

## SECTION - 1

### INTRODUCTION

#### 1.0 Project Background

Lahore is the second largest urban center in Pakistan. It is the provincial capital of the Punjab Province with a population of 9 million inhabitants in 2006. The transport demand amounts to 6.8 million daily person trips for work, shopping or recreation other than walking. Over the past fifteen years the rapid growth in population and vehicle ownership in Lahore has steadily worsened traffic congestion. Several transport studies were conducted to overcome this situation.

The travel demand in 2005 was almost 7 million which was expected to rise to more than 11 million by the year 2021.<sup>1</sup>Lahore Urban Transport Master Plan (LUTMP) in 2010-2011, recorded 8 million trips per day in the year 2010. The major percentage of this travel demand comprises of public transport.

Based on identification of potential mass transit corridors, a strategic long term LRMTS network was developed by MVA Asia Limited in the following order of priority:

**Green Line:** Ferozpur Road/Mall Road/Ravi Road/Shahdara

**Orange Line:** Raiwind Road/Multan Road/ McLeod Road/ Railway Station/GT Road

**Blue Line:** Township/Gulberg Boulevard/Jail Road

**Purple Line:** Bhatti Gate/Allama Iqbal Road/Airport

To resolve public transport issues in Lahore and to provide safe, efficient, comfortable, and affordable transport to the public, Government of the Punjab (GoP) has successfully completed Green Line and currently planning to introduce a Metro Rail Transit System on the Orange Line (From Ali Town to Dera Gujran), Lahore.

The overall objective of the proposed project is to provide a safe, congestion free and smooth traffic facility to the commuters of the project area. The proposed project will greatly benefit the public by providing a transport facility that is more efficient than the existing bus services and reduce the number of vehicles on road.

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<sup>1</sup>Feasibility studies for Green Line and Orange Line, MVA Asia Limited, 2006.

To comply with Pakistan's Environmental Regulations as per Pakistan Environmental Protection Act (PEPA) 1997, the Government of Punjab (GoP) has entrusted National Engineering Services Pakistan (NESPAK) with the assignment of carrying out an Environmental Impact Assessment (EIA) Study of the proposed construction of Lahore Rapid Mass Transit System (LRMTS).

### **1.1 Scope of Study**

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

### **1.2 Study Objectives**

The overall objective of EIA is to assess the environmental impacts arising from the project. The specific objectives of the EIA Study for construction of Lahore Rapid Mass Transit System (LRMTS) include the following:

- Collection and synchronization of data related to physical, biological and socio-economic environments of the project area and to prepare baseline environmental profile;
- Identification, prediction and evaluation of environmental impacts of the proposed Project;
- Implementation of mitigation measures to minimize the adverse impacts; and
- Preparation of an Environmental Management and Monitoring Plan.

### **1.3 Need for EIA Study of the Proposed Project**

EIA is mandatory according to the Punjab Environmental Protection (Amendment) Act, 2012 of Pakistan Environmental Protection Act (PEPA-1997). Section 12 (1) of the PEPA-1997 which states that:

*“No proponent of a project shall commence construction or operation unless he has filed with the Provincial Agency an initial environmental examination or, where the project is*

*likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Provincial Agency approval in respect thereof.”*

According to the Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations 2000, the proposed project falls under category D (Transport) of Schedule II, which requires EIA before commencement of construction.

#### **1.4 The Proponent and Consultant**

The proponent of the project is the Punjab Metro Bus Authority (PMA) while the Consultant is NESPAK. The details are given as under:

##### **a) Proponent Contact/Address**

The Punjab Metro Bus Authority (PMA),  
Government of the Punjab (GoP)  
5th Floor, Arfa Software Technology Park,  
346 - B Ferozpur Road, Lahore  
Tel: +92 42 99232540  
Fax: +92 42 99232541

##### **b) Consultant Contact/Address**

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

#### **1.5 Study Team**

A multidisciplinary team was formulated to conduct the study. The team comprises the following persons.

