicative breakdown below includes the provision for environmental protection equipment, which is presented separately in Section 7.14.

Head of Cost	Indicative Amount (PKR)
Asphalt batch mix plant, erection and commissioning	8,000,000
Site development, hardstanding, boundary and internal roads	2,000,000
Air pollution control train, stack and water sprinkling system	950,000
Bitumen and fuel storage with bunding and drip containment	700,000
Electrical connection, standby generator and installation	1,400,000
Office, laboratory, workshop, store and welfare facilities	900,000
Tube well, overhead tank and water distribution	350,000
Firefighting, safety equipment and greenbelt development	420,000
Contingency and pre-operating expenses	280,000
Total Project Cost	15,000,000

Table 3.5: Indicative Project Cost

3.25 Implementation Schedule

Activity	Indicative Duration
Environmental approval and statutory clearances	Month 1 to Month 2
Site preparation, levelling, boundary and internal roads	Month 2 to Month 3
Civil foundations for plant, tanks and structures	Month 3 to Month 4
Erection of plant, pollution control train and stack	Month 4 to Month 5
Electrical work, generator installation and tube well	Month 5
Greenbelt planting along boundary	Month 5, in the planting season
Trial run, stack testing and commissioning	Month 6
Commencement of regular production	Month 6 onward

Table 3.6: Indicative Implementation Schedule

CHAPTER 4: DESCRIPTION OF THE ENVIRONMENT

4.1 General

This chapter records the condition of the environment at the site and in the area around it before the plant is built. The baseline serves two purposes. It allows the significance of the predicted impacts to be judged against what is actually present rather than against an assumed condition, and it provides the reference point against which the monitoring results obtained during operation will later be compared. The study area for the physical and biological baseline was taken as a radius of approximately two kilometres from the site at **Faisalabad–Chiniot Road, Rasool Nagar Canal, near Hassan Murtaza Petroleum, District Chiniot**, extended where necessary to cover the settlements, agricultural areas, commercial establishments, and access routes along the Faisalabad–Chiniot Road.

4.2 Physical Environment

4.2.1 Geological Formation and Seismicity

The site lies within the alluvial plains of the Chenab River basin in District Chiniot, Punjab, forming part of the Upper Indus Plain. The subsurface consists of thick Quaternary alluvium deposited by the rivers and associated drainage systems of Punjab, made up of interbedded sand, silt, and clay with occasional gravel lenses, extending to considerable depth without any exposed bedrock. The ground is generally level and stable and presents no landslide, subsidence, or slope-stability concern. In terms of seismic exposure, central Punjab falls within a zone of low to moderate seismic hazard under the Building Code of Pakistan, well removed from the active thrust belt of northern Pakistan. Plant foundations and the bitumen-tank supports will nevertheless be designed in accordance with the seismic provisions applicable to the project area.

4.2.2 Topography and Physiography

The terrain around the project site is flat to very gently sloping, with the general fall of the land following the regional drainage pattern of the Faisalabad–Chiniot area. Elevation in this part of District Chiniot is generally low and consistent with the alluvial plain. There are no hills, ridges, escarpments, or significant natural depressions within the study area. The surrounding landscape comprises an agricultural mosaic of rectangular fields separated by earthen bunds, irrigation channels, drainage pathways, village tracks, and lines of trees along field boundaries and roads. Scattered settlements, commercial establishments, roadside facilities, and agricultural land occur along Faisalabad–Chiniot Road, including the vicinity of Rasool Nagar Canal and Hassan Murtaza Petroleum.

4.2.3 Soil

The soils of the area are alluvial, deep, moderately well drained, and generally of loam to silt-loam texture. These soils support the agricultural activities characteristic of District Chiniot, including wheat, rice, fodder, maize, sugarcane, and seasonal vegetables, depending on irrigation availability and local farming practices. The soils are generally calcareous, low to moderate in organic matter, and slightly alkaline in reaction. Patches of salinity and sodicity may occur locally where drainage is impeded or irrigation practices are poor. The soils of the project parcel are typical of the surrounding alluvial tract and carry no special soil-conservation designation.

4.2.4 Temperature and Rainfall

The climate of District Chiniot is semi-arid subtropical, with four recognizable seasons: a hot summer from April to June, the monsoon from July to September, a short autumn in October and November, and a cool winter from December to March. Summer daytime temperatures commonly exceed forty degrees Celsius in May and June, while winter nights may fall to around five degrees Celsius. Mean annual rainfall in the district is generally in the range of five hundred to six hundred millimetres, with the greater part occurring during July and August. This seasonal pattern is directly relevant to plant operation because dust generation increases during dry periods, runoff risk increases during heavy rainfall, and asphalt production and delivery may be affected during periods of intense rain and colder winter conditions.

Month	Average Maximum Temperature (°C)	Average Minimum Temperature (°C)	Mean Rainfall (mm)	Seasonal Character
January	19.5	5.0	20	Cool and dry, frequent fog
February	22.5	8.0	28	Mild, occasional western disturbance
March	28.0	13.0	32	Pleasant, spring transition
April	35.0	18.5	18	Dry and warming rapidly
May	40.0	24.0	16	Hot, high thermal stress
June	41.5	27.0	38	Peak summer heat, pre-monsoon dust
July	37.0	27.0	145	Hot and humid, monsoon onset
August	35.5	26.0	135	Humid, heaviest rainfall
September	35.0	23.5	55	Post-monsoon, clearing
October	33.0	17.0	10	Mild and clear
November	27.5	10.5	5	Cool and dry
December	21.0	6.0	15	Cool and dry, fog spells

Table 4.1: Indicative Monthly Climate Profile of the Study Area

4.2.5 Wind and Meteorological Dynamics

Winds in the Faisalabad–Chiniot area vary seasonally. During summer and monsoon months, winds generally occur from easterly, south-easterly, and south-westerly directions, while winter conditions may include north-westerly and westerly winds. Average wind speeds are modest, generally in the range of five to fifteen kilometres per hour, but may increase during pre-monsoon dust events, thunderstorms, and squalls. Calm conditions with shallow inversions may occur during winter nights and mornings, when dispersion of stack emissions and fugitive dust is relatively poor.

The plant layout has taken local wind conditions into account. The stockyard, stack, and major dust-generating components will be positioned and managed to reduce exposure of nearby settlements, roadside receptors, agricultural land, and commercial establishments. The perimeter greenbelt will be made denser along the boundary facing the nearest sensitive receptors and the direction from which dust may be transported toward surrounding land uses.

4.2.6 Hydrology and Water Resources

Surface water in the area is managed through the canal irrigation and drainage network, supplemented by tube wells and local stormwater pathways. Rasool Nagar Canal is located near the proposed project site and is an important water-related feature requiring protection. Other minor drains, irrigation channels, agricultural watercourses, and roadside drainage features may also occur within the wider study area. No canal, distributary, minor, or natural watercourse will be allowed to pass through or be obstructed by the leased project parcel.

The plant will not draw directly from Rasool Nagar Canal and will not discharge process wastewater or contaminated runoff to the canal or any other watercourse. The site drainage design will separate clean stormwater from potentially contaminated runoff generated in fuel-storage, bitumen-storage, workshop, maintenance, and vehicle-washing areas.

Groundwater occurs in the alluvial aquifer at a depth that may generally range from approximately twelve to twenty-five metres below ground level in this tract, subject to seasonal fluctuation and local pumping conditions. Groundwater quality in the region is generally suitable for irrigation and domestic use, although marginal or brackish pockets may occur locally. Protection of groundwater is a principal reason for requiring bunded and impervious fuel, oil, and bitumen storage, proper spill control, and suitable treatment or containment of washing water before any soakage arrangement.

4.2.7 Ambient Air Quality

The baseline air quality around the project site is representative of a mixed agricultural and roadside environment with no major industrial facility immediately adjoining the proposed site. Existing sources of air pollution include vehicle exhaust on Faisalabad–Chiniot Road, dust from unpaved tracks and agricultural activities, soil disturbance during ploughing and harvesting, seasonal burning of crop residue, domestic fuel use, and emissions from local commercial or roadside activities.

Baseline measurements carried out for this study indicate that gaseous pollutants are generally within applicable ambient standards, while particulate concentrations, particularly PM10, may increase during dry, dusty, and pre-monsoon conditions and during winter smog episodes affecting central Punjab. The results of the baseline survey are summarized below.

Parameter	**Observed Baseline Range**	**PEQS Limit (24 hour)**	**Status**
PM10	Within limit in the general period; approaching the limit during dry and smog episodes	150 µg/m³	Compliant, with seasonal sensitivity
PM2.5	Elevated during winter smog episodes in common with the region	35 µg/m³	Regionally sensitive parameter
Sulphur Dioxide (SO2)	Low, with no significant local industrial source	120 µg/m³	Compliant
Nitrogen Dioxide (NO2)	Low to moderate, primarily attributable to road traffic	80 µg/m³	Compliant
Carbon Monoxide (CO)	Low, attributable mainly to road traffic and local combustion	5 mg/m³ (8 hour)	Compliant

Table 4.2: Summary of Baseline Ambient Air Quality

The baseline condition indicates that particulate matter will be the most sensitive air-quality parameter during operation of the asphalt plant. Particular attention will therefore be required for aggregate stockpiles, internal roads, conveyor transfer points, the dryer, the stack, truck movement, and potential cumulative effects with traffic on Faisalabad–Chiniot Road.

4.2.8 Ambient Noise Levels

Noise in the study area is characteristic of a rural and roadside setting. Existing noise sources include tractors and agricultural machinery, tube-well engines, traffic on Faisalabad–Chiniot Road, trucks, motorcycles, roadside commercial activity, and ordinary settlement activity. Measurements taken at the project boundary, along the access route, and at the nearest settlement or sensitive receptor indicate daytime levels generally within the applicable standard for residential areas, with lower night-time levels and occasional short-duration peaks when tractors, trucks, or other vehicles pass.

The absence of an existing continuous industrial noise source in the immediate vicinity means that the plant may introduce a new and noticeable character of sound to the area. For this reason, confinement of operations to daylight hours, equipment maintenance, generator enclosure, and quarterly boundary monitoring will be treated as important environmental controls.

Location	**Day Time Observed**	**Night Time Observed**	**PEQS Limit, Residential**
Project site boundary	Within the residential day limit	Well below the night limit	55 dB(A) day / 45 dB(A) night
Nearest settlement or sensitive receptor	Within the residential day limit	Well below the night limit	55 dB(A) day / 45 dB(A) night
Faisalabad–Chiniot Road and site access area	Short peaks during vehicle passage	Low, occasional vehicle-related noise	55 dB(A) day / 45 dB(A) night

Table 4-3: Summary of Baseline Noise Levels

4.2.9 Water Quality

Groundwater samples were drawn from the tube well serving the project site and from a domestic hand pump or comparable drinking-water source in the nearest settlement along the Faisalabad–Chiniot Road and near the project area. Samples were tested by a certified laboratory for physical, chemical, and bacteriological parameters.

The results indicate water quality generally found in the alluvial tract of District Chiniot. The pH lies within the neutral to slightly alkaline range prescribed by drinking-water standards. Total dissolved solids are moderate and generally within the limits for domestic use. Hardness is on the higher side, which is common in calcareous alluvial soils. Nitrate, chloride, and sulphate are within applicable limits, and no oil, grease, or hydrocarbon was detected, consistent with the absence of existing industrial activity at the proposed site. Bacteriological quality

at the open hand pump was less satisfactory than at the tube well, a condition commonly associated with rural sanitation rather than industrial contamination.

These results establish the reference condition against which any future allegation or indication of contamination from the asphalt plant can be assessed. The baseline is particularly important because the proposed project is located near Rasool Nagar Canal and in an area where groundwater and surface-water resources may support domestic, agricultural, and livestock-related uses.

4.3 Biological Environment

The study area lies within the irrigated plains ecological zone of Punjab. It is a cultivated agricultural and roadside landscape that has been under agricultural use for many years and retains no identified natural habitat of significant conservation value. The biological interest of the area lies mainly in cultivated crops, boundary and roadside tree lines, farmland birds, seasonal wetland-associated species near irrigation features, and common mammals and reptiles found in agricultural environments.

4.3.1 Flora

The dominant vegetation comprises cultivated crops, principally wheat, rice, sugarcane, maize, fodder, and seasonal vegetables depending on the agricultural cycle, irrigation availability, and local farming practices. Tree cover is mainly confined to planted species along field boundaries, agricultural tracks, drainage or irrigation channels, settlement edges, roadside areas, and properties near Faisalabad–Chiniot Road.

Common tree species in the wider area may include shisham, kikar, eucalyptus or sufeda, siris, bakain, neem, jaman, mulberry, ber, and occasional pipal near settlements, roadside locations, or community gathering points. Ground flora consists mainly of agricultural weeds and ruderal species of disturbed land, including bhakra, itsit, congress grass, dhaman, sarkanda, and kana along uncultivated margins, drainage pathways, and field boundaries.

No species listed as threatened or protected, and no species of restricted distribution, was recorded on the project parcel or in its immediate surroundings during the baseline assessment. Existing trees and vegetation within the

project boundary will be retained where practicable. Any unavoidable removal will be subject to applicable permission and replacement plantation.

4.3.2 Fauna

The mammals of the area are those commonly found in cultivated and roadside environments, including jackal, small Indian mongoose, Indian hare, house shrew, field rats, mice, and bats associated with older trees and buildings. Bird life is comparatively rich and represents the most visible component of local wildlife.

Species that may commonly occur in the wider agricultural landscape include house crow, common myna, bank myna, cattle egret, house sparrow, red-vented bulbul, black drongo, little green bee-eater, Indian roller, hoopoe, laughing dove, ring-necked parakeet, black kite, shikra, and occasional kingfishers near watercourses such as Rasool Nagar Canal or irrigation features.

Reptiles may include garden lizard, common house gecko, monitor lizard, rat snake, and other locally occurring snakes. Amphibians may be seasonally common near irrigated fields, watercourses, and temporarily flooded agricultural areas, particularly during and after the monsoon.

No critical habitat, breeding colony, heronry, wetland of national or international importance, or migratory bird concentration was recorded within the study area. Nevertheless, pollution prevention, waste control, and prohibition of hunting or trapping by workers will be required during construction and operation.

4.3.3 Protected Areas and Critical Habitats

No national park, wildlife sanctuary, game reserve, community reserve, Ramsar site, protected forest, or other area carrying a formal conservation designation has been identified within or adjacent to the project site or within the defined study area. The project is therefore not expected to affect a protected area.

No separate wildlife clearance is anticipated on the basis of the current baseline information. If any protected species, nesting site, breeding area, or other feature of conservation importance is identified during construction or operation, work in the relevant location will be stopped or controlled and the relevant Wildlife Department or competent authority will be informed before activities resume.

4.4 Socio-Economic Environment

4.4.1 Demography and Settlement Patterns

The settlement pattern around the proposed project site at Faisalabad–Chiniot Road, near Rasool Nagar Canal and Hassan Murtaza Petroleum, consists of rural settlements, roadside commercial establishments, agricultural holdings, scattered residences, and farm-to-market connections. The surrounding area is predominantly rural and Punjabi-speaking, with Urdu commonly used for official, commercial, and educational purposes.

Household size is generally larger than the urban average, and the population is relatively young, with a substantial proportion below the age of twenty. Settlements and individual houses are distributed along road corridors, agricultural tracks, canal or drainage features, and village access routes. The nearest settlement or abadi, nearby landowners, agricultural workers, roadside businesses, road users, and users of the Rasool Nagar Canal area are the principal social receptors considered in this assessment.

4.4.2 Economic Infrastructure and Local Land Use

Agriculture is the mainstay of the local economy. Farming activities in the surrounding area include wheat, rice, fodder, maize, sugarcane, vegetables, and other seasonal crops supported by canal irrigation, tube wells, and local watercourses. Livestock, particularly buffalo, cattle, goats, and poultry, represents an important supplementary source of household income.

Non-farm employment is provided mainly through small shops, roadside businesses, transport, vehicle repair, construction labour, agricultural support services, employment in nearby towns, and remittances from family members working elsewhere in Pakistan or abroad. Land within the study area is predominantly agricultural, with smaller areas occupied by settlements, commercial activities, roads, canal and drainage corridors, petroleum-related facilities, and other roadside uses.

The industrial land use around the proposed site is limited. The proposed asphalt plant will therefore introduce a new industrial activity into a largely agricultural and roadside setting. This is an important consideration in relation to public perception, dust control, traffic management, visual appearance, employment expectations, and protection of crops and water resources.

4.4.3 Transportation and Public Utilities

The area is served by Faisalabad–Chiniot Road and connecting district, village, agricultural, and farm-to-market roads. The project site will use Faisalabad–Chiniot Road for the delivery of aggregates, bitumen, fuel, plant components, and other materials and for dispatch of finished hot-mix asphalt.

Public transport in the wider area may include wagons, Suzuki pickups, buses, motorcycle rickshaws, and other local transport services. Private transport is largely by motorcycles, cars, tractors, tractor-trolleys, loaders, and agricultural vehicles. Faisalabad–Chiniot Road is shared by commercial vehicles, residents, pedestrians, motorcyclists, farmers, livestock, and local transport operators.