Muhammad Zubair	:	Project Advisor/ Quality Expert
Kashif Bashir	:	Team Leader
Saeed Hussain	:	Senior Sociologist
Uzma Rafique	:	Senior Environmentalist
Ramla Siddique	:	Senior Environmentalist

Zahida Manzoor	:	Senior Sociologist
Syed Zeeshan Abbas	:	Environmental Engineer
Nida Batool	:	Environmental Engineer
Abdullah Mustafa	:	Civil Engineer
Shehnala Hanif	:	Environmentalist
Raheela Hakim	:	Environmentalist
Komal Goraya	:	Environmentalist

## **1.6 Study Approach & Methodology**

### **1.6.1 Study Approach**

The study has been conducted in accordance with Environmental Protection Agency (EPA), Government of Pakistan (GOP) guidelines, 2000. The study is based on both primary and secondary data and information. Discussions were held with stakeholders including government officials, community representatives and a wide range of road users and roadside dwellers. The main purpose of this approach was to obtain a fair impression on the people's perceptions of the project and its environmental impacts.

### **1.6.2 Methodology**

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

#### **a) Orientation**

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

#### **b) Planning for Data Collection**

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

### **c) Data Collection**

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

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

### ***Physical Environment***

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

#### Geology, Topography, Soils

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

#### Hydrology and Drainage

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

#### Air Quality

Ambient air quality measurements are essential to provide a description of the existing conditions, to provide a baseline against which changes can be measured and to assist in the determination of potential impacts of the proposed construction on air quality conditions. Ambient air quality was continuously monitored for Carbon Monoxide (CO), Sulphur Dioxide (SO<sub>2</sub>), Nitrogen Dioxide (NO<sub>2</sub>), Particulate Matter (PM<sub>10</sub>), for 24 hours.

CO was analyzed by Testo 317-3 CO Analyzer, While SO<sub>2</sub> and NO<sub>2</sub> were analyzed according to Standard Operating Procedures (SOP) based on recognized method ISO 6767 and method ISO 6768 of USEPA respectively.

### Noise

Noise level readings were taken for 24 hours with the interval of one second and hourly average data was reported. Sound level measurements were taken using a digital sound meter (TES 1350A).

### Water Quality

Water quality monitoring was conducted to determine the water quality situation prior to construction. It has been observed that the surface water and air quality are the most important environmental variables to be affected in the project. The extent of surface water and groundwater contamination in the project area was assessed based on the test results of chemical and microbiological parameters for surface and groundwater. Dissolved oxygen (DO), pH and conductivity measurements were taken in situ at all sampling stations. Laboratory analyses were performed according to SOP based on recognized methods of ASTM, USEPA, or APHA methods. **Table 1.1** shows the standard analytical methods and instrument used for analysis of water quality parameters.

**Table 1.1: Standard Analytical Methods for Analysis of Water Quality Parameters**

Sr. No.	Parameter	Standard Method	Instrument Used
1	Temperature	APHA 2550 B	Digital Thermometer, USA
2	pH	APHA D1293-95	Hach pH meter, USA
3	Color	APHA 8025	Hach Spectrometer DR/2000, USA
4	COD	APHA 5220 C (1992)	Hach COD Reactor, USA
5	TSS	APHA 2540 D	Hach Conductivity meter, USA
6	Oil & Grease	APHA 5520 (1995)	Hach Conductivity meter, USA
7	Chloride	USEPA 1665	Hach Spectrometer DR/2000
8	Fluoride	USEPA 346.1	Hach Spectrometer DR/2000
9	Sulphate	APHA 4500 SO <sub>4</sub> <sup>-2</sup>	Hach Spectrometer DR/2000

Sr. No.	Parameter	Standard Method	Instrument Used
		E (1995)	
10	Sulfide	USEPA 376.2	Hach Spectrometer DR/2000
11	Ammonia	Hach Method 8038	Hach Spectrometer DR/2000
12	Cadmium	USEPA 3500 cd-D	Hach Spectrometer DR/2000
13	Chromium	USEPA 3500 cR-D	Hach Spectrometer DR/2000
14	Copper	USEPA 3390 e	Hach Spectrometer DR/2000
15	Lead	Atomic Absorption	GBC-Atomic Absorption,Australia
16	Nickel	USEPA 3500 Ni-D	Hach Spectrometer DR/2000
17	Silver	USEPA 3500 Ni-D	Hach Spectrometer DR/2000
18	Zinc	-----	GBC-Atomic Absorption,Australia
19	Arsenic	USEPA 3500 As	Hach Spectrometer DR/2000
20	Barium	-----	Hach Spectrometer DR/2000
21	Iron	APHA 3500 Fe	Hach Spectrometer DR/2000, USA
22	Manganese	USEPA 34193	Hach Spectrometer DR/2000, USA
23	Potassium	-----	Microprocessor Flame photometer 1381, ESICO
24	Sodium	-----	Microprocessor Flame photometer 1381
25	Calcium	USEPA 130.2	Microprocessor Flame photometer 1381
26	Magnesium	USEPA 130.2	Hach Spectrometer DR/2000
27	Turbidity	USEPA 275	Hach Spectrometer DR/2000