Electricity is supplied through the relevant rural distribution system, with load-shedding and voltage fluctuations possible. Mobile telephone and data coverage is available from the principal operators. Piped water supply is limited in many rural locations, and households may rely on hand pumps, motorized bores, tube wells, or other local sources. Sanitation is commonly provided through on-site systems, soakage pits, septic arrangements, or open drains. Organized solid-waste collection may be limited or unavailable in some surrounding settlements.

4.4.4 Health, Education, and Quality of Life

Primary healthcare for the surrounding population is provided through basic health facilities, rural health centres, private clinics, and local medical practitioners, with referral to larger hospitals in Chiniot, Faisalabad, or other nearby district and tehsil centres for serious conditions.

The prevailing health concerns of the area are those commonly reported in rural Punjab, including waterborne illness, respiratory complaints that may worsen during winter smog, seasonal crop-residue burning, heat stress, diabetes, hypertension, and hepatitis. Occupational exposure, road accidents, and access to emergency services are also relevant considerations for a project involving hot materials, heavy vehicles, fuel, bitumen, and industrial equipment.

Education is provided through government primary, elementary, and secondary schools in nearby settlements, with private schools and colleges available in larger towns and urban centres. Literacy may be higher among men than women, and women’s access to employment and public consultation requires specific attention.

Quality of life is closely linked to agriculture, road access, water availability, livestock, local employment, and household income. Community expectations regarding the proposed asphalt plant are likely to focus on employment and local economic benefits, while concerns will focus on dust, air quality, noise, traffic safety, groundwater, Rasool Nagar Canal, crops, and the safe operation of fuel and bitumen facilities. These expectations and concerns are recorded in Chapter 8 and have shaped the commitments included in Chapter 6 and the monitoring arrangements presented in Chapter 7.

CHAPTER 5: IMPACT ASSESSMENT

5.1 Introduction

This chapter presents the methodology adopted to identify, predict, evaluate, and characterize the potential environmental and social impacts associated with the proposed **Munawar Brothers Asphalt Plant** at Faisalabad–Chiniot Road, near Rasool Nagar Canal and Hassan Murtaza Petroleum, District Chiniot, Punjab.

The project will occupy approximately **3.5 acres** and will involve site preparation, installation of asphalt-production equipment, aggregate storage and handling, aggregate heating/drying, bitumen storage and use, hot-mix asphalt production, loading and dispatch of finished asphalt, internal vehicle movement, and supporting facilities such as an office, workshop, generator, drainage system, and waste-storage areas.

The impact assessment covers the following project phases:

- Pre-construction and design phase.
- Construction and installation phase.
- Commissioning and trial-operation phase.
- Operational and maintenance phase.
- Emergency or accidental-event phase.
- Closure/decommissioning phase, if the plant is permanently removed or relocated.

The assessment addresses impacts on ambient air quality, noise environment, land and soil, drainage and surface water, Rasool Nagar Canal, waste generation, occupational health and safety, traffic, community health and safety, ecology, visual conditions, and socio-economic conditions.

5.2 Methodology for Impact Identification

5.2.1 General Approach

Potential impacts were identified through a systematic review of:

- Proposed project activities and plant components.

- Site location and surrounding land uses.
- Potential environmental receptors within and around the project area.
- Likely emissions, discharges, waste streams, traffic movements, and occupational risks.
- Applicable environmental standards, regulatory requirements, and good international industry practices.
- Information obtained during site reconnaissance and stakeholder consultation.
- The expected interaction between asphalt-plant activities and environmental/social receptors.

The assessment uses a combination of the following impact-identification techniques:

1. Environmental impact screening checklist.
2. Project activity–environmental receptor interaction matrix.
3. Cause-and-effect network analysis.
4. Overlay mapping and GIS-based spatial analysis.
5. Professional judgement and computer/expert-system-supported assessment.

The use of multiple methods is appropriate because checklists help ensure that all relevant environmental components are considered; matrices identify interactions between project activities and receptors; networks trace indirect and secondary effects; and GIS/overlays identify the spatial relationship between the plant, receptors, traffic routes, drainage features, and Rasool Nagar Canal. These are recognized impact-identification approaches in environmental assessment practice.

5.2.2 Environmental Impact Screening Checklist

A structured impact-screening checklist was used as the primary tool for the preliminary identification of likely environmental and social impacts. The checklist considered physical, biological, occupational, community, and socio-economic receptors that may be affected by the project.

The checklist method is useful because it provides a systematic list of environmental components and potential impact areas that must be considered during the assessment. It is especially effective for ensuring that direct impacts, indirect impacts, cumulative impacts, and potential compliance issues are not overlooked.[

The following rating terms have been used:

- **Positive (+):** Beneficial impact.
- **Negative (–):** Adverse impact.
- **No significant impact (NS):** No material impact anticipated or impact is negligible.
- **Low (L):** Limited impact that can be managed through routine controls.
- **Moderate (M):** Impact requiring specific mitigation and monitoring.
- **High (H):** Potentially significant impact requiring strict design controls, management measures, and regular monitoring.

5.2.3 Impact Screening Checklist

Environmental and Social Component	Construction/Installation Phase	Operational Phase	Potential Impact	Preliminary Significance
Land use and site condition	Site clearing, levelling, excavation, storage of materials	Continued industrial use of the 3.5-acre site	Localized alteration of existing land use and soil compaction	L
Topography and drainage	Earthwork and modification of surface levels	Altered runoff pattern due to paved areas, stockpiles, and structures	Localized drainage obstruction, erosion, ponding, or contaminated runoff if poorly designed	M
Soil quality	Fuel, lubricant, paint, and construction-material handling	Bitumen, diesel, used oil, hydraulic oil, and maintenance activities	Soil contamination due to leakage, spills, or improper waste disposal	M
Groundwater	Limited risk during construction	Possible indirect contamination through persistent leaks/spills	Localized risk where containment and drainage are inadequate	L–M
Surface water and canal environment	Sediment-laden runoff during construction	Contaminated runoff, oil/grease, diesel, bitumen, or waste entering drainage and Rasool Nagar Canal	Potential water-quality degradation and ecological impact	H before mitigation; L after mitigation
Ambient air quality	Dust from earthwork, material handling, and vehicle movement	Stack emissions, combustion gases, aggregate dust, fugitive dust, asphalt fumes, and diesel exhaust	Deterioration of local air quality and nuisance to workers/nearby receptors	H before mitigation; M/L after mitigation
Dust deposition	Construction dust and vehicle movement	Aggregate stockpiles, conveyors, loading/unloading, internal roads, and truck movement	Dust deposition on nearby land, vegetation, roadside businesses, and property	M–H before mitigation; L after mitigation
Noise and vibration	Construction machinery, vehicles, installation activities	Mixer, dryer, burner, conveyors, generator, loader, trucks, and maintenance activities	Noise nuisance and worker hearing risk	M before mitigation; L after mitigation
Odour and fumes	Limited, except equipment fuel use	Bitumen heating, asphalt mixing, loading, and storage	Temporary odour/asphalt-fume nuisance and worker exposure	M before mitigation; L after mitigation
Climate and energy use	Fuel consumed by construction equipment	Fuel consumption by dryer/burner, generator, loading equipment, and transport vehicles	Greenhouse-gas emissions and inefficient energy use if equipment is poorly maintained	M
Ecology and vegetation	Minor disturbance to existing vegetation	Dust deposition, traffic, drainage impacts, and possible contamination	Localized effect on roadside vegetation and nearby agricultural land	L–M
Waste generation	Construction debris, scrap material, packaging, domestic waste	Baghouse dust, rejected asphalt, used oil, oily rags, empty containers,	Improper disposal may create soil, air, and water contamination	M

		maintenance waste, and domestic waste		
Hazardous materials	Diesel, lubricants, chemicals, welding gases, paints	Bitumen, diesel, lubricants, used oil, grease, cleaning agents, batteries, and contaminated materials	Fire, spill, worker-exposure, and environmental-contamination risk	H before mitigation; L–M after mitigation
Occupational health and safety	Excavation, lifting, welding, electrical work, machinery installation	Hot bitumen burns, heat stress, dust/fume exposure, noise, fire, moving machinery, slips/trips/falls, and vehicular accidents	Injury, illness, lost-time incidents, or fatality	H before mitigation; M/L after mitigation
Community health and safety	Construction traffic and dust	Plant emissions, noise, dust, odour, truck traffic, and accident risk	Nuisance and safety risk for nearby residents, businesses, farmers, and road users	M–H before mitigation; L–M after mitigation
Traffic and transport	Movement of construction equipment and materials	Regular aggregate trucks, bitumen tankers, hot-mix asphalt delivery trucks, and employee vehicles	Congestion, road-safety risk, dust, road damage, and access issues on Faisalabad–Chiniot Road	M–H before mitigation; M after mitigation
Socio-economic conditions	Temporary construction employment and local procurement	Direct/indirect employment, local procurement, support to road-development activities	Employment generation and improved availability of asphalt for infrastructure works	+M
Visual environment	Temporary construction clutter	Plant structures, stockpiles, trucks, lighting, and signage	Localized visual change from roadside/nearby land	L
Cultural and archaeological resources	Ground disturbance may reveal unknown resources	No material impact expected during routine operation	Chance-find risk during excavation	L
Emergency events	Construction fire, vehicle accident, spill	Fire, explosion, bitumen/fuel spill, baghouse failure, stack-emission excursion, and traffic accident	Low-probability but potentially high-consequence event	H before mitigation; M/L after mitigation

The preliminary screening indicates that the most important impact areas requiring detailed assessment are:

- Stack emissions and fugitive dust.
- Noise and vibration.
- Surface-water protection and prevention of contaminated runoff entering Rasool Nagar Canal.
- Storage and handling of bitumen, fuel, used oil, and other hazardous materials.
- Solid and hazardous-waste management.
- Occupational health and safety.
- Heavy-vehicle movement, traffic safety, and road access.
- Community health, nuisance, and stakeholder concerns.
- Emergency preparedness, including fire prevention and spill response.

5.2.4 Project Impact Evaluation Matrix

A project impact evaluation matrix was prepared to identify interactions between project activities and environmental/social receptors. A matrix is a two-dimensional assessment tool in which project actions are

placed on one axis and environmental components are placed on the other axis. It assists in identifying the relative importance of different activity–receptor interactions.

The following symbols are used in the matrix:

- **H–:** High adverse impact before mitigation.
- **M–:** Moderate adverse impact before mitigation.
- **L–:** Low adverse impact before mitigation.
- **M+:** Moderate beneficial impact.
- **L+:** Low beneficial impact.
- **NS:** No significant impact anticipated.

Project Activity	**Air Quality**	**Noise**	**Soil/Land**	**Water/Canal**	**Ecology**	**Waste**	**OHS**	**Traffic/Community Safety**	**Socio-economic**
Site clearing, levelling, and civil works	M–	M–	M–	M–	L–	M–	M–	M–	L+
Construction-material transport	M–	M–	L–	L–	L–	L–	M–	M–	L+
Equipment installation and commissioning	L–	M–	L–	NS	NS	M–	H–	L–	L+
Aggregate unloading and stockpiling	H–	M–	L–	M–	M–	L–	M–	M–	L+
Aggregate conveying and screening	M–	M–	L–	L–	L–	NS	M–	L–	NS
Aggregate drying and heating	H–	M–	L–	L–	L–	NS	H–	M–	L+
Bitumen heating, pumping, and storage	M–	L–	H–	H–	M–	M–	H–	M–	L+
Asphalt mixing and loading	H–	M–	L–	L–	L–	L–	H–	M–	M+
Generator operation	M–	M–	L–	L–	NS	L–	M–	L–	NS
Internal vehicle movement	M–	M–	L–	L–	L–	NS	H–	H–	NS
Truck loading and dispatch	M–	M–	L–	L–	L–	NS	M–	H–	M+

Workshop and maintenance activities	L–	L–	M–	M–	L–	M–	M–	L–	NS
Waste storage and disposal	L–	NS	H–	H–	M–	H–	M–	L–	NS
Plantation and greenbelt maintenance	L+	L+	L+	L+	M+	NS	NS	L+	L+
Local employment and procurement	NS	NS	NS	NS	NS	NS	L+	L+	M+

The matrix confirms that the most significant potential adverse interactions occur between:

- Aggregate handling, drying, asphalt mixing, and **air quality**.
- Bitumen/fuel handling and **soil/surface-water protection**.
- Plant operation and **occupational health and safety**.
- Truck movement and **traffic/community safety**.
- Waste storage and **land/water quality**.

These interactions will be managed through pollution-control technology, site-layout planning, controlled drainage, waste-management procedures, worker-safety measures, emergency preparedness, and routine environmental monitoring.

5.2.5 Network Analysis

Network analysis was used to identify direct, indirect, and secondary impacts resulting from project activities. A network, also referred to as cause-and-effect analysis, traces the relationship between an initiating project action, its immediate environmental change, and subsequent effects on environmental or social receptors.

A. Air-Quality Impact Network

Aggregate handling / drying / asphalt mixing / truck movement→Dust, particulate matter, combustion emissio ns and fumes→Change in local ambient air quality→Worker exposure, community nuisance, dust deposition o n vegetation/property

Potential secondary effects include reduced worker comfort, respiratory irritation, complaints from nearby communities, dust deposition on crops or roadside businesses, and reduced visibility during very dusty conditions.

B. Surface-Water Impact Network

Fuel, bitumen and usedoil storage / maintenance activities / rainfall runoff→Leakage, spill or contami nated runoff→Contamination of drains, soil or stormwater→Potential transport of pollutants toward Rasool Nagar Canal→Surface-water quality and ecological risk

Potential secondary effects include damage to vegetation, visible oil sheen, odour, public complaints, costly cleanup, regulatory non-compliance, and potential harm to downstream users of the canal.

C. Traffic Impact Network

Aggregate trucks, bitumen tankers and asphalt delivery vehicles→Increased traffic volume and turning movem ents→Congestion, road dust, noise and interaction with local road users→Higher accident risk and community inconvenience

Potential secondary effects include delay to local traffic, road-surface deterioration, obstruction at the site entrance/exit, risk to pedestrians and motorcyclists, and complaints from nearby businesses and residents.

D. Occupational Health and Safety Impact Network

Hot bitumen, rotating machinery, burner, electrical systems, trucks and fuel→Heat, fumes, noise, moving equi pment, fire and spill hazards→Worker exposure and unsafe conditions→Burns, respiratory effects, injury, hear ing damage, fire/explosion or lost-time incidents

The network analysis shows that poor management of one activity may cause multiple secondary impacts. For example, an inadequately maintained baghouse may lead to higher emissions, reduced worker safety, community complaints, regulatory action, and potential interruption of operations. Preventive maintenance and continuous environmental monitoring are therefore essential management measures.

5.2.6 Overlay Mapping and GIS Analysis

Overlay mapping and Geographic Information System (GIS) analysis are proposed to assess the spatial relationship between the project location and environmental/social receptors. GIS and map-overlay techniques combine multiple layers of information such as plant boundaries, roads, settlements, drainage features, canals, agricultural land, and sensitive receptors to identify where potential impacts overlap with vulnerable receptors. Such techniques are useful for determining the spatial distribution of direct, cumulative, and interacting impacts.

The following GIS/map layers should be prepared and incorporated into the final EIA:

- Project-site boundary and coordinates.
- Plant layout, stack location, aggregate stockpiles, bitumen tanks, fuel storage, workshop, waste-storage area, drainage system, and plantation/greenbelt.
- Faisalabad–Chiniot Road, site access road, truck routes, and nearby intersections.
- Rasool Nagar Canal, drainage channels, low-lying areas, and surface-water flow direction.
- Nearby settlements, houses, roadside businesses, agricultural land, mosques, schools, healthcare facilities, and other sensitive receptors.
- Existing land use and land cover.
- Topography, contours, site drainage, and flood-prone areas, where applicable.
- Prevailing wind direction and expected air-dispersion zone.
- Noise-sensitive receptors and applicable buffer distances.

- Existing industrial, commercial, petroleum, or other emission-generating facilities in the local area.

The overlay analysis will be used to:

- Confirm the distance between the project boundary and Rasool Nagar Canal.
- Identify the nearest residential, institutional, commercial, and agricultural receptors.
- Evaluate the suitability of the site entrance and truck-routing arrangement.
- Determine the preferred locations for the stack, dust-control system, fuel/bitumen storage, drainage infrastructure, waste-storage area, and greenbelt.
- Identify areas where dust, noise, traffic, or accidental spills could affect the same receptor cumulatively.
- Establish the appropriate environmental monitoring locations.

5.2.7 Professional Judgment and Computer/Expert-System Support

Professional judgment was applied by environmental specialists to interpret the likely magnitude and significance of project impacts using the project description, site setting, standard industrial practices, baseline observations, stakeholder concerns, and applicable environmental requirements.

Computer-based tools and expert-system support may be used during detailed assessment for:

- Preparation of GIS maps and spatial overlays.
- Calculation of distances between the site and sensitive receptors.
- Identification of drainage direction and runoff pathways.
- Estimation of truck-movement frequency and traffic impact.
- Compilation and interpretation of baseline and monitoring data.
- Air-emission and dispersion screening, where plant capacity, stack dimensions, fuel type, emission rate, and local meteorological data are available.
- Noise-prediction screening, based on equipment sound-power data, operating conditions, and receptor distances.
- Development of environmental monitoring records, compliance registers, and corrective-action tracking.

The final assessment should not rely solely on computer-based predictions. Model outputs must be supported by field data, equipment specifications, engineering controls, baseline monitoring, visual observations, and verification through post-commissioning monitoring.

5.3 Impact Evaluation Criteria

5.3.1 Impact Significance

The significance of an impact has been determined by considering:

- Nature of impact.
- Magnitude or intensity.
- Geographical extent and location.
- Timing and frequency.
- Duration.
- Reversibility.
- Likelihood or risk.
- Sensitivity of the affected receptor.
- Existing baseline conditions.
- Applicable legal standards and regulatory requirements.
- Availability and effectiveness of mitigation measures.
- Residual impact after mitigation.

A potentially significant impact is one that may exceed applicable standards, affect a sensitive receptor, cause irreversible or long-term damage, involve a high-consequence accident, create substantial community concern, or remain moderate/high after practical mitigation is applied.

5.3.2 Impact-Rating Categories

Rating Parameter	Low	Moderate	High
Magnitude	Minor and localized change; remains within normal variation or regulatory limits	Noticeable change requiring specific controls; may approach limits or affect nearby receptors	Major change; may exceed standards, affect sensitive receptors, or require major mitigation
Geographic extent	Confined within the project site	Extends beyond the site to immediate surrounding area	Extends to a wider area, canal/drainage catchment, major road corridor, or multiple communities
Duration	Short-term or temporary	Medium-term, intermittent, or recurring	Long-term, permanent, continuous, or repeated throughout operation
Reversibility	Readily reversible through routine action	Reversible with time, cleanup, restoration, or management effort	Difficult, costly, or impossible to reverse
Likelihood	Unlikely or rare	Possible under foreseeable operating conditions	Likely or expected without effective mitigation
Receptor sensitivity	Low sensitivity; no critical resource affected	Moderate sensitivity; local community, agricultural, or common resource may be affected	High sensitivity; canal/water resource, dense settlement, workers, school, hospital, or ecologically important area may be affected
Residual significance	Negligible or low after mitigation	Moderate after mitigation, requiring continued monitoring	High after mitigation, requiring redesign, additional controls, or avoidance

5.4 Characteristics of Impacts

5.4.1 Nature of Impacts

The impacts associated with the proposed asphalt plant may be beneficial or adverse, direct or indirect, short-term or long-term, reversible or irreversible, and routine or accidental.

Impact Characteristic	Description	Application to the Proposed Project
Beneficial impact	An impact that improves environmental, social, or economic conditions	Local employment, procurement of goods/services, improved availability of asphalt for road construction and maintenance
Adverse impact	An impact that may reduce environmental quality, create risk, or affect health/safety	Dust, stack emissions, noise, traffic risk, spills, waste generation, and worker exposure
Direct impact	Occurs as an immediate result of project activity	Dust from aggregate handling; noise from the mixer; emissions from dryer/burner
Indirect impact	Occurs as a secondary result of a direct impact	Dust deposition on crops; road congestion due to truck movement; community complaints due to odour/noise
Cumulative impact	Results from the combined influence of the project and other existing/planned activities	Combined air pollution, dust, traffic, and noise from the road, nearby petroleum facilities, commercial activity, and other industrial sources

Positive induced impact	Secondary benefit triggered by the project	Indirect employment for transporters, suppliers, maintenance providers, and local businesses
Routine impact	Arises under normal operating conditions	Stack emissions, vehicle exhaust, noise, waste generation, water use, and internal traffic
Accidental impact	Occurs due to malfunction, human error, spill, fire, or other unplanned event	Diesel/bitumen spill, fire, baghouse failure, fuel leak, truck accident, or contaminated runoff reaching the canal

5.4.2 Magnitude of Impacts

Magnitude refers to the intensity or scale of change likely to occur compared with baseline environmental conditions.

Impact Area	**Pre-Mitigation Magnitude**	**Basis of Assessment**	**Expected Residual Magnitude After Mitigation**
Stack emissions and air quality	High	Dryer/burner emissions and asphalt fumes may affect local air quality if the plant lacks effective filtration, a suitable stack, proper fuel, and regular maintenance	Low to moderate, subject to compliant baghouse performance and stack monitoring
Fugitive dust	High	Aggregate unloading, stockpiles, transfer points, unpaved areas, and truck movement can generate substantial dust in dry weather	Low, subject to paving/compaction, water sprinkling, covered transfer points, vehicle-covering, and housekeeping
Noise	Moderate	Operational noise from the dryer, mixer, conveyors, generator, loader, and trucks	Low, subject to equipment maintenance, acoustic enclosure, restricted idling, and PPE
Water and canal contamination	High	A major fuel/bitumen spill or contaminated runoff could affect drains and Rasool Nagar Canal	Low, subject to bunding, impervious flooring, drainage segregation, spill kits, oil-and-grease control, and emergency response
Soil contamination	Moderate to high	Leaks of diesel, used oil, bitumen, and workshop waste may contaminate soil	Low, subject to contained storage, proper waste management, routine inspection, and spill response
Waste generation	Moderate	Baghouse dust, waste asphalt, used oil, oily rags, containers, and domestic waste require control	Low, subject to segregation, reuse/recycling, covered storage, and authorized disposal
Occupational health and safety	High	Hot bitumen, moving equipment, noise, fumes, fire hazards, and vehicle movement can result in serious injury	Low to moderate, subject to HSE procedures, PPE, training, guarding, emergency preparedness, and supervision
Traffic and road safety	Moderate to high	Heavy vehicles may create collision risks, congestion, dust, and turning hazards on Faisalabad–Chiniot Road	Moderate, subject to traffic routing, scheduling, signage, vehicle inspections, speed control, and trained drivers
Socio-economic benefits	Moderate positive	Employment and improved supply of asphalt may support local construction activity	Moderate positive, provided local recruitment and procurement are encouraged

5.4.3 Extent and Location of Impacts

The geographical extent of impacts is determined by the source of impact, wind direction, drainage pathways, truck routes, and location of sensitive receptors.

Impact Type	Likely Extent	Location/Receptors
Land disturbance	Site-specific	Within the 3.5-acre project boundary
Soil contamination	Site-specific to local	Fuel storage, bitumen tanks, workshop, generator area, waste-storage area, loading/unloading points, and drainage channels
Fugitive dust	Local	Plant boundary, internal roads, stockpiles, Faisalabad–Chiniot Road, nearby businesses, agricultural land, and residences within the immediate influence area
Stack emissions and fumes	Local to area-wide, depending on stack height and meteorological conditions	Downwind receptors within the local air-shed; nearest homes, businesses, roadside users, agricultural areas, and workers
Noise	Local	Within the plant, at the site boundary, and at nearby sensitive receptors
Surface-water contamination	Local to downstream	Site drains, stormwater pathways, nearby drainage features, and Rasool Nagar Canal if runoff/spills are not contained
Traffic impacts	Local to corridor-wide	Site entrance/exit, Faisalabad–Chiniot Road, truck routes, intersections, roadside shops, pedestrians, cyclists, and motorcyclists
Employment benefits	Local and regional	Workers, suppliers, transporters, contractors, and local businesses in District Chiniot and surrounding areas

5.4.4 Timing and Frequency of Impacts

Impact	Timing	Frequency
Construction dust and noise	During site preparation, civil works, and plant installation	Intermittent and temporary
Operational dust	Aggregate unloading, stockpiling, conveying, loading, and vehicle movement	Daily during plant operation; higher during dry and windy conditions
Stack emissions	Dryer/burner and generator operation	Continuous or intermittent during production hours
Asphalt fumes and odour	Bitumen heating, asphalt mixing, storage, and loading	Intermittent during production and dispatch
Noise	Equipment operation, truck movement, and maintenance	Recurring during working hours; may be continuous when the plant is operating
Runoff-related risk	Rainfall events, drainage blockage, or spills	Seasonal and event-based; elevated during monsoon or heavy rain
Spill and fire risk	Fuel/bitumen transfer, storage, maintenance, hot work, and equipment malfunction	Low frequency but potentially high consequence
Traffic impact	Delivery of aggregates, fuel/bitumen, and dispatch of asphalt	Daily; potentially greater at peak production and dispatch periods
Employment benefit	Construction and operational phases	Temporary during construction; long-term during operation

The operational schedule should preferably avoid unnecessary nighttime activities, particularly where sensitive receptors are present nearby. Peak truck movements should be planned to avoid high-traffic periods on Faisalabad–Chiniot Road, where feasible.

5.4.5 Duration of Impacts

Duration Category	Definition	Examples for the Proposed Project
Temporary	Limited to a short activity or construction period	Dust from excavation, installation noise, construction waste, and temporary traffic disturbance
Short-term	Lasting days to weeks	Trial-operation emissions, temporary stockpiling, maintenance-related waste, and short-duration road disruption
Medium-term	Lasting months or recurring periodically	Seasonal dust, recurring truck traffic, routine operational noise, and temporary drainage issues during rainfall
Long-term	Continuing throughout the operational life of the plant	Stack emissions, routine dust, traffic, energy consumption, employment, waste generation, and occupational exposures
Permanent	Continuing after project closure unless actively restored	Land-use conversion, long-term soil contamination if unmanaged, and physical structures unless dismantled and site restored

Most construction-phase impacts are temporary and reversible. Operational impacts can be long-term because they recur throughout the life of the plant; however, they can generally be reduced to low or moderate levels through appropriate plant design, maintenance, operational controls, and monitoring.

5.4.6 Reversibility of Impacts

Impact	Reversibility	Explanation
Construction dust and noise	Reversible	Impacts cease once construction is complete and disturbed areas are stabilized
Operational dust and emissions	Reversible/manageable	Can be substantially reduced through baghouse operation, proper fuel, maintenance, water sprinkling, enclosures, and housekeeping
Noise	Reversible/manageable	Can be controlled through silencers, acoustic enclosures, maintenance, operational scheduling, barriers, and PPE
Soil contamination from minor spills	Reversible with cleanup	Requires immediate containment, removal of contaminated soil, and proper disposal
Major soil/groundwater contamination	Potentially difficult to reverse	Cleanup may be costly and time-consuming; prevention is the primary control
Canal contamination	Potentially difficult to reverse	Spills reaching surface water may spread downstream and affect multiple users/resources; strict prevention is essential
Waste accumulation	Reversible	Can be managed through segregation, recycling, authorized disposal, and good housekeeping
Traffic impact	Reversible/manageable	Can be reduced through routing, scheduling, signage, speed limits, parking management, and driver training
Occupational injury	Partly reversible to irreversible	Minor injuries may be treatable; serious injury, disability, or fatality may be irreversible

Employment and economic benefit	Reversible	Benefits may decline if plant operation ceases, although skills development and local business relationships may remain
Land-use change	Partly reversible	Site can be restored after closure, subject to removal of structures and remediation of any contamination

5.4.7 Risk Assessment

Risk is determined by considering the probability of an event and the severity of its consequences.

Risk Level=Likelihood of Occurrence × Consequence Severity

For the purposes of this assessment:

- **Likelihood** is categorized as rare, unlikely, possible, likely, or almost certain.
- **Consequence** is categorized as minor, moderate, major, or severe.
- **Risk level** is categorized as low, medium, high, or extreme.

Hazard/Event	Likelihood Before Controls	Consequence	Initial Risk	Key Controls	Residual Risk
Excessive stack emissions due to baghouse malfunction	Possible	Major	High	Preventive maintenance, pressure-drop monitoring, filter inspection/replacement, emissions testing, standby maintenance arrangements	Low–Medium
Fugitive dust from stockpiles and roads	Likely	Moderate	High	Water sprinkling, defined stockpiles, paved/compacted roads, speed limits, vehicle covering, housekeeping, windbreaks	Low
Diesel, bitumen, or used-oil spill	Possible	Major	High	Bunded storage, impermeable floor, drip trays, supervised transfer, spill kits, trained staff, emergency-response procedure	Low–Medium
Contaminated runoff reaching Rasool Nagar Canal	Unlikely to possible	Severe	High	Separate drainage, runoff control, oil-and-grease trap, drain isolation, no direct discharge, spill containment, rain-event inspection	Low–Medium
Fire or explosion involving fuel/bitumen/hot works	Unlikely to possible	Severe	High	Fire extinguishers, hydrant/water arrangement, hot-work permit, earthing, no-smoking policy, emergency training, safe storage, electrical inspection	Medium
Burns from hot asphalt and bitumen	Possible	Major	High	PPE, insulated gloves, face shields, protective clothing, safe transfer procedures,	Low–Medium

				restricted access, first aid, worker training	
Injury from moving machinery	Possible	Major	High	Machine guarding, lockout/tagout, trained operators, barricading, inspection, permit-to-work system	Low–Medium
Truck collision or pedestrian accident	Possible	Major	High	Traffic-management plan, designated routes, speed limits, spotters, reverse alarms, reflective signage, driver training, parking management	Medium
Hearing loss due to prolonged noise exposure	Possible	Moderate	Medium	Acoustic controls, exposure monitoring, job rotation, hearing protection, medical checks	Low
Improper disposal of hazardous waste	Possible	Moderate to major	Medium–High	Waste segregation, labelled storage, inventory, authorized contractor/recycler, disposal record, staff training	Low
Community complaint due to dust/noise/odour	Possible	Moderate	Medium	Monitoring, operational controls, grievance mechanism, timely corrective action, community liaison	Low–Medium

High-risk issues before mitigation must be controlled through engineering measures, operating procedures, preventive maintenance, worker training, emergency preparedness, supervision, and environmental monitoring. Activities with unacceptable residual risk should be redesigned or restricted until the risk is reduced to an acceptable level.

5.5 Impact Assessment Summary

The following table summarizes the key impacts, their characteristics, and the expected residual significance after mitigation.

Impact	Nature	Magnitude Before Mitigation	Extent	Duration	Reversibility	Risk	Residual Significance After Mitigation
Stack emissions and ambient-air deterioration	Direct adverse	High	Local air-shed/downwind area	Long-term during operation	Reversible/manageable	High	Low–Moderate
Fugitive dust from aggregates and roads	Direct adverse	High	Site and immediate surroundings	Long-term/recurring	Reversible/manageable	High	Low
Asphalt fumes and odour	Direct adverse	Moderate	Site and nearby downwind receptors	Intermittent during operation	Reversible/manageable	Medium	Low
Noise from plant and trucks	Direct adverse	Moderate	Site and immediate surroundings	Long-term/recurring	Reversible/manageable	Medium	Low
Soil contamination from spills	Direct adverse	Moderate–High	Site-specific/local	Event-based; potentially long-term	Reversible with timely cleanup	High	Low
Contaminated runoff affecting canal	Direct/indirect adverse	High	Site drainage and potentially downstream canal area	Event-based; potentially long-term	Difficult if pollutant reaches canal	High	Low–Medium
Waste generation	Direct adverse	Moderate	Site-specific	Long-term/recurring	Reversible/manageable	Medium	Low
Worker exposure/injury	Direct adverse	High	Site-specific	During construction and operation	Partly reversible; serious injury may be irreversible	High	Low–Medium
Fire/explosion	Accidental adverse	High	Site-specific; potential off-site effects	Sudden/event-based	Potentially irreversible	High	Medium
Traffic and road safety	Direct/indirect adverse	Moderate–High	Site access and road corridor	Long-term/recurring	Reversible/manageable	High	Medium
Impact on vegetation/agriculture	Indirect adverse	Low–Moderate	Immediate surrounding area	Long-term if dust is uncontrolled	Reversible/manageable	Medium	Low
Visual impact	Direct adverse	Low	Immediate surroundings	Long-term during operation	Reversible at closure	Low	Low
Employment and local economic activity	Direct/indirect beneficial	Moderate positive	Local/regional	Long-term during operation	Reversible if operations cease	Low	Moderate Positive

5.6 Conclusion

The impact assessment indicates that the proposed asphalt plant has the potential to create moderate to high adverse impacts before mitigation, particularly in relation to **air emissions, fugitive dust, contaminated runoff, protection of Rasool Nagar Canal, hazardous-material handling, occupational health and safety, fire risk, and traffic safety**.

However, most identified impacts are localized, predictable, and manageable through appropriate design, operation, maintenance, and monitoring. The key requirement is that the plant must incorporate effective

engineering and management controls from the beginning of the project, rather than attempting to address impacts after complaints, incidents, or non-compliance occur.

The project should therefore implement the following essential measures:

- High-efficiency baghouse/bag-filter system, properly designed stack, and routine stack-emission testing.
- Dust suppression, controlled aggregate stockpiles, paved/compacted roads, covered trucks, speed limits, and regular housekeeping.
- Bunded and impervious storage for diesel, bitumen, lubricants, used oil, and hazardous waste.
- Separate stormwater drainage, oil-and-grease control where required, spill-containment measures, and absolute prevention of discharge to Rasool Nagar Canal.
- Noise-control measures, including acoustic enclosure for generator equipment, preventive maintenance, and PPE for workers.
- A comprehensive occupational health, safety, fire-prevention, and emergency-response system.
- A traffic-management plan for material deliveries and asphalt dispatch on Faisalabad–Chiniot Road.
- Regular environmental monitoring, inspections, documentation, corrective actions, and a community grievance mechanism.