### **Biological Environment**

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

### Flora

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

### Fauna

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

### ***Socio-Cultural Environment***

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

- Land use and Municipal Status
- Traffic, Transportation and Access Roads
- Demographics
- Livelihoods
- Poverty
- Education
- Health
- Social Setup
- Community Facilities
- Solid Waste Management
- Proposed Developments
- Recreational Activities
- Archaeological and Cultural Heritage

### **d) Identification and Evaluation of Environmental Impacts**

The impacts of the project on the physical, biological and socio-economic environment at the design, construction and operational phases were identified and evaluated based on their type and magnitude.



### e) **Mitigation Measures and Implementation Arrangements**

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

## 1.7 **Structure of the Report**

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

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

Section 3: **Description of the Project** furnishes project related information such as location, cost, size and major components. It also contains a description and evaluation of the various alternatives that were under consideration and a justification for selecting the proposed system.

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

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

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

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

## **SECTION – 2**

### **POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK**

#### **2.1 Policy Framework**

The Ministry of Environment is the authority responsible for policy making for environmental protection in Pakistan.

##### **2.1.1 National Environment Policy, 2005**

In March 2005, Government of Pakistan (GOP) launched its National Environmental Policy, which provides an overarching framework for addressing environmental issues. Section 5 of the policy commits for integration of environment into development planning as instrument for achieving the objectives of National Environmental Policy. It further states in clause (b) of subsection 5.1 that EIA related provisions of Environmental Protection Act, 1997, will be diligently enforced for all development projects. It also provides broad guidelines to the federal government, provincial governments, federally administered territories and local governments to address their environmental concerns and to ensure effective management of their environmental resources.

##### **2.1.2 National Resettlement Policy, 2002**

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

#### **2.2 Legal Framework**

GOP has promulgated laws, acts, regulations and standards for the protection, conservation, rehabilitation and improvement of the environment. In addition to this, they have also developed environmental assessment procedures governing developmental projects. The relevant excerpts of these laws and procedures are attached below.

##### **2.2.1 Pakistan Environmental Protection Act, 1997**

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

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

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

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

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

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

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

### **2.2.3 Pakistan Environmental Assessment Procedures, 1997**

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

Pakistan Environmental Assessment Procedures (1997) contains the following sets of information relevant to the proposed project.

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

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

**b) Guidelines for the Preparation and Review of Environmental Reports**

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

**c) National Environmental Quality Standards (NEQS), 2010**

Pakistan Environmental Protection Council (PEPC) first approved these standards in 1993. They were later revised in 1995, 2000 and 2010. They furnish information on the permissible limits for discharges of municipal and industrial effluent parameters and industrial gaseous emissions in order to control environmental pollution. The National Environmental Quality Standards (NEQS), 2010 are available at official website of EPD, Punjab.

**2.2.4 Other Relevant Laws**

**a) Punjab Local Government Ordinance, 2001**

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

**b) Canal and Drainage Act, 1873**

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

**c) Pakistan Penal Code, 1860**

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

**d) Guideline for Solid Waste Management (2005)**

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

**e) Sectoral Guidelines (1997)**

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

- 1) Major thermal power stations
- 2) Major chemical manufacturing plants
- 3) Municipal waste disposal
- 4) New township development
- 5) Oil and gas exploration and production
- 6) Major roads
- 7) Water supply projects
- 8) Sewerage Schemes
- 9) Industrial estates, etc.

**1.1 2.3 Air Quality Standards**

In pursuance of the statutory requirement under clause (e) of sub-section (1) of section (6) of the Pakistan Environmental Protection Act, 1997(XXXIV of 1997), the Pakistan Environmental Protection Agency with prior approval of the Pakistan Environmental Protection Council, has published the NEQS for Ambient Air in 2010. USEPA standards along with NEQS effective from January, 2013 are given in **Table 2.1**.