Subject to the implementation of these mitigation and monitoring measures, the residual impacts of the project are expected to remain low to moderate and environmentally manageable. The assessment methodology draws on standard EIA tools checklists, matrices, networks, overlays/GIS, and computer-supported analysis to identify direct, indirect, spatial, and cumulative effects systematically.

CHAPTER 6: ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

6.1 General

This chapter identifies the environmental, social, and occupational impacts likely to arise from the proposed Munawar Brothers Asphalt Plant at **Faisalabad–Chiniot Road, near Rasool Nagar Canal and Hassan Murtaza Petroleum, District Chiniot**. It evaluates their significance and prescribes measures through which each impact will be avoided, reduced, controlled, restored, or compensated.

Impacts are examined separately for the construction and installation phase, operational phase, and eventual decommissioning phase because the sources of impact and affected receptors vary between these stages. The chapter is intended to serve as a practical management document. Each mitigation measure has therefore been framed so that it can be assigned to a responsible person, included in the project budget, implemented through a defined procedure, and verified through inspection or monitoring.

The project covers approximately **3.5 acres** and will involve aggregate storage and handling, aggregate drying and heating, bitumen storage and mixing, asphalt production, loading and dispatch, internal vehicle movement, maintenance activities, fuel use, waste generation, and supporting facilities. Particular attention has been given to the protection of **Rasool Nagar Canal**, nearby agricultural land, users of Faisalabad–Chiniot Road, surrounding settlements, workers, and neighbouring commercial establishments.

The Environmental Management Plan will form part of the project's environmental compliance system. It will be implemented throughout the project life cycle and updated where monitoring, consultation, changes in plant design, or regulatory requirements indicate that additional controls are required. Punjab environmental guidance recognizes the EMP as a compliance document covering mitigation, monitoring, reporting, and auditing for the life of a project.

6.2 Objectives

The objectives of this chapter are:

- To identify significant sources of environmental, social, and occupational effects arising from the proposed asphalt plant at Faisalabad–Chiniot Road, District Chiniot.
- To trace each potential impact to the environmental or social receptors that could be affected, including Rasool Nagar Canal, agricultural land, nearby communities, road users, workers, and local businesses.
- To evaluate the nature, magnitude, extent, duration, timing, reversibility, likelihood, and significance of each impact before and after mitigation.
- To prescribe mitigation measures that are technically sound, affordable at the scale of the 3.5-acre project, and capable of being sustained throughout the operating life of the plant.
- To identify residual impacts that will remain after mitigation so that monitoring and management effort can be concentrated on the most important issues.
- To define the responsibilities of the proponent, plant manager, Environmental and Safety Officer, contractors, workers, drivers, and third-party laboratories.
- To identify opportunities for environmental and social enhancement beyond basic impact mitigation.
- To provide a framework for environmental monitoring, record keeping, reporting, corrective action, and regulatory compliance.

6.3 Impact Assessment Methodology

6.3.1 Screening of Potential Impacts

Potential impacts were screened on the basis of:

- The location of the project at Faisalabad–Chiniot Road, near Rasool Nagar Canal and Hassan Murtaza Petroleum, District Chiniot.
- The proposed 3.5-acre site and its surrounding land uses.
- The proposed plant layout, equipment, production process, fuel system, bitumen storage, aggregate stockpiles, and traffic arrangements.
- Site reconnaissance and baseline environmental observations.

- Discussions with the proponent's technical and operational staff.
- Environmental and socio-economic information presented in Chapter 4.
- Concerns recorded during the public consultation process.
- Applicable Punjab Environmental Quality Standards, environmental approval conditions, and occupational health and safety requirements.

Each identified impact was characterized according to:

- Its nature: positive or adverse.
- Its relationship: direct, indirect, induced, or cumulative.
- Its magnitude: low, moderate, or high.
- Its extent: site-specific, local, or wider.
- Its timing: construction, operation, maintenance, emergency, or closure.
- Its duration: temporary, intermittent, recurring, or long-term.
- Its reversibility: reversible, partly reversible, or difficult to reverse.
- Its likelihood and potential consequence.
- The sensitivity of the affected receptor.
- Its residual significance after mitigation.

6.3.2 Identification of Mitigation Measures

Mitigation has been identified according to the following hierarchy, applied in descending order of preference:

- **Avoid:** Eliminate the impact at source through site selection, layout, scheduling, or process choice. For example, locating fuel, bitumen, and hazardous-waste storage away from the drainage side of the site and maintaining a safe setback from Rasool Nagar Canal and neighbouring land.
- **Minimize:** Reduce the magnitude, duration, or likelihood of the impact. Examples include installing effective particulate-control equipment, enclosing transfer points, paving internal roads, controlling vehicle speeds, and restricting production to daylight hours.

- **Rectify:** Repair, restore, or clean up after an impact has occurred. Examples include removing contaminated soil after a spill, repairing road damage caused by project vehicles, restoring drainage, and reinstating the site during decommissioning.
- **Compensate:** Offset a residual impact that cannot reasonably be avoided or reduced. For example, replacing any tree removed for the plant layout with multiple suitable indigenous trees.
- **Enhance:** Create a positive benefit beyond simple mitigation. Examples include local employment, local procurement, greenbelt development, approach-road maintenance, and environmental and safety awareness sessions for workers.

6.3.3 Evaluation of Residual Impacts

After implementation of the proposed mitigation measures, most impacts of the project are expected to reduce to a low level. The residual effects requiring continuing management and monitoring are:

- Stack emissions from the aggregate dryer and burner.
- Fugitive dust during dry and windy conditions.
- Bitumen fumes and odour during heating, mixing, storage, and loading.
- Noise at the plant boundary and within designated high-noise work areas.
- Risk of soil or groundwater contamination from fuel, oil, bitumen, or used-oil spills.
- Occupational risk of burns, heat stress, dust exposure, fumes, noise, machinery injury, and fire.
- Heavy-vehicle movement and road-safety risk on Faisalabad–Chiniot Road.
- Potential contamination of drainage or Rasool Nagar Canal during an uncontrolled spill or polluted runoff event.

6.3.4 Identification of Monitoring Requirements

The frequency and scope of monitoring have been set in proportion to the residual significance of each impact. Parameters with a direct health, environmental, or regulatory consequence—such as stack particulate emissions, ambient air quality, workplace conditions, noise, fuel/bitumen storage, and runoff protection—will receive greater monitoring attention.

Monitoring will include:

- Visual inspections and daily operational checklists.
- Stack-emission testing by a competent/certified laboratory.
- Ambient air-quality and noise monitoring.
- Inspection of drainage, bunds, spill-control equipment, and storage areas.
- Waste records and disposal documentation.
- Occupational health and safety inspections.
- Traffic and road-safety inspections.
- Community complaints and grievance records.
- Corrective-action tracking and management review.

The detailed monitoring framework is provided in Chapter 7. Punjab environmental guidance requires monitoring plans to identify parameters, locations, frequencies, applicable standards, responsible personnel or laboratories, and maintenance of monitoring records.

6.3.5 Criteria for Significance

The following significance scale has been used:

- **Negligible or no impact:** An effect that is unapparent or has no discernible consequence for the natural, social, economic, or occupational environment.
- **Low adverse impact:** A slight, localized, temporary, or readily manageable effect.
- **Moderate adverse impact:** An effect that requires specific mitigation and monitoring but can be brought within acceptable limits through the identified measures.
- **Severe adverse impact:** An effect that may cause serious harm or non-compliance and can only be partially controlled unless the activity is redesigned or stopped.
- **Positive or beneficial impact:** An effect that improves environmental, social, economic, or employment conditions.

6.4 Anticipated Potential Environmental Impacts

The impacts anticipated from the proposed Munawar Brothers Asphalt Plant have been classified as direct, indirect, induced, and cumulative. They have also been characterized as positive or adverse; minor, moderate, or major; local or wider; temporary or long-term; and reversible or difficult to reverse.

Most routine impacts are expected to be local in extent and manageable through appropriate engineering and operational controls. The project does not involve a process discharge to Rasool Nagar Canal, permanent impoundment, large-scale excavation, or intentional discharge of wastewater to a watercourse. Nevertheless, accidental spills, contaminated runoff, uncontrolled emissions, poor housekeeping, traffic accidents, and fire could create significant impacts if not prevented and managed.

The most sensitive receptors include:

- Nearby residents and households.
- Agricultural land and crops.
- Businesses and users of Faisalabad–Chiniot Road.
- Workers and contractors at the plant.
- Rasool Nagar Canal and connected drainage pathways.
- Groundwater users and nearby tube wells.
- Pedestrians, motorcyclists, livestock owners, and other road users.
- Local vegetation and farmland birds.

6.5 Impacts Associated with Project Location

The selection of the site at **Faisalabad–Chiniot Road, near Rasool Nagar Canal and Hassan Murtaza Petroleum, District Chiniot** is one of the most important environmental decisions for the project because it determines the receptors exposed to plant emissions, dust, noise, traffic, and accidental events.

The location offers direct access to Faisalabad–Chiniot Road, which is beneficial for the delivery of aggregate, bitumen, fuel, and other materials and for dispatching finished asphalt to road-construction sites. The site is also expected to provide sufficient area for the proposed plant, storage, internal circulation, safety facilities, drainage, and greenbelt within the approximately 3.5-acre project boundary.

The main locational sensitivities are:

- The presence of Rasool Nagar Canal and associated drainage pathways in the wider site vicinity.
- The use of Faisalabad–Chiniot Road by heavy vehicles, pedestrians, motorcycles, agricultural vehicles, and local traffic.
- The presence of agricultural land and farming activities around the project area.
- Potential exposure of nearby residents, roadside businesses, workers, and road users to dust, emissions, noise, odour, and traffic.
- The visual change created by a new industrial facility in an area where agricultural and commercial land uses may currently dominate.

The site layout will therefore maintain a safe setback from boundaries, drainage paths, neighbouring land, and the canal-side direction. Fuel, bitumen, oil, and hazardous-waste storage will be located on impervious surfaces with bunding and spill containment. No project activity will obstruct a natural watercourse or discharge wastewater, oil, bitumen, or contaminated runoff into Rasool Nagar Canal.

Subject to these controls, the locational impact is rated **low adverse before mitigation** and **negligible to low after mitigation**.

6.6 Impacts Associated with Project Design

Several environmental outcomes are determined at the design stage and cannot be effectively corrected later through housekeeping alone. The following design measures have therefore been incorporated into the proposed project:

- A high-efficiency particulate-control system, such as a baghouse/bag-filter system or other approved equivalent, will be provided for the dryer and relevant material-transfer points.
- The stack will be designed with sufficient height, a sampling port, safe access, and suitable engineering specifications to support effective dispersion and compliance testing. The final stack height will be confirmed through engineering design and regulatory requirements rather than assumed without verification.

- The bitumen tanks will be insulated and fitted with thermostatic controls to prevent overheating and minimize fumes and odour.
- Fuel, oil, and bitumen storage will be located on paved impervious surfaces within bunds capable of containing the largest storage vessel with appropriate freeboard.
- Conveyors, transfer points, screens, and mixing areas will be enclosed or hooded where practicable to control fugitive dust and asphalt fumes.
- Internal circulation, loading, and principal plant hardstanding areas will be paved or properly compacted to reduce dust.
- Clean stormwater will be separated from potentially contaminated runoff.
- Drainage from fuel, bitumen, workshop, and vehicle-washing areas will be isolated and treated or contained as appropriate.
- Adequate space will be retained for greenbelt development, emergency access, fire-fighting equipment, waste storage, and safe vehicle movement.
- The site entrance and exit will be designed to minimize conflict with traffic on Faisalabad–Chiniot Road.

Design-related impacts are therefore rated **low**, provided that the design measures are implemented before construction and maintained throughout operation. In this case, design itself is a principal mitigation measure rather than a significant source of impact.

6.7 Impacts of the Construction and Installation Phase

The construction and installation phase is expected to last approximately **five to six months**, subject to final scheduling and procurement. Activities will include site preparation and levelling, boundary construction, civil foundations, installation of the asphalt plant and associated structures, electrical and mechanical work, construction of the office and ancillary facilities, installation of drainage and storage areas, and preparation of internal roads and hardstanding.

The impacts of this phase will generally be temporary and reversible. However, poor construction management could create dust, noise, traffic disruption, waste, spills, safety incidents, and community dissatisfaction.

6.7.1 Air Quality during Construction

Site levelling, excavation for foundations, movement of construction vehicles over unpaved surfaces, handling of cement, sand, aggregate, and soil, and operation of diesel-powered equipment may generate dust and exhaust emissions. The impact is expected to be temporary, local, and of **low to moderate significance**.

Mitigation Measures

- Water will be sprinkled on active work areas and construction access routes at least twice daily and more frequently during dry or windy conditions.
- Cement, fine sand, and other dusty materials will be stored under cover.
- Trucks carrying earth, sand, aggregate, or construction waste will be covered or sheeted.
- Construction machinery will be maintained and will not be left idling unnecessarily.
- High-dust activities will be suspended or modified during strong winds where practicable.
- Construction vehicles will follow controlled routes within the project site.
- Soil and aggregate stockpiles will be located away from the boundary facing nearby receptors and protected against windblown dust.
- The perimeter greenbelt will be planted as early as practicable rather than being postponed until the end of construction.
- Construction personnel will be provided with suitable dust masks where dust cannot be adequately controlled through engineering measures.

6.7.2 Noise and Vibration during Construction

Excavators, concrete mixers, compactors, welding sets, cranes, lifting equipment, and construction vehicles will temporarily increase noise levels at the site and along the access route. The impact is expected to be temporary, local, and of **low significance**, provided that construction is properly scheduled.

Mitigation Measures

- Construction activities will be restricted to daylight hours.
- Equipment will be fitted with functioning silencers and maintained in good working condition.

- Noisy activities will be scheduled to avoid early morning, late evening, prayer times, and other locally sensitive periods where practicable.
- Workers exposed to elevated noise will be provided with hearing protection.
- Vibratory compaction near the project boundary will be minimized and controlled.
- Construction vehicles will avoid unnecessary horn use.
- Complaints regarding noise will be recorded and investigated through the grievance mechanism.

6.7.3 Soil and Water during Construction

Stripping of topsoil, fuel or oil spills from construction equipment, concrete-mixer washing, and disposal of construction wastewater could degrade soil and create a pathway toward nearby drainage or groundwater. The impact is temporary, local, and of **low to moderate significance**.

Mitigation Measures

- Topsoil removed from foundations and building footprints will be stockpiled separately and reused in the greenbelt and landscaped areas.
- Refuelling and equipment maintenance will be carried out only on a prepared impervious surface with drip trays.
- Fuel and lubricant containers will be stored securely and away from drainage pathways.
- Spills will be contained immediately using sand, absorbent material, or a spill kit.
- Contaminated soil and absorbent materials will be collected, labelled, and transferred for suitable disposal.
- Concrete washout will be confined to a lined and designated area.
- Hardened concrete residue will be removed and managed as construction waste.
- No wastewater will be allowed to flow toward neighbouring fields, open land, drains, or Rasool Nagar Canal.
- Construction drainage will be inspected after rainfall.
- The contractor will not block existing watercourses or natural drainage routes.

6.7.4 Construction Waste

Construction will generate excavated earth, broken masonry, steel offcuts, packaging, empty cement bags, used welding rods, scrap timber, domestic waste, and potentially oil-contaminated materials. The impact is temporary and of **low significance** if managed properly.

Mitigation Measures

- Waste will be segregated at source into inert, recyclable, hazardous, and domestic waste streams.
- Excavated earth will be reused on site for levelling, grading, landscaping, or boundary works where technically suitable.
- Steel, cardboard, packaging, and other recyclable materials will be sold or transferred to suitable recyclers.
- Used filters, oil-soaked rags, contaminated absorbents, and chemical containers will be stored in closed, labelled containers.
- Hazardous waste will be handed over only to suitable authorized collectors or disposal facilities.
- Domestic refuse will be placed in covered bins and removed through an approved arrangement.
- Waste will not be buried, dumped near the canal, placed in fields, or burned on site.
- Waste records will be maintained by the contractor and reviewed by the Environmental and Safety Officer.

6.7.5 Occupational Health and Safety during Construction

Work at height during erection of the asphalt plant and stack, lifting operations, welding and cutting, electrical work, excavation, vehicle movement, and operation of construction machinery may result in serious injury. The impact is rated **moderate to severe before mitigation**.

Mitigation Measures

- Task-appropriate PPE will be provided and its use enforced, including helmets, safety footwear, gloves, eye protection, high-visibility clothing, dust masks, and full-body harnesses for work at height.
- Scaffolding, ladders, lifting equipment, cranes, slings, and other equipment will be inspected before use.

- Work at height will be undertaken only by trained workers using suitable fall-protection systems.
- Electrical work will be performed only by qualified electricians under an approved permit-to-work system.
- Excavations will be shored, barricaded, signed, and inspected.
- Hot work will be conducted under a hot-work permit with fire-watch arrangements.
- A trained first aider and stocked first-aid box will be available throughout construction.
- Emergency transport arrangements will be maintained for evacuation to the nearest appropriate health facility.
- Toolbox talks and daily safety briefings will be conducted.
- No child labour will be engaged in any capacity.
- Accidents, near misses, and dangerous occurrences will be recorded and investigated.

6.7.6 Traffic during Construction

Delivery of plant components, structural steel, cement, aggregate, machinery, and construction materials will introduce heavy vehicles onto Faisalabad–Chiniot Road and local access routes. The impact is temporary, local, and of **low to moderate significance**.

Mitigation Measures

- Heavy deliveries will be scheduled outside school opening and closing periods and, where practicable, outside peak agricultural movement.
- Drivers will be briefed on speed control, pedestrians, motorcycles, livestock, agricultural vehicles, and local road conditions.
- Trucks will not be allowed to wait unnecessarily on Faisalabad–Chiniot Road.
- Loads will be covered and secured.
- A flagman or banksman will be used when oversized plant components are manoeuvred.
- Site access and turning areas will be kept clear.
- Vehicles will be checked for roadworthiness and valid documentation.
- Any damage caused to public or local access roads by project vehicles will be investigated and repaired by the proponent in coordination with the relevant authority.
- Traffic complaints will be recorded and managed through the grievance mechanism.

6.8 Impacts of the Operation Phase

The operational phase will be the longest phase of the project and the phase of greatest environmental significance. It is during this phase that the control systems specified in the design must operate effectively and be supported by trained personnel, preventive maintenance, routine inspection, and environmental monitoring.

6.8.1 Stack Emissions from the Aggregate Dryer

The aggregate dryer and burner will be the principal point source of air emissions. The exhaust may contain particulate matter entrained from aggregates and combustion products such as sulphur dioxide, nitrogen oxides,

carbon monoxide, and carbon dioxide. The significance of emissions will depend on plant capacity, fuel quality, burner condition, stack design, filtration efficiency, operating temperature, and maintenance.

The impact before mitigation is rated **high to severe**, and after mitigation is expected to be **low to moderate**, subject to compliance monitoring.

Mitigation Measures

- The dryer exhaust will pass through an effective particulate-control system, preferably a properly designed baghouse/bag-filter system or another technology approved by the competent authority.
- If a cyclone or wet scrubber is included in the final design, it will be used as part of a properly engineered emission-control train and not as a substitute for an effective final particulate-control stage where such stage is required.
- The stack will be designed with an appropriate height, sampling port, safe access platform, and engineering specifications based on the final plant capacity and regulatory requirements.
- The burner will be tuned for the correct air-to-fuel ratio.
- Burner and combustion equipment will be serviced according to a documented preventive-maintenance schedule.
- Fuel of suitable quality will be used. Lower-sulphur fuel will be selected where furnace oil or another liquid fuel is used and is commercially available.
- The dryer will not be operated beyond its rated throughput.
- The baghouse, filters, ducts, fans, and associated controls will be inspected regularly.
- A failure of the primary emission-control system will require controlled shutdown of the affected plant component until the system is restored.
- Stack emissions will be tested by a competent laboratory at the frequency specified in Chapter 7 and compared with applicable Punjab Environmental Quality Standards.
- Results will be retained in the environmental compliance record and corrective action will be taken where results approach or exceed applicable limits.

Punjab Environmental Quality Standards regulate industrial gaseous emissions and effluents, including limits relevant to industrial air pollution and noise.

6.8.2 Fugitive Dust from Material Handling

Aggregate stockpiles, cold-feed bins, conveyor transfer points, screens, loading operations, internal roads, and movement of trucks may generate fugitive dust. Because this dust is released close to ground level, it may be visible and noticeable to nearby residents, agricultural land users, roadside businesses, and road users.

The impact before mitigation is rated **moderate to high**, and after mitigation is expected to be **low**.

Mitigation Measures

- Internal circulation areas, the loading area, and principal plant hardstanding will be paved or properly compacted.
- Internal roads, stockpiles, and exposed surfaces will be sprinkled with water according to a fixed schedule, with increased frequency during dry and windy conditions.
- A water bowser and fixed sprinkler points will be maintained where required.
- Stockpile height will be controlled and stockpiles will be protected with windbreaks, boundary walls, or other suitable measures.
- Fine materials will be stored under cover where practicable.
- Conveyors and transfer points will be enclosed.
- Drop heights will be kept as low as practicable.
- Vehicle speed within the site will be limited to **10 km/hour** and displayed through signs.
- Loaded vehicles will be covered or sheeted before leaving the site.
- The site entrance and public road will be inspected for mud, dust, and material tracking.
- Wheel and body washing will be provided where tracking onto Faisalabad–Chiniot Road is observed.
- A dense perimeter greenbelt of at least two rows will be established, with greater density toward nearby settlements and sensitive receptors.
- Dust complaints will trigger an inspection of stockpiles, roads, sprinkling arrangements, and plant housekeeping.

6.8.3 Bitumen Fumes, Odour, and Hydrocarbons

Bitumen heated to the required working temperature releases vapours and hydrocarbon compounds and produces the characteristic odour associated with asphalt plants. Emissions increase when bitumen is overheated or held at elevated temperatures for long periods. Workers near the mixer, bitumen pump, tanks, and loading area are likely to have the greatest exposure, while odour may be the aspect most likely to generate community complaints.

The impact before mitigation is rated **moderate**, and after mitigation is expected to be **low**.

Mitigation Measures

- Bitumen will be heated under thermostatic control and maintained within the supplier's recommended temperature range.
- Bitumen temperature logs will be maintained for each shift.
- Thermostats and temperature instruments will be calibrated periodically.
- Prolonged heating or holding of bitumen outside production hours will be avoided.
- The pug mill, weigh hopper, mixer, and discharge points will be hooded and connected to a suitable extraction or control system where required.
- Bitumen tanks will be insulated to reduce heat loss and unnecessary heating.
- Tank vents will be directed away from work platforms and nearby receptors.
- Workers in bitumen-handling areas will receive suitable heat-resistant gloves, aprons, face shields, safety footwear, and respiratory protection where exposure assessment requires it.
- Worker rotation will be used to limit individual exposure at high-temperature or fume-generating positions.
- Loaded hot-mix trucks will be covered with suitable sheets to reduce heat loss and fume release during transport.
- Community complaints regarding odour will be investigated promptly and corrective action recorded.

6.8.4 Noise and Vibration during Operation

Operational noise sources will include the burner and combustion-air blower, induced-draft fan, vibrating screen, elevators, conveyors, wheel loader, standby generator, pumps, maintenance activities, and movement of tippers.

Noise levels within the plant may require hearing protection in designated areas. At the boundary, noise is expected to be lower but will require verification through monitoring. The impact before mitigation is rated **moderate within the workplace and low at the boundary**, and after mitigation is expected to be **low**.

Mitigation Measures

- Equipment will be installed on properly designed foundations.
- Vibration isolation will be provided where specified by the equipment supplier.
- The standby generator will be housed in an acoustic enclosure.
- Machinery will be maintained and lubricated according to schedule.
- Worn bearings, loose guards, unbalanced screens, and damaged silencers will be repaired promptly.
- Production will preferably be confined to daylight hours, with no unnecessary night-time operation.
- Hearing protection will be mandatory in designated high-noise areas.
- High-noise areas will be marked with suitable signage.
- Vehicle horns will not be used unnecessarily inside the site.
- Boundary noise will be measured at least quarterly during operation and compared with baseline conditions and applicable standards.
- Any noise complaint will trigger a check of equipment condition, operating hours, generator enclosure, and vehicle activity.

6.8.5 Water Consumption and Wastewater

Water use at the plant will mainly relate to dust suppression, equipment or vehicle washing where required, domestic use, and any wet emission-control system included in the final design. The plant should not generate routine process effluent if the asphalt-production process and drainage system are properly designed.

The main water-related risks are contaminated wash water, oil and grease from vehicle or plant washing, domestic sewage, sediment-laden stormwater, and accidental contamination reaching Rasool Nagar Canal. The impact before mitigation is rated **low to moderate**, and after mitigation is expected to be **low**.

Mitigation Measures

- Water use will be limited to actual operational requirements.
- Dust-suppression water will be applied carefully to prevent excessive runoff.
- If a scrubber is used, scrubber water will be recirculated through a settling tank, with fresh water added only as make-up.
- Settled fines will be removed periodically and reused as process material where technically suitable or stored in a contained area.
- Washing water will pass through an oil-and-grease interceptor where vehicle or equipment washing is undertaken.
- The interceptor will be cleaned according to a documented schedule.
- Recovered oil and oily sludge will be managed as hazardous waste.
- Domestic sewage will be directed to a properly designed septic tank and soakage system, located at a safe distance from the site tube well and drainage pathways.
- The septic tank and soakage arrangement will be inspected and maintained.
- No effluent, wash water, oil, bitumen, or contaminated runoff will be discharged to fields, open land, drains, or Rasool Nagar Canal.
- Clean stormwater and potentially contaminated runoff will be kept separate.
- Drainage channels will be inspected before and after significant rainfall.
- Water consumption and any wastewater generated will be recorded.

6.8.6 Soil and Groundwater Contamination

Potential contamination pathways include spillage or overflow during delivery and transfer of bitumen, leakage from fuel tanks or pipework, leaking pumps or flanged joints, careless disposal of used lubricating oil, poor storage of hazardous waste, and discharge of oily washing water onto unpaved ground.

The impact before mitigation is rated **moderate**, with potentially serious consequences if contamination reaches groundwater or Rasool Nagar Canal. After mitigation, the impact is expected to be **low**.

Mitigation Measures

- All fuel, oil, bitumen, and hazardous-material storage will be placed on impervious paved surfaces within suitable bunds.
- Bund capacity will be designed to contain the largest storage vessel with adequate freeboard.
- Drip trays will be installed beneath pumps, valves, joints, transfer points, and other potential leakage points.
- Fuel and bitumen transfer operations will remain attended and will not be left unsupervised.
- Flexible hoses, pipework, valves, pumps, and tanks will be inspected regularly.
- A spill kit containing sand, absorbent material, shovels, gloves, and recovery drums will be maintained near storage and transfer areas.
- Workers will be trained in spill prevention, containment, reporting, and cleanup.
- Any spill will be contained immediately and prevented from entering drains or the canal.
- Contaminated soil will be excavated and managed as hazardous waste rather than being mixed back into the ground.
- Used oil will be collected in closed, labelled drums on an impervious plinth and transferred only to suitable authorized collectors against a record.
- Underground fuel storage will not be used unless specifically justified, approved, and designed with appropriate leak detection and protection.
- Groundwater from the site tube well will be tested at least annually against the baseline parameters established in Chapter 4, or more frequently if required by the regulatory authority or an incident occurs.
- The site drainage system will be inspected after heavy rainfall and after any spill or fuel-transfer incident.
- No contaminated water will be allowed to enter Rasool Nagar Canal, nearby fields, or open drainage.

6.8.7 Solid and Hazardous Waste during Operation

Operational waste will include collected dust, filter material, scrubber sludge if applicable, rejected or cooled asphalt mix, empty bitumen containers, used oil, used filters, oily rags, worn parts, scrap metal, packaging, and domestic refuse.

The impact before mitigation is rated **low to moderate**, and after mitigation is expected to be **negligible to low**.

Mitigation Measures

- Waste will be segregated at source into reusable, recyclable, domestic, and hazardous streams.
- A waste register will record the type, quantity, reuse, recycling, storage, transfer, and disposal of waste.
- Collected dust and scrubber sludge will be returned to the process as filler where technical specifications permit.
- Rejected or cooled asphalt mix will be reused for internal roads, hardstanding, or other technically suitable applications.
- Empty bitumen drums will be returned to the supplier or transferred to authorized reconditioners.
- Empty bitumen containers will not be released for storage of drinking water, food, livestock feed, or household use.
- Used oil, filters, oily rags, contaminated absorbents, and chemical containers will be stored as hazardous waste in labelled, covered containers on an impervious surface.
- Hazardous waste will be transferred only to suitable authorized collectors or disposal facilities.
- Scrap metal and packaging will be sold or transferred to recyclers.
- Domestic refuse will be placed in covered bins and removed through an arrangement approved by the local authority.
- Open burning, burial, or dumping of waste near the project boundary, agricultural land, road, or Rasool Nagar Canal is prohibited.
- Waste storage areas will be inspected regularly for leakage, odour, windblown material, and unauthorized access.

6.8.8 Energy Use and Greenhouse-Gas Emissions

The dryer burner is expected to be the dominant energy consumer and source of carbon dioxide emissions. Fuel use and greenhouse-gas emissions will depend on aggregate moisture, burner condition, plant loading, fuel quality, bitumen temperature, vehicle idling, and equipment maintenance.

The impact is rated **low**, but energy efficiency will reduce both operating costs and emissions.

Mitigation Measures

- The burner will be tuned and serviced to maintain efficient combustion.
- The dryer shell, ducts, and bitumen tanks will be insulated to reduce heat loss.
- Aggregates will be stockpiled and managed to minimize unnecessary exposure to rainwater and moisture.
- The plant will not be operated beyond its rated production capacity.
- Vehicles and generators will not be left idling unnecessarily.
- Fuel consumption per tonne of asphalt produced will be recorded monthly.
- Fuel-use records will be reviewed to identify deterioration in burner or equipment efficiency.
- Energy-efficient motors and equipment will be selected where practicable.
- The perimeter greenbelt will provide a modest carbon benefit and a significant visual, dust, and local-amenity benefit.
- Preventive maintenance will be used to reduce energy losses, excessive smoke, and unplanned shutdowns.

6.8.9 Impacts on the Biological Environment

The biological impacts are expected to be limited because the proposed site is intended for an asphalt plant and no protected area or critical habitat has been identified in the project description. Potential impacts may include removal of boundary vegetation, dust deposition on nearby vegetation and crops, disturbance to farmland birds, and localized disturbance from noise and plant activity.

The impact before mitigation is rated **low**, and after mitigation is expected to be **neutral to positive**.

Mitigation Measures

- Removal of existing trees and vegetation will be avoided where the final layout permits.
- Where removal of a tree is unavoidable, the required permission will be obtained and replacement plantation will be undertaken at a suitable ratio, preferably not fewer than five saplings for each tree removed, subject to applicable requirements.
- Dust-control measures will reduce deposition on neighbouring crops and vegetation.
- A perimeter greenbelt will be planted using suitable indigenous or locally adapted species, such as shisham, kikar, neem, sukhchain, jaman, and bakain, subject to local suitability and irrigation requirements.
- Greenbelt plants will be protected, watered, maintained, and replaced where mortality occurs.
- Hunting, trapping, or killing of birds and other wildlife by workers will be prohibited.
- Artificial lighting will be directed toward operational areas and minimized at the boundary.
- Waste, food scraps, and other materials that may attract animals will be properly managed.

6.8.10 Socio-Economic and Community Impacts

Employment and Local Economy

The plant is expected to provide direct employment for plant operators, drivers, technicians, maintenance workers, security personnel, administrative staff, and other workers. It will also create indirect employment in transport, aggregate supply, equipment maintenance, local services, and general procurement.

This is a **positive impact of moderate significance**.

Enhancement Measures

- Preference will be given to qualified residents of nearby settlements and surrounding chaks for unskilled and semi-skilled employment.
- Recruitment criteria will be communicated openly through local representatives to reduce perceptions of favoritism.
- Local transporters, mechanics, suppliers, and service providers will be used where practicable.

- Workers will receive training in asphalt production, plant safety, environmental management, emergency response, and equipment maintenance.
- Employment records will distinguish local and non-local recruitment for management review.

Induction of Labour and Social Friction

The arrival of outside workers may create social friction if local residents believe employment opportunities have not been distributed fairly. The impact before mitigation is **low to moderate**, and after mitigation is expected to be **low**.

Mitigation Measures

- Local recruitment will be maximized where qualified workers are available.
- All workers and contractors will be briefed on expected conduct toward residents, farmers, businesses, road users, and local representatives.
- Workers will be prohibited from creating disturbances, trespassing on neighbouring land, interfering with agricultural activities, or using village facilities in a manner that causes offence.
- The project grievance mechanism will be used to manage complaints and prevent disputes from escalating.
- Security personnel will be trained to deal respectfully with community members and road users.

Community Health

The main community-health pathways are dust, combustion emissions, asphalt fumes, noise, traffic, fire risk, and possible water contamination. Dust may aggravate existing respiratory conditions, while odour may cause discomfort and concern even where it does not cause a measurable health effect.

The impact before mitigation is **moderate**, and after mitigation is expected to be **low**.

Mitigation Measures

- The plant will be maintained in a clean and orderly condition.
- Dust, emissions, odour, and noise will be monitored according to Chapter 7.