**Table 2.1: Ambient Air Quality Standards**

#	Pollutant	NEQS		USEPA	
		Time-Weighted average	Concentration standard	Time weighted average	Concentration standard
1	SO <sub>2</sub>	Annual average	80 µg/m <sup>3</sup>	Annual arithmetic mean	80 µg/m <sup>3</sup> , (0.030 ppm)
		24 hours	120 µg/m <sup>3</sup>	24-hours average	365 µg/m <sup>3</sup> , 0.50 ppm
2	NO	Annual average	40 µg/m <sup>3</sup>	-	-
		24 hours	40 µg/m <sup>3</sup>	-	-
3	NO <sub>2</sub>	Annual average	40 µg/m <sup>3</sup>	Annual arithmetic mean	100 µg/m <sup>3</sup> , (0.053 ppm)
		24 hours	80 µg/m <sup>3</sup>		
4	O <sub>3</sub>	1 hour	130 µg/m <sup>3</sup>		235 µg/m <sup>3</sup> , (0.12 ppm)
		-	-	8-hours average	157 µg/m <sup>3</sup> , (0.08 ppm)
5	Suspended Particulate Matters (SPM)	Annual average	360µg/m <sup>3</sup>	-	-
		24 hours	500 µg/m <sup>3</sup>	-	-
6	PM <sub>10</sub>	Annual average	120 µg/m <sup>3</sup>	Annual arithmetic mean	50 µg/m <sup>3</sup>
		24 hours	150 µg/m <sup>3</sup>	24-hours average	150 µg/m <sup>3</sup>
7	PM <sub>2.5</sub>	Annual average	15 µg/m <sup>3</sup>	Annual arithmetic mean	15 µg/m <sup>3</sup>
		24 hours	35 µg/m <sup>3</sup>	24-hours average	65 µg/m <sup>3</sup>
		1 hour	15 µg/m <sup>3</sup>	-	-
8	Lead	Annual average	1 µg/m <sup>3</sup>	Quarterly average	1.5 µg/m <sup>3</sup>
		24 hours	1.5 µg/m <sup>3</sup>		
9	CO	8 hours	5 mg/m <sup>3</sup>	8-hours Average	10 mg/m <sup>3</sup> , ( 9 ppm)
		1 hour	10 mg/m <sup>3</sup>	1-hour average	40 mg/m <sup>3</sup> , (35 ppm)

## 2.4 Noise Quality Standards

In pursuance of the statutory requirement under clause (c) of sub-section (1) of section (6) of the Pakistan Environmental Protection Act, 1997(XXXIV of 1997), the Pakistan Environmental Protection Agency with prior approval of the Pakistan Environmental Protection Council, has published the NEQS for Noise (2010). These standards are established for the four different categories which include residential area, commercial area, industrial area and silent zone. These standards vary according to the day and night timing, day time hours are 6:00 am to 10:00 pm and night time hours are 10:00 pm to 6:00 am. USEPA standards and World Bank guidelines along with National Environmental Quality Standards for Noise effective from January, 2012 are used for bench marking purpose and given in **Table 2.2**.

**Table 2.2: Noise Quality Standards**

#	Category of Area	NEQS		WB guidelines		USEPA Standards	
		Day Time	Night Time	Day Time	Night Time	Indoor	Outdoor
1	Residential Area	55	45	55	45	45	55
2	Commercial Area	65	55	70	70	70	70
3	Industrial Area	75	65	70	70	70	70
4	Silence Zone	50	45	-	-	-	-

## 2.5 Drinking Water Quality Standards

In pursuance of the statutory requirement under clause (c) of sub-section (1) of section (6) of the Pakistan Environmental Protection Act, 1997(XXXIV of 1997), the Pakistan Environmental Protection Agency with prior approval of the Pakistan Environmental Protection Council, has published the National Standards for Drinking Water Quality (2010).

**Table 2.3** presents the national standards for drinking water quality. Drinking water quality guidelines issued by WHO and USEPA have also been included for benchmarking purposes.

**Table 2.3: Drinking Water Quality Standards**

#	Parameters	Concentration Standards		
		NEQS (mg/l)	WHO (mg/l)	USEPA (mg/l)
<b>Chemical Parameters</b>				
1	Aluminium (Al)	≤ 0.2	0.2	0.05-0.02
2	Ammonium (NH <sub>3</sub> )	-	1.5	NS
3	Antimony (Sb)	≤ 0.005	0.005	0.006
4	Arsenic (As)	≤ 0.05	0.01	0.05
5	Barium (Ba)	0.7	0.7	2.0
6	Boron (B)	0.3	0.3	NS
7	Cadmium (Cd)	0.01	0.003	0.005
8	Chloride (Cl)	< 250	250	250
9	Chromium (Cr)	≤ 0.05	0.05	0.1
10	Copper (Cu)	2	1-2	1.0
11	Cyanide (CN)	≤ 0.05	0.07	0.2
12	Fluoride (F)	≤ 1.5	1.5	2.0-4.0
13	Iron (Fe)	-	0.3	0.3
14	Lead (Pb)	≤ 0.05	0.01	0.015
15	Manganese (Mn)	≤ 0.5	0.1-0.5	0.05
16	Mercury (Hg)	≤ 0.001	0.001	0.002
17	Molybdenum (Mo)	-	0.07	NS
18	Nickel (Ni)	≤ 0.02	0.02	0.1
19	Nitrate (NO <sub>3</sub> )	≤ 50	NS	10.0 as N
20	Nitrite (NO <sub>2</sub> )	≤ 3	NS	10.0 as N
21	Selenium (Se)	0.01	0.01	0.05
22	Silver (Ag)	-	NS	0.1
23	Sodium (Na)	-	200	20
24	Sulphate (So <sub>3</sub> )	-	250	250
25	Residual Chlorine	0.2-0.5	-	-
26	Zinc (Zn)	5.0	3.0	5.0
<b>Physical Parameters</b>				
27	Color	≤ 15 TCU	15 cu	15 cu
28	Taste	Non Objectionable/	-	-



#	Parameters	Concentration Standards		
		NEQS (mg/l)	WHO (mg/l)	USEPA (mg/l)
		Acceptable		
29	Odour	Non Objectionable/ Acceptable	N S	3 TON
30	Turbidity	< 5 NTU	5 NTU	0.5-5.0 NTU
31	Total hardness	< 500 mg/l	-	-
32	TDS	< 1000	1000	500
33	pH	6.5-8.5	6.5-8.5	6.5-8.5
<b>Biological Parameters</b>				
34	E-Coli	Must not be detectable in any 100 ml sample	0	0
35	Total Coliforms	Must not be detectable in any 100 ml sample	0	0

## 2.6 Occupational Health

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

## 2.7 Toxic or Hazardous Waste

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

## **2.8 Preservation of Cultural Heritage**

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

## **2.9 Administrative Framework**

### **2.9.1 Punjab Metro Bus Authority (PMA)**

The implementing agency of the proposed project is PMA Government of Punjab. The management of PMA will ensure that all the proposed measures are effectively implemented at the design, construction and operational stages.

### **2.9.2 Environmental Protection Agency, Punjab**

Pakistan Environmental Protection Council is the apex inter-ministerial and multi-stakeholder decision-making body, which is headed by the Prime Minister, while Pakistan Environmental Protection Agency is meant for the enforcement of environmental laws in Pakistan. They have delegated powers to provincial environmental protection agencies for review, approval and monitoring of environmental examination/assessment projects. As regards the proposed Project, EPA Punjab will be responsible for reviewing the report, issuing No Objection Certificate (NOC) and overall/broad based monitoring of the proposed project activities.

### **2.9.3 Rules of Business for District Environment Office under Punjab LGO, 2001**

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

- To regulate motor vehicles subject to the provisions of the Pakistan Environmental Protection Act, 1997 and the rules and regulations made there-under;
- To ensure, guide and assist the proponents of new projects in submission of Initial Environmental Examination (IEE)/ Environmental Impact Assessment (EIA) to Director General, EPA for approval;
- To ensure implementation of environmental protection and preservation measures in all development projects at the district level and to sensitize government agencies on environmental issues;

- To identify the needs for legislation in various sectors of the environmental matters;
- To provide information and guidance to the public on environment;
- To encourage the formation and working of non-governmental organizations, to prevent and combat pollution and promote sustainable development;
- To undertake regular monitoring of projects and to submit progress reports to Director General, EPA for publication in the annual Report.