- Complaints from communities around Faisalabad–Chiniot Road, Rasool Nagar Canal, Hassan Murtaza Petroleum, and nearby settlements will be investigated promptly.
- No contaminated water or waste will be discharged toward groundwater, agricultural land, drainage pathways, or Rasool Nagar Canal.
- Heavy vehicle movement will be controlled to reduce community road-safety risk.
- The emergency-response plan will include arrangements for informing nearby stakeholders in the event of a fire, major spill, or other incident with potential off-site consequences.
- The community grievance mechanism will be maintained throughout operation.

Worker Health and Safety

Worker health and safety is the most important operational impact. Bitumen is handled at high temperatures, and contact with hot bitumen can cause deep burns. Other hazards include heat stress during the hot season, respirable mineral dust, hydrocarbon fumes, noise-induced hearing loss, entanglement in conveyors and elevators, burns from hot surfaces and ducts, electrical hazards, vehicle accidents, fire, and slips or falls.

The impact before mitigation is rated **severe**, and after mitigation is expected to be **low to moderate** because occupational risk can be substantially reduced but not completely eliminated.

Mitigation Measures

- Written safe operating procedures will be prepared for bitumen handling, dryer start-up and shutdown, hot-surface work, equipment isolation, loading, and maintenance.
- Procedures will be explained to workers in Urdu or Punjabi, supported by practical demonstrations.
- Heat-resistant gloves, aprons, face shields, safety footwear, helmets, dust masks, organic-vapour respirators where required, and hearing protection will be provided free of charge.
- PPE use will be supervised and enforced.
- Conveyors, elevators, drive shafts, pulleys, and other moving components will be guarded.
- Guards will not be removed during operation and will be replaced after maintenance.
- Hot pipework, ducts, tanks, and other exposed surfaces will be insulated or guarded.
- Emergency eyewash and a cold-water shower will be installed near the bitumen-handling area.

- Drinking water, shaded rest areas, and rest breaks will be provided, particularly during hot weather.
- Work will be scheduled away from the hottest hours where production requirements allow.
- A first-aid post with a trained first aider and stocked equipment will be maintained.
- Emergency transport will be available for evacuation to the nearest suitable hospital or health facility.
- Pre-employment and periodic medical examinations will be arranged, including respiratory screening for workers exposed to dust or fumes.
- All accidents, near misses, occupational illnesses, and dangerous occurrences will be recorded and investigated.
- Workers will receive induction training, refresher training, toolbox talks, and emergency drills.
- Contractors will be required to comply with the project's health, safety, and environmental requirements.

Traffic and Road Safety

Loaded tippers carrying aggregates, bitumen tankers, fuel vehicles, and hot-mix delivery trucks will use Faisalabad–Chiniot Road and other local roads shared with pedestrians, livestock, motorcycles, tractor-trolleys, agricultural vehicles, and commercial traffic.

The impact before mitigation is rated **moderate**, and after mitigation is expected to be **low to moderate**.

Mitigation Measures

- A speed limit will be enforced within the site and near the site entrance.
- Heavy vehicles will be scheduled to avoid school opening and closing times and periods of high local traffic where practicable.
- All aggregate and other dusty loads will be covered.
- Vehicle overloading will be prohibited.
- Drivers will receive induction and periodic briefings on local road conditions, pedestrians, livestock, motorcycles, and agricultural traffic.
- Driver licences, vehicle fitness, tyres, lights, brakes, and safety equipment will be checked.
- Reversing alarms and suitable spotters will be used where required.
- Trucks will not park unnecessarily on Faisalabad–Chiniot Road.

- Internal parking, loading, and turning will occur within the project boundary.
- The proponent will coordinate with relevant authorities regarding road access and any damage caused by project vehicles.
- Any verified damage to local roads caused by project traffic will be repaired by the proponent or addressed through an agreed arrangement.
- Traffic complaints and incidents will be recorded and reviewed.

Security

The presence of fuel, bitumen, machinery, and heavy equipment on a roadside industrial site may create risks of theft, vandalism, unauthorized entry, and access by children.

The impact is rated **low**.

Mitigation Measures

- The project boundary will be secured with a suitable fence or wall and controlled gate.
- Security staff will be deployed during and outside operating hours as required.
- Storage areas will be adequately illuminated without causing unnecessary glare toward neighbouring properties or Faisalabad–Chiniot Road.
- Fuel, bitumen, tools, and hazardous materials will be kept secured.
- The plant and stores will be locked outside working hours.
- Warning signs will be displayed in Urdu and, where appropriate, Punjabi or English.
- Unauthorized access to operational areas will be prohibited.

Emergency Response

The credible emergencies include:

- Fire in the fuel, bitumen, generator, or electrical area.
- Bitumen burn or other serious worker injury.
- Major fuel, oil, or bitumen spill.
- Vehicle accident at the site entrance or on Faisalabad–Chiniot Road.

- Electrocution or electrical fire.
- Failure of the dust-control system.
- Contaminated runoff following a major spill or heavy rainfall event.

A written Emergency Response Plan will be prepared before commissioning. It will identify:

- Alarm and communication arrangements.
- Emergency assembly point.
- Roles and responsibilities of named personnel.
- Locations of fire extinguishers, fire-fighting equipment, spill kits, first-aid equipment, eyewash, and emergency showers.
- Contact numbers for Rescue 1122, the nearest hospital, local fire service, police, District Administration Chiniot, and relevant project representatives.
- Procedures for isolating fuel, bitumen, electricity, and plant equipment.
- Procedures for preventing spilled material from reaching Rasool Nagar Canal or local drainage.
- Arrangements for notifying the Environmental Protection Agency of incidents with environmental consequences.
- Procedures for recording, investigating, and reporting incidents.

Emergency drills will be conducted at least twice each year, with attendance, observations, shortcomings, and corrective actions recorded.

6.9 Impacts of the Decommissioning Phase

The project land is expected to be held under a lease arrangement, and the plant may be dismantled, relocated, or retained at the end of the lease period, subject to renewal and regulatory approvals. Decommissioning may involve dismantling of the asphalt plant, removal of tanks, pipework, conveyors, burners, generators, structures, hardstanding, and waste materials.

Poorly managed decommissioning could leave behind contaminated soil, bitumen residues, oil, redundant foundations, waste metal, abandoned drums, and blocked drainage. The impact before mitigation is rated **moderate**, and after mitigation is expected to be **low**.

Mitigation Measures

- A Site Restoration and Decommissioning Plan will be prepared before closure and submitted to the competent environmental authority where required.
- All tanks, pipework, pumps, and vessels will be drained, cleaned, and removed rather than abandoned.
- Residual bitumen, oil, sludge, contaminated absorbents, and hazardous waste will be removed through suitable authorized collectors.
- Storage, refuelling, workshop, and maintenance areas will be inspected for soil contamination.
- Contaminated soil will be excavated, tested where required, and managed appropriately.
- Foundations and hardstanding will be removed where the land is to return to agricultural or other former use, subject to the agreement with the landowner and applicable requirements.
- Stockpiled topsoil will be reinstated.
- Drainage pathways will be restored and left free of obstruction.
- Greenbelt trees will be retained and transferred to the landowner where practicable.
- Scrap metal, equipment, and reusable material will be sold or transferred to recyclers or suitable buyers.
- Empty containers will not be abandoned or released for unsafe domestic use.
- The land will be handed back to the lessor in a condition suitable for its agreed future use.
- Photographic records, waste-transfer documents, soil-inspection results, and restoration records will be retained.

6.10 Potential Environmental Enhancement Measures

The following enhancement measures will be implemented where technically and financially feasible:

- Development of a perimeter greenbelt consisting of at least **250 indigenous or locally suitable trees**, subject to final site layout, available plantation area, irrigation, and applicable permissions.

- Greater plantation density along the side facing nearby settlements, agricultural land, and receptors near Faisalabad–Chiniot Road.
- Participation by the proponent in plantation along the project approach road and suitable community or village common areas in coordination with local representatives.
- Recovery and reuse of collected dust as mineral filler, where the gradation and product-quality requirements permit.
- Reuse of rejected or cooled asphalt mix for internal roads, hardstanding, or other suitable site works.
- Recirculation of scrubber water if a wet-control system forms part of the final approved design, reducing fresh-water abstraction.
- Preferential recruitment of local residents and on-the-job training in plant operation, laboratory testing, equipment maintenance, environmental controls, and occupational safety.
- Local procurement of ordinary supplies, transport, maintenance, and support services where practicable.
- Maintenance or repair of the project approach road where damage is demonstrably caused by project vehicles and subject to coordination with the relevant authority.
- Provision of environmental, safety, traffic, and community-conduct awareness sessions for the workforce.
- Installation of Urdu safety and environmental signage at the main gate, storage areas, traffic points, emergency equipment, and restricted areas.
- Maintenance of a visible and accessible community grievance mechanism for residents and businesses near Faisalabad–Chiniot Road, Rasool Nagar Canal, Hassan Murtaza Petroleum, and surrounding areas.
- Development of a site cleanliness and housekeeping programme so that dust, waste, oil, and material spillages do not become a continuing source of public concern.

6.11 Responsibilities for Implementation

The proponent will have overall responsibility for implementation of this chapter and the Environmental Management Plan. The following responsibilities will apply:

- **Proponent/Project Manager:** Provide resources, approve mitigation budgets, ensure regulatory compliance, and review environmental performance.

- **Plant Manager:** Implement operational controls, maintain equipment, enforce working procedures, and ensure that production does not compromise environmental or safety requirements.
- **Environmental and Safety Officer:** Conduct inspections, maintain records, coordinate monitoring, manage complaints, investigate incidents, deliver training, and report non-compliance.
- **Construction Contractor:** Implement construction-phase controls, provide PPE, manage waste, control dust/noise, and comply with the approved construction environmental requirements.
- **Maintenance Supervisor:** Maintain burners, filters, conveyors, pumps, tanks, generators, drainage, fire equipment, and spill-control equipment.
- **Transport Contractor/Drivers:** Comply with speed limits, vehicle-covering, route requirements, loading limits, road-safety procedures, and driver conduct requirements.
- **Workers:** Follow safe operating procedures, use PPE, report hazards, prevent spills, and participate in training and emergency drills.
- **Third-Party Laboratory:** Conduct environmental testing using appropriate methods and provide signed reports suitable for compliance records.

6.12 Conclusion

The proposed asphalt plant at Faisalabad–Chiniot Road, near Rasool Nagar Canal and Hassan Murtaza Petroleum, District Chiniot may create adverse impacts related to air emissions, fugitive dust, bitumen fumes, noise, traffic, hazardous-material storage, waste, occupational safety, and accidental spills. The most sensitive environmental receptors are nearby communities, agricultural land, groundwater users, road users, workers, and Rasool Nagar Canal.

The impacts are generally localized and manageable through appropriate design, pollution-control systems, drainage protection, spill prevention, traffic management, occupational safety procedures, emergency preparedness, environmental monitoring, and community engagement. The most important commitments are the installation and maintenance of effective particulate control, paving and dust suppression, bunded fuel and bitumen storage, protection of local drainage and Rasool Nagar Canal, safe handling of hot bitumen, controlled vehicle movement on Faisalabad–Chiniot Road, and timely response to community complaints.

Subject to implementation of this Environmental Management Plan and the monitoring programme presented in Chapter 7, residual environmental and social impacts are expected to remain low to moderate and manageable throughout construction, operation, maintenance, and eventual decommissioning.

CHAPTER 7: ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

7.1 General

This chapter sets out the Environmental Management Plan for the installation and operation of the asphalt hot mix plant, together with the monitoring programme by which its effectiveness will be judged. The Plan translates the mitigation measures identified in Chapter 6 into assigned responsibilities, defined actions and measurable checks. It is intended to be kept at the site office as a working document, referred to during daily operation and produced for inspection, rather than filed once and forgotten.

7.2 Objectives of the Environmental Management Plan

- To ensure that every mitigation measure committed to in this report is actually implemented, by whom and by when.
- To keep the emissions, effluent and noise of the plant within the limits prescribed by the Punjab Environmental Quality Standards throughout its operating life.
- To protect the health and safety of workers and of the surrounding community.
- To provide a documented basis on which compliance can be demonstrated to the Environmental Protection Agency, Punjab.
- To provide a means of detecting deterioration in performance early, while it can still be corrected cheaply.
- To provide the community with a defined route for raising and resolving grievances.

7.3 Management Approach

The approach adopted rests on four principles. First, prevention at source is preferred to treatment, which is why the design commitments in Section 6.6 carry as much weight in this Plan as the operating procedures. Second, responsibility is assigned to a named position rather than to the organization in the abstract, because a duty that belongs to everyone belongs to no one. Third, every control has an associated record, since an unrecorded inspection cannot be verified. Fourth, the Plan is reviewed annually and after any incident, and is amended where experience shows a measure to be ineffective or impractical.

7.4 Components of the EMP

- The mitigation plan, setting out each activity, its potential impact, the mitigation measure, the implementing body and the supervising authority.
- The monitoring plan, setting out parameters, methods, locations, frequency and responsibility.
- The institutional arrangement, defining who within the organization is accountable for what.
- The training programme for workers and supervisors.
- The documentation and reporting system, including registers, logs and periodic reports to the regulator.
- The emergency response plan and the grievance mechanism.
- The budget allocated to environmental management.

7.5 Environmental Management Plan

Table 7.1 lists the mitigation measures identified in Chapter 6 against the activity that gives rise to the impact, together with the implementing body and the supervising authority.

Project Activity	Potential Impact	Extent	Mitigation Measures	Implementing Body	Supervision
Site preparation and civil works	Dust, noise, soil disturbance, spillage	Site level, temporary	Twice daily water sprinkling; sheeted material vehicles; daylight working only; topsoil stripped and stockpiled for reuse; refuelling on impervious surface with drip tray; lined concrete washout pit	Civil contractor	Environmental and Safety Officer
Erection of plant, stack and structures	Fall from height, lifting accident, electrical and welding hazard	Site level, temporary, high consequence	Full body harness and helmets for work at height; inspection of scaffolding and lifting gear; permit to work for electrical tasks; qualified electrician only; trained first aider and evacuation transport on site	Erection contractor	Site Engineer and Proponent
Aggregate drying in rotary dryer	Particulate matter, SO2, NOx, CO, smoke	Point source, long term, high before control	Cyclone followed by wet scrubber; stack not less than 15 m with sampling port and access; burner tuning and scheduled	Plant Operator	Environmental and Safety Officer and Proponent

Project Activity	Potential Impact	Extent	Mitigation Measures	Implementing Body	Supervision
			servicing; low sulphur fuel; no overloading beyond rated throughput; dryer shut down if scrubber stops		
Aggregate stockpiling, feeding and conveying	Fugitive dust at low level	Site and adjoining land, long term	Paved circulation area and hardstanding; daily sprinkling of roads and stockpiles; enclosed conveyors and transfer points; reduced drop height; limited stockpile height; fine material under cover; perimeter greenbelt	Plant Operator and Loader Operator	Environmental and Safety Officer
Bitumen storage, heating and mixing	Hydrocarbon fume, odour, burn injury, fire	Site level with odour extending beyond boundary, long term	Thermostatic temperature control with shift-wise temperature log; insulated tanks; hooded and vented pug mill and weigh hopper; organic vapour respirators, heat resistant gloves, aprons and face shields; eyewash and cold water shower nearby; no prolonged holding at working temperature	Burner and Bitumen Attendant	Environmental and Safety Officer
Fuel and oil storage and handling	Soil and groundwater contamination, fire	Site level, long term, high consequence	Paved impervious bunded storage containing the largest vessel with freeboard; drip trays at every pump, valve and joint; attended transfers; spill kit at storage point; no underground tanks; separation from ignition sources	Store In-charge	Environmental and Safety Officer
Operation of screen, elevators, fans and generator	Noise and vibration	Site level with limited boundary effect, long term	Vibration isolated foundations; acoustic enclosure for generator; scheduled maintenance and lubrication; marked high noise zones; mandatory hearing protection; daylight operation only; no vehicle horns on site	Plant Operator and Mechanic	Environmental and Safety Officer
Washing of plant and vehicles	Oily wastewater,	Site level, long term	Designated paved washing bay; oil and grease interceptor	Plant Operator	Environmental and Safety Officer

Project Activity	Potential Impact	Extent	Mitigation Measures	Implementing Body	Supervision
	soil contamination		cleaned on schedule; recovered oil handled as hazardous waste; no washing on open ground		
Scrubber operation	Sludge generation, water consumption	Site level, long term	Recirculation from settling tank; periodic desludging; fines returned to process as filler where gradation permits; make-up water only	Plant Operator	Environmental and Safety Officer
Waste generation and disposal	Land contamination, nuisance, hazardous waste release	Site and local, long term	Segregation at source; waste register of quantities generated, reused, sold and disposed; hazardous waste in closed labelled containers on impervious plinth to authorized collectors only; drums returned to supplier or reconditioner; absolute prohibition on open burning	Store In-charge	Environmental and Safety Officer
Transport of aggregate, bitumen and hot mix	Dust, exhaust emission, road safety, road damage	Approach road and village roads, long term	Sheeted loads; 10 km per hour limit within site; movement scheduled away from school opening and closing; driver briefing; licence and fitness checks; no overloading; repair of road damage at proponent cost	Transport In-charge	Proponent
Employment of workforce	Occupational injury, heat stress, dust and fume exposure, hearing loss	Site wide, long term, high consequence	Written safe operating procedures taught in Urdu or Punjabi; free issue and enforced use of personal protective equipment; machine guarding; lagging of hot surfaces; drinking water, shade and rest breaks in hot weather; pre-employment and annual medical examination with respiratory screening; incident and near miss register; no child labour	Site Engineer	Environmental and Safety Officer and Proponent
Interaction with the community	Friction, complaints,	Local, long term	Preference for local recruitment with openly communicated	Site Engineer	Proponent

Project Activity	Potential Impact	Extent	Mitigation Measures	Implementing Body	Supervision
	perception of harm		policy; complaint register and displayed contact details; investigation and reply within a defined period; worker conduct briefing; participation in village plantation		
Greenbelt development	Beneficial: dust interception, screening, habitat	Site boundary, long term	Not fewer than 250 indigenous saplings in at least two rows, densest toward nearby residential settlements, commercial establishments, and sensitive receptors along the Faisalabad–Chiniot Road; planted early in the programme; watering and replacement of casualties until fully established.	Site Engineer	Environmental and Safety Officer
Decommissioning and site handover	Residual contamination, abandoned material, loss of land use	Site level, end of life	Advance restoration plan shared with the Agency; tanks and pipework drained, cleaned and removed; residues to authorized collectors; soil beneath storage areas inspected and remediated; foundations broken out and topsoil reinstated; trees retained and handed over	Proponent	Environmental Protection Agency, Punjab

Table 7.1: Environmental Management Plan

7.6 Environmental Monitoring Plan

Monitoring is the mechanism by which the effectiveness of the Environmental Management Plan is measured. It confirms whether the plant is being operated in conformity with the Plan, identifies any impact exceeding the significance criteria adopted, and documents actual performance so that mitigation can be refined where it is falling short. Table 7.2 sets out the parameters, frequency, locations and responsibility. Sampling and analysis requiring laboratory capability will be carried out through a laboratory certified by the Environmental Protection Agency.

Component	Objective	Parameters Monitored	Frequency	Location	Responsibility
Stack emissions	Compliance with PEQS for industrial gaseous emissions	Particulate matter, SO2, NOx, CO, smoke opacity	Half yearly, and after any major repair to burner or scrubber	Dryer stack sampling port	Environmental and Safety Officer through certified laboratory
Ambient air quality	Effectiveness of dust and emission control at receptors	PM10, PM2.5, SO2, NO2, CO	Half yearly, with one round in the dry pre-monsoon season	Site boundary on the downwind side and nearest village abadi	Environmental and Safety Officer through certified laboratory
Visible dust and housekeeping	Early detection of fugitive dust	Visual inspection of stockpiles, roads, conveyors and sprinkling record	Daily	Entire site and approach road	Environmental and Safety Officer
Noise levels	Compliance with PEQS for noise and protection of workers	Noise level in dB(A), day time	Quarterly	Site boundary, nearest abadi, and designated high noise positions within the plant	Environmental and Safety Officer
Bitumen temperature	Prevention of overheating and excess fume	Tank and mixing temperature against supplier range	Every shift, logged	Bitumen tank and pug mill	Burner and Bitumen Attendant
Groundwater quality	Detection of contamination against baseline	pH, TDS, TSS, oil and grease, hydrocarbons, chloride, nitrate	Annually	Site tube well and one community source	Environmental and Safety Officer through certified laboratory
Wastewater and interceptor	Prevention of oily discharge to ground	Visual condition, oil and grease, interceptor cleaning record	Monthly	Washing bay, interceptor and septic tank	Environmental and Safety Officer
Storage bund and drip containment	Prevention of soil and groundwater contamination	Bund integrity, drip tray condition, evidence of spillage, spill kit stock	Weekly	Fuel, oil and bitumen storage area	Store In-charge
Waste management	Proper handling and disposal of all waste streams	Quantities generated, reused, sold and disposed; collector receipts	Monthly, with register maintained continuously	Waste storage area	Store In-charge
Occupational health and safety	Protection of workers	Personal protective equipment compliance, accidents and near misses, first aid usage	Daily for compliance and incidents	Entire site	Environmental and Safety Officer
Worker medical screening	Early detection of occupational illness	General examination, respiratory screening, audiometry for high noise positions	Pre-employment and annually	Through a registered medical practitioner	Proponent and Environmental and Safety Officer

Component	Objective	Parameters Monitored	Frequency	Location	Responsibility
Plant and equipment condition	Maintenance of emission and noise performance	Burner service record, scrubber condition, fuel consumption per ton of mix, machinery condition	Monthly review	Entire plant	Mechanic and Plant Operator
Greenbelt	Survival and establishment of plantation	Survival rate, replacement of casualties, watering record	Monthly during establishment, quarterly thereafter	Site boundary	Site Engineer
Community grievances	Timely resolution of complaints	Complaints received, investigated, resolved and outstanding	Continuous, reviewed monthly	Site office complaint register	Environmental and Safety Officer

Table 7.2: Environmental Monitoring Plan

The following records will be maintained at the site office by the Environmental and Safety Officer and produced to the Environmental Protection Agency, Punjab on request.

- Stack emission and ambient air monitoring reports from the certified laboratory.
- Noise monitoring records for the boundary and for workplace positions.
- Shift-wise bitumen temperature log and burner service record.
- Daily water sprinkling record and housekeeping inspection record.
- Waste register with disposal receipts from authorized collectors.
- Groundwater test reports and the baseline against which they are compared.
- Personal protective equipment issue register and training attendance record.
- Accident, injury and near miss register and medical screening records.
- Emergency drill records.
- Complaint register with the action taken and the reply given in each case.

7.7 Institutional Capacity

Primary responsibility. Overall responsibility for the implementation of this Plan rests with the proponent, M/s Munawar & Brothers, represented by its proprietor, Mr. Munawar Hussain. The proponent is accountable to the Environmental Protection Agency, Punjab for compliance with the conditions of the environmental approval.

Operational management. The Site Engineer or Plant In-charge is responsible for operating the plant in a manner consistent with this Plan, for ensuring that the pollution control equipment is in service whenever the dryer is running, and for the safety of the workforce.

Environmental and Safety Officer. The proponent will designate an Environmental and Safety Officer before commissioning. This officer will be responsible for day to day implementation of the mitigation and monitoring measures, for maintaining all registers and records, for arranging laboratory monitoring, for conducting training and drills, for receiving and investigating complaints, and for preparing the periodic reports required by the Agency. The officer will have the authority to stop an operation that is being carried out in an unsafe or non-compliant manner, and that authority will be stated in writing, since an officer who can only advise cannot discharge the function.

Workforce. Every worker carries the responsibility of following the safe operating procedures, using the protective equipment issued, reporting spills, leaks, defects and near misses, and cooperating in monitoring and drills.

7.8 Communications and Documentation

A compliance report will be submitted to the Environmental Protection Agency, Punjab at the frequency specified in the environmental approval, covering monitoring results, incidents, complaints and the status of mitigation measures. Any incident with environmental consequence, such as a significant spill, a fire or a failure of the pollution control equipment lasting more than a short period, will be notified to the Agency promptly rather than reported at the next scheduled interval. Internally, a daily log will record production, fuel consumption, bitumen temperature and abnormal events, and a monthly review meeting will be held between the proponent, the Site Engineer and the Environmental and Safety Officer to consider monitoring results, complaints and outstanding actions. A board displaying the name and telephone number of the Environmental and Safety Officer will be maintained at the gate in Urdu.

7.9 Environmental and Safety Training

Training will be delivered in Urdu or Punjabi, will be practical rather than theoretical, and will be repeated rather than delivered once at induction. All new workers will receive induction training before being permitted to work.

The programme will cover the hazards of hot bitumen and the correct response to a burn, safe start-up and shutdown of the dryer and burner, the correct use and care of personal protective equipment, fire prevention and the use of extinguishers, spill containment and the use of the spill kit, waste segregation and the prohibition on burning, dust suppression duties, machine guarding and the prohibition on removing guards, emergency procedures and assembly points, and expected conduct toward the local community. Refresher sessions will be held at least twice a year and after any incident, with attendance recorded.

7.10 Greenbelt and Tree Plantation

A perimeter greenbelt of not fewer than two hundred and fifty saplings will be established in at least two staggered rows along the boundary, with the greatest density along the side facing the facility. Indigenous and locally proven species will be used, including shisham, kikar, neem, sukhchain, jaman, bakain and siris, chosen for their tolerance of dust and heat and for their value to birds. Planting will be carried out early in the implementation programme and in the appropriate planting season rather than deferred to the end of construction, so that the belt has begun to establish before production starts. Saplings will be watered through the first two summers, protected from grazing, and replaced where they fail, with a survival record maintained. In addition, the proponent will plant not fewer than five saplings for every boundary tree removed during site development, and will participate in the plantation of the approach road and the village common space as requested during consultation.

7.11 Emergency Response Plan

A written emergency response plan will be prepared and displayed before commissioning. It will identify the credible emergencies, namely fire at the bitumen or fuel storage, a burn injury from hot bitumen, a major spill, a vehicle accident and electrocution. It will specify the alarm arrangement and the assembly point, name the individuals responsible for raising the alarm, for firefighting, for first aid and for liaison with external services, and list the locations of firefighting equipment, the spill kit, the first aid box, the eyewash and the cold water shower. It will display the telephone numbers of Rescue 1122, the nearest hospital, the fire service, the police and the Environmental Protection Agency. Drills covering fire and burn injury will be held at least twice a year, and the plan will be revised after any incident in the light of what the incident reveals.

7.12 Equipment Maintenance

Preventive maintenance is treated in this Plan as an environmental control and not merely as a commercial matter, because most deterioration in emission and noise performance at a plant of this type originates in deferred maintenance. A maintenance schedule will be maintained for the burner and its combustion controls, the cyclone and scrubber including nozzle condition and water flow, the induced draught fan and ductwork, the conveyor and elevator enclosures and seals, the screen and its mountings, the bitumen tank thermostat and heating system, the pumps and pipework, the generator and its acoustic enclosure, and the vehicles and loader. Servicing will be recorded, and the fuel consumption per ton of mix will be tracked monthly as an early indicator of burner deterioration.

7.13 Site Restoration and Closure

The land is held under a five year lease. A site restoration plan will be prepared in advance of the expiry of the lease, or of any earlier decision to relocate the plant, and will be shared with the Environmental Protection Agency. Its content is described in Section 6.9. The essential commitments are that tanks, pipework and equipment will be drained, cleaned and removed rather than abandoned, that residues will go to authorized collectors, that soil beneath the storage and refueling areas will be inspected and remediated where contamination is found, that foundations and hard standing will be broken out where the land is to return to cultivation, that stockpiled topsoil will be reinstated, and that the trees established in the greenbelt will be retained and handed over rather than felled.

7.14 Environmental Budget

A specific provision has been made within the project cost for environmental and occupational safety management. The capital element is included in the project cost set out in Table 3.5, and the recurring element will be provided in the annual operating budget of the plant.

Item	Capital Provision (PKR)	Recurring per Annum (PKR)
Cyclone, wet scrubber, ducting, induced draught fan and stack with sampling port	700,000	Included in maintenance
Water sprinkling system, bowser connection and fixed sprinkler points	250,000	40,000
Bunding, impervious paving and drip containment at fuel and bitumen storage	200,000	20,000
Firefighting equipment, spill kit, eyewash and cold water shower	120,000	30,000
Greenbelt development, not fewer than 250 saplings with protection	150,000	60,000
Personal protective equipment for the workforce	Included in recurring	120,000
Environmental monitoring through a certified laboratory	—	250,000
Worker medical screening and first aid provision	—	60,000
Training, drills, signage and awareness material	—	50,000
Waste handling, hazardous waste disposal and collector charges	—	60,000
Total	1,420,000	690,000

Table 7-3: Indicative Environmental and Safety Budget

CHAPTER 8: PUBLIC CONSULTATION

8.1 General

Public consultation is a requirement of the environmental assessment process in Punjab and, apart from the legal obligation, it is an important means of understanding the expectations, concerns, and priorities of people living and working near a proposed project. Consultation for the proposed Munawar Brothers Asphalt Plant was carried out in the vicinity of **Faisalabad–Chiniot Road, Rasool Nagar Canal, near Hassan Murtaza Petroleum, District Chiniot**.

The consultation covered nearby residents, commercial establishments, landowners, agricultural land users, road users, transport operators, workers, and other stakeholders located along the Faisalabad–Chiniot Road and near the Rasool Nagar Canal. The exercise included both the immediate surroundings of the project site and the wider local community that may be affected by plant emissions, traffic movement, drainage, land use, employment, and other project-related activities.

8.2 Identification of Main Stakeholders

The principal stakeholders identified for the proposed project included:

- Residents, local business operators, landholders, and agricultural land users located along the Faisalabad–Chiniot Road in the vicinity of Rasool Nagar Canal and Hassan Murtaza Petroleum.
- The lessor of the project land and the owners or occupants of neighbouring land parcels.
- Local community elders, notable area representatives, and traders or commercial representatives operating along Faisalabad–Chiniot Road.
- Prospective employees, local labourers, transport operators, drivers, mechanics, and daily wage workers from nearby settlements in District Chiniot.
- Women from neighbouring households and nearby settlements, whose concerns regarding dust emissions, water quality, traffic safety, noise, and household health were recorded through separate consultations where possible.
- Road users, including pedestrians, motorcyclists, tractor operators, livestock owners, and drivers using Faisalabad–Chiniot Road.

- Farmers and land users concerned about dust deposition on crops, drainage, access to agricultural land, and possible contamination from fuel, oil, bitumen, or plant runoff.
- Relevant government departments and regulatory authorities, including the Environmental Protection Agency Punjab, District Administration Chiniot, Tehsil Municipal Administration Chiniot, Irrigation Department responsible for the Rasool Nagar Canal jurisdiction, Labour and Human Resource Department, and Punjab Highways Department.

8.3 Focus Group Discussions and Scoping Sessions

Focus group discussions were held with mixed groups of nearby residents, landholders, agricultural land users, local workers, transport operators, and younger people seeking employment opportunities in the vicinity of Faisalabad–Chiniot Road and Rasool Nagar Canal. Separate consultation sessions were arranged, where feasible, to enable women from neighbouring households to express their concerns openly.

The purpose of the proposed asphalt plant, the nature of asphalt production, the materials to be handled, the expected emissions, the movement of heavy vehicles, and the proposed environmental and safety controls were explained in plain Punjabi and Urdu before inviting comments. This approach was adopted to ensure that the views expressed by stakeholders were based on an understanding of the proposed project rather than on assumptions or incomplete information.

Scoping sessions were also held with the proponent's technical and operational staff to determine whether the issues raised by local stakeholders could be addressed through the project design, operational procedures, environmental controls, and Environmental Management Plan. The mitigation commitments described in this chapter were incorporated where they were technically and operationally feasible.

8.4 Methodology

The consultation process combined the following methods:

- Focus group discussions with residents, landholders, agricultural workers, local labourers, transport operators, and other members of the surrounding community.

- Structured household questionnaires administered to a sample of households and nearby stakeholders to collect demographic and socio-economic information and views regarding air quality, water resources, noise, traffic, health, employment, and general attitudes toward the project.
- Individual meetings with local community elders, area representatives, the land lessor, neighbouring landowners, nearby business operators, and relevant local representatives.
- Informal discussions with road users, drivers, workers, and agricultural land users along Faisalabad–Chiniot Road and around the project surroundings.
- Consultation with relevant government departments and regulatory authorities, where applicable.

The consultation sessions were conducted in the vicinity of Faisalabad–Chiniot Road, Rasool Nagar Canal, near Hassan Murtaza Petroleum, District Chiniot. Information from the consultations was recorded through meeting notes, participant names, signatures or thumb impressions, photographs where consent was provided, and completed questionnaires.

8.5 Summary Findings

The general response to the proposed project was positive, particularly because of the expected employment opportunities, local procurement, transport work, and potential contribution to road-development activities in District Chiniot and surrounding areas.

Most respondents were familiar with road construction and asphalt use but had limited technical knowledge of asphalt-plant operations. Their concerns were therefore practical and directly related to their daily lives and livelihoods. The main concerns included whether dust from aggregate stockpiles and plant operations would settle on nearby crops, agricultural land, houses, or roadside businesses; whether the smell of hot bitumen would affect nearby residents; whether fuel, oil, bitumen, or plant runoff could contaminate groundwater or the Rasool Nagar Canal; and whether heavy vehicles would create safety risks on Faisalabad–Chiniot Road.

Some stakeholders also expressed concern regarding noise, night-time operation, fire and accident risks, site drainage, possible obstruction of access routes, boundary encroachment, and the potential effect of the project on agricultural activities. The concerns raised during consultation and the corresponding responses incorporated into the project design and Environmental Management Plan are presented below.

Table 8.1: Summary of Public Consultation Findings and Responses

Component	Concern Raised by the Community	Response Incorporated into the Project
Employment	Local residents requested that employment opportunities be provided to people living near Faisalabad–Chiniot Road, Rasool Nagar Canal, and surrounding areas of District Chiniot rather than relying entirely on outside labour.	Preference will be given to qualified local residents for unskilled and semi-skilled positions. Employment opportunities will be communicated through local representatives and community contacts.
Dust on crops, houses, and businesses	Stakeholders were concerned that dust from aggregate stockpiles, internal roads, plant operations, and heavy vehicles could settle on standing crops, agricultural land, houses, and nearby roadside businesses.	A two-stage emission-control arrangement will be provided for the dryer; conveyors and transfer points will be enclosed where practicable; water sprinkling will be conducted on internal roads and stockpiles; internal circulation areas will be paved or properly compacted; and a dense perimeter greenbelt will be developed, particularly along the side facing nearby receptors.
Smell and fumes from bitumen	Nearby residents and businesses expressed concern that fumes or the smell of hot bitumen could spread from the plant toward surrounding areas along Faisalabad–Chiniot Road and near Hassan Murtaza Petroleum.	Thermostatic control will be used to prevent overheating of bitumen, which can increase fumes. The mixer and relevant emission points will be hooded and connected to the extraction/control system where required. Plant operations will preferably be confined to daylight hours to minimize nuisance.
Drinking water and groundwater quality	Stakeholders were concerned that diesel, oil, bitumen, or plant washings could contaminate nearby tube wells, hand pumps, groundwater, agricultural land, or the Rasool Nagar Canal.	Fuel, oil, and bitumen will be stored in bunded areas on impervious surfaces. Drip trays will be provided at pumps, joints, and transfer points. Washing water, where generated, will be managed through an oil-and-grease interceptor. No contaminated water will be discharged to fields, open land, drains, or Rasool Nagar Canal.
Rasool Nagar Canal protection	Stakeholders requested that the canal and its associated drainage pathways be protected from polluted stormwater, oil, bitumen, sediment, and accidental spills.	Clean and potentially contaminated runoff will be separated. Storage and maintenance areas will be located away from drainage pathways where practicable. Spill-containment materials, drain isolation arrangements, and regular inspections will be provided. No untreated effluent, oil, bitumen, or contaminated runoff will be allowed to enter Rasool Nagar Canal.
Road safety	Residents, farmers, pedestrians, motorcyclists, and road users were concerned that loaded tippers, bitumen tankers, and asphalt-delivery trucks could endanger children, livestock, pedestrians, and other vehicles using Faisalabad–Chiniot Road.	Speed limits will be enforced within and near the site. Truck loads will be covered or sheeted where applicable. Heavy vehicle movement will be scheduled to avoid congested periods where practicable. Drivers will receive safety briefings, and vehicles will be required to use designated access arrangements. The proponent will address damage to the access road caused by project vehicles in coordination with the relevant authority.
Traffic congestion and access	Stakeholders were concerned that project vehicles could obstruct the Faisalabad–Chiniot Road, nearby access routes, agricultural entrances, or commercial establishments.	Trucks will not be allowed to park unnecessarily on the main road. Loading and unloading will occur within the project boundary. Vehicle entry and exit will be controlled, and a traffic-management plan will be implemented.
Noise	Nearby residents and commercial operators were concerned that the plant, generator, and trucks might operate at night and disturb sleep or business activities.	The plant will preferably operate during daylight hours, with no unnecessary night-time production. The standby generator will be fitted with an acoustic enclosure, and all machinery will be maintained to control noise at source.
Fire and accidents	Stakeholders were concerned that a fire, fuel incident, bitumen spill, or hot-asphalt accident could affect workers, nearby residents, road users, or surrounding land.	Fire-fighting equipment will be installed at all relevant risk points. Fuel and bitumen storage will be bunded and separated from ignition sources. A written emergency-response plan will be prepared, fire and spill drills will be conducted at least twice annually, and a first-aid facility will be maintained on site.

Land and agricultural access	Neighbouring landowners and farmers were concerned that the project boundary could extend into adjoining fields, obstruct agricultural access, or interfere with existing watercourses and drainage routes.	All project activities will remain strictly within the approved and leased project boundary. Existing watercourses and drainage routes will not be blocked. A setback will be maintained along the boundary, and a greenbelt will be established where feasible.
Impact on crops and agricultural land	Farmers expressed concern that dust, contaminated runoff, or uncontrolled vehicle movement could affect crops, soil quality, irrigation, or access to cultivated land.	Dust-control measures, controlled drainage, spill prevention, vehicle speed limits, and designated internal routes will be implemented. Any verified project-related damage to agricultural access or land will be investigated and addressed by the proponent.
Local economic benefit	Community members requested that the project provide benefits beyond direct employment, including opportunities for local transporters, suppliers, mechanics, and small businesses.	Local procurement of ordinary supplies, transport, maintenance services, and other suitable services will be encouraged where practicable. The proponent will also consider participation in plantation along the approach road and in suitable local common areas.
Waste management	Stakeholders were concerned that used oil, empty containers, rejected asphalt, baghouse dust, and domestic waste could be dumped on open land or near the canal.	Waste will be segregated, stored in designated areas, and reused, recycled, or disposed of through suitable authorized arrangements. Open dumping and burning of waste will be prohibited.
Complaint resolution	Stakeholders requested a clear and accessible method for reporting dust, noise, traffic, drainage, or other project-related complaints.	A grievance mechanism will be established before commissioning. The site office will maintain a complaint register, and the name and telephone number of the Environmental and Safety Officer will be displayed at the entrance in Urdu. Complaints will be recorded, investigated, responded to within a defined period, and made available to the Environmental Protection Agency upon request.

8.6 Community Grievance Mechanism

A grievance mechanism will be established before commissioning of the asphalt plant. The mechanism will provide nearby residents, landowners, farmers, commercial operators, road users, workers, and other stakeholders with a clear channel for raising concerns related to project activities.

The following arrangements will be implemented:

- A complaint register will be maintained at the project site office.
- The name and telephone number of the Environmental and Safety Officer will be displayed on a board at the main gate in Urdu.
- Complaints may be submitted verbally, by telephone, in writing, or through a designated local representative.
- Each complaint will be assigned a reference number and recorded with the date, complainant details where provided, subject, location, and description of the issue.
- Complaints regarding dust, noise, traffic, drainage, spills, waste, employment, or safety will be investigated by the responsible project officer.

- Corrective action will be taken within a defined period according to the seriousness of the complaint.
- The complainant will be informed of the action taken, where contact details are available.
- Repeated or unresolved complaints will be referred to senior project management for review.
- Records of complaints, investigations, responses, and corrective actions will be retained and made available to the Environmental Protection Agency or other competent authority upon request.

The grievance mechanism is intended to ensure that households and businesses near Faisalabad–Chiniot Road, Rasool Nagar Canal, Hassan Murtaza Petroleum, and surrounding areas of District Chiniot have a practical and transparent way to report concerns and seek resolution without resorting to confrontation at the project entrance.

CHAPTER 9: CONCLUSION AND RECOMMENDATIONS

This report presents the Environmental Impact Assessment for the proposed establishment and operation of an asphalt hot mix plant by M/s Munawar & Brothers, Government Contractor, on a 3.5 acre leased parcel at Faisalabad-Chiniot Road, Rasool Nagar Canal, Near Hassan Murtaza Petroleum, District Chiniot.. The plant is rated at 50 tons of hot bituminous mix per day and carries a capital cost of PKR 15.00 million. The proponent is a licensee of the Pakistan Engineering Council with a long record in civil works contracting, and the plant is intended to supply its own road construction and maintenance contracts rather than to trade on the open market.

The assessment has been carried out in accordance with the requirements of the Punjab Environmental Protection Act, 1997 as amended in 2012, and the Punjab Environmental Protection (Review of IEE and EIA) Regulations, 2022. It is based on site reconnaissance, review of the plant specification, baseline measurement of ambient air, noise and water quality, review of published secondary data on the physical, biological and socio-economic environment of the area, and consultation with the local community and other stakeholders.

9.1 Main Issues and Concerns

The field survey and the technical appraisal identified the principal concerns as particulate emission from the rotary dryer stack; fugitive dust from aggregate handling, stockpiling and vehicle movement on the site and the approach road; hydrocarbon fume and odour from the heating and mixing of bitumen; noise from the burner, fan, screen and generator; the risk of soil and shallow groundwater contamination from fuel, oil and bitumen handling; road safety along shared village roads; and, most significantly in terms of consequence, the occupational risk of burns, heat stress and dust and fume exposure among the workers who handle hot bitumen and hot mix.

None of the identified impacts involves an environmentally sensitive receptor, a protected area, a critical habitat, an archaeological or religious site, the displacement of any household, or an irreversible loss of ecological value. The land is agricultural but is held on lease and is capable of returning to cultivation on decommissioning, provided the restoration commitments in this report are honoured. The summary matrix in Table 9.1 presents the predicted impacts of the project before and after mitigation.

Environmental Component	Nature of Impact	Phase	Significance Before Mitigation	Residual Significance After Mitigation
Air quality, point source	Particulate matter and combustion gases from dryer stack	Operation	High adverse	Low adverse
Air quality, fugitive	Dust from stockpiles, handling and vehicle movement	Construction and operation	High adverse	Low adverse
Odour and hydrocarbon fume	Volatile emission from heated bitumen	Operation	Moderate adverse	Low adverse
Noise	Plant machinery, generator and vehicles	Construction and operation	Moderate adverse	Low adverse
Soil and groundwater	Spillage of fuel, oil and bitumen; oily washings	Construction and operation	Moderate adverse	Low adverse
Water resources	Abstraction and wastewater management	Operation	Low adverse	Negligible
Solid and hazardous waste	Dust, sludge, spent oil, drums and scrap	Operation	Moderate adverse	Low adverse
Flora	Possible removal of boundary trees	Construction	Low adverse	Positive after greenbelt
Fauna	Disturbance to farmland species	Construction and operation	Low adverse	Negligible
Occupational health and safety	Burns, heat stress, dust, fume, noise and machinery hazard	Construction and operation	High adverse	Low to moderate adverse
Community health and amenity	Dust, odour and perception of harm	Operation	Moderate adverse	Low adverse
Traffic and road safety	Heavy vehicle movement on shared roads	Construction and operation	Moderate adverse	Low adverse
Employment and local economy	Direct and indirect employment and local procurement	Construction and operation	Positive, medium	Positive, medium
Land use and landscape	Industrial use in an agricultural setting	Operation	Low adverse	Negligible after greenbelt
Site condition at closure	Residual contamination and abandoned material	Decommissioning	Moderate adverse	Low adverse

Table 9.1: Summary Matrix of Environmental Impacts

9.2 Summary of Operational Environmental and Safety Risks

Environmental risks. The dominant environmental risk is failure of the air pollution control train, whether through scrubber stoppage, nozzle blockage, loss of water supply, duct leakage or an untuned burner. Any of these converts a compliant plant into a non-compliant one within a single shift, and none of them is visible from the control cabin. This is why the monitoring plan requires daily visual checking and why the shutdown of the dryer on scrubber failure is stated as a rule rather than a preference. The secondary environmental risks are a

lapse in dust suppression during the dry season, overheating of bitumen through thermostat failure or operator shortcut, and a spill at the fuel or bitumen storage area.

Safety risks. The dominant safety risk is contact with hot bitumen or hot mix, which causes deep and disfiguring burns. The associated risks are heat stress in summer, fire at the fuel or bitumen storage, entanglement in unguarded conveyors and elevators, electrical hazard, and vehicle movement within a congested site. These risks are well understood and are controllable by the measures set out in Chapter 6 and Chapter 7, but they are controllable only through sustained discipline. Slippage in protective equipment use, in guarding, in maintenance and in training is the normal precursor to a serious accident at plants of this type.

9.3 Recommendations

On the basis of the evaluation presented in this report, the following recommendations are made to ensure the environmentally and occupationally sound establishment and operation of the plant.

1. Prioritising implementation of the Environmental Management Plan. The proponent should give operational priority to the implementation of the Environmental Management Plan set out in Chapter 7, should designate an Environmental and Safety Officer in writing before commissioning with the authority to stop non-compliant or unsafe work, and should allocate the budget identified in Section 7.14 in full.
2. Commissioning of pollution control equipment before production. The cyclone, wet scrubber, ducting, induced draught fan and stack should be installed, tested and demonstrated to be functioning before the first commercial batch is produced, and the dryer should not be operated at any time when the scrubber is out of service.
3. Stack testing and ambient monitoring. Stack emissions should be tested by a laboratory certified by the Environmental Protection Agency at commissioning and half yearly thereafter, and ambient air quality should be monitored at the boundary and at the nearest abadi half yearly, with one round taken during the dry pre-monsoon season when dust levels are highest.
4. Control of fugitive dust. The internal circulation area, loading area and plant hardstanding should be paved before production begins, and a written daily sprinkling schedule should be maintained and recorded, with the frequency increased during dry and windy weather.

5. Control of bitumen temperature. The bitumen tank thermostat should be kept in calibration, the tank and mixing temperature should be logged every shift, and bitumen should not be held at working temperature outside production hours. Overheating should be treated as a reportable abnormality rather than a routine occurrence.

6. Containment of fuel, oil and bitumen. All storage should stand on impervious paving within a bund capable of containing the largest vessel with freeboard, drip trays should be fitted at every pump, valve and joint, a spill kit should be maintained at the storage area, and underground fuel tanks should not be used.

7. Occupational safety programme. A documented occupational safety programme should be enforced covering safe operating procedures taught in Urdu or Punjabi, free issue and enforced use of heat resistant gloves, aprons, face shields, helmets, safety footwear, dust masks, organic vapour respirators and hearing protection, guarding of all conveyors and elevators, lagging of hot surfaces, an eyewash and cold water shower adjacent to the bitumen handling area, drinking water and shaded rest in hot weather, and pre-employment and annual medical screening including respiratory examination.

8. Waste management. Waste should be segregated at source and a waste register maintained. Hazardous waste, including spent oil, filters and oily rags, should be transferred only to authorized collectors against a documented receipt. Open burning of waste on the site should be prohibited absolutely.

9. Wastewater management. Scrubber water should be recirculated, washing water should pass through an oil and grease interceptor cleaned on schedule, domestic sewage should go to a septic tank sited away from the tube well, and no effluent of any kind should be discharged to a field, drain or watercourse.

10. Traffic management. A speed limit should be enforced within and near the site, all loads should be sheeted, heavy vehicle movement should be scheduled away from school opening and closing times, drivers should be briefed and their licences and vehicle fitness checked periodically, and any damage caused to village roads by the proponent’s vehicles should be repaired at the proponent’s cost.

11. Greenbelt development. A perimeter greenbelt of not fewer than two hundred and fifty indigenous saplings in at least two rows should be planted early in the implementation programme, watered and protected until established, with casualties replaced and a survival record maintained.

12. Community engagement and grievance redress. A complaint register should be maintained, the name and telephone number of the Environmental and Safety Officer displayed at the gate in Urdu, and every complaint investigated and answered within a defined period, with the record available to the Agency.
13. Emergency preparedness. A written emergency response plan should be in place and displayed before commissioning, firefighting equipment should be installed and maintained at all risk points, and drills should be held at least twice a year with attendance recorded.
14. Restriction to daylight operation. Production should be confined to a single daylight shift, so that night time noise and lighting do not affect the surrounding settlements, and any future proposal to extend to a second shift should be referred to the Agency before it is implemented.
15. Site restoration at closure. A site restoration plan should be prepared in advance of the expiry of the lease and shared with the Agency, and the restoration commitments recorded in Sections 6.9 and 7.13 should be honoured in full on decommissioning.

9.4 Final Conclusion

This Environmental Impact Assessment demonstrates that the proposed asphalt hot mix plant of M/s Munawar & Brothers at Faisalabad-Chiniot Road, Rasool Nagar Canal, Near Hassan Murtaza Petroleum, District Chiniot., will not give rise to significant or unmanageable adverse environmental impacts on the surrounding agricultural landscape or on the neighbouring community, provided that the mitigation measures and the Environmental Management Plan set out in this report are implemented in full and sustained throughout the operating life of the plant. The critical requirements are the installation and continuous operation of the two stage air pollution control train, disciplined dust suppression, thermostatic control of bitumen temperature, and containment of all fuel, oil and bitumen storage, and a genuine occupational safety programme for the workers who handle hot material.

The project involves no involuntary resettlement, no acquisition of public land, no loss of protected habitat and no irreversible environmental change. It will generate direct employment for approximately twenty two persons together with indirect employment in transport and supply, in a rural tehsil where non-agricultural work is scarce, and it will improve the quality and reduce the cost of the road works the proponent executes for public sector clients.

Taken as a whole, the project is assessed as environmentally manageable, technically sound and socially beneficial. It is accordingly recommended that the Environmental Protection Agency, Punjab grant the requisite environmental approval for the project under Section 12 of the Punjab Environmental Protection Act, 1997 as amended in 2012, subject to the standard terms and conditions prescribed under that Act, to compliance with the Environmental Management Plan set out in Chapter 7, and to payment of the prescribed scrutiny fee by the proponent